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Study of an Information System for Second-hand Housing Transactions

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Content

Abstract

With the rapid development of computer technology and the constant updating of the management concept, more and more enterprises and individuals choose Internet platform to realize various trading activities. However, in the second-hand housing transaction market, the asymmetric information between buyers and sellers reduces the transparency of second-hand housing transaction and increases transaction costs. Therefore, by taking the second-hand housing transaction market as the investigation object, the second-hand housing transaction management system is designed to provide convenience for people to trade second-hand housing.

First, the features and problems of the present second-hand housing transaction market were analyzed and the development background of the system was introduced. Next, the demands of second-hand housing transaction market were analyzed. The performance requirement of the system was provided. Besides, the second-hand housing transaction system was designed, on the basis of which, the design and development of each function module were studied in detail. Finally, the function of information release, management and search of the second-hand housing transaction system were reached.

The purpose of the system is to provide a more convenient, free, efficient and transparent second-hand housing transaction platform for users.

Keywords: second-hand housing transaction, system development, transparent and efficient.

Chapter 1

Introduction

1.1 Background of the Research

In the past few years, China 's second-hand housing market has maintained a rapid growth, especially in the first-tier cities, the second-hand housing market has developed most rapidly, achieving leapfrog growth. Following is an analysis of the size of China second-hand housing market in the past three years:
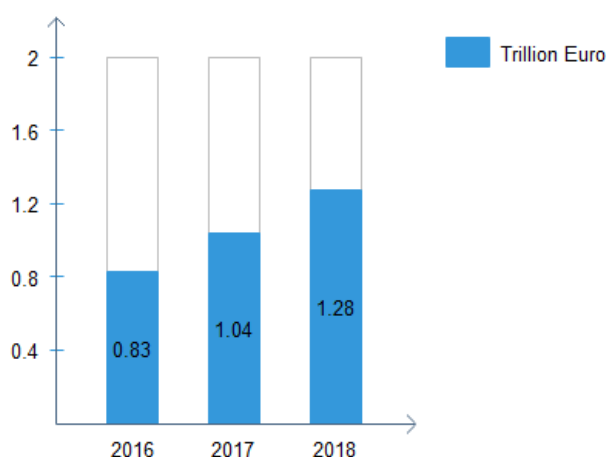
Figure 1: China second-hand housing market scale[1]

The growth potential of China second-hand housing market is still huge, on the one hand, with the deepening of the Internet industry and the improvement of consumers' recognition of the Internet, On the other hand, the scale of second-hand housing transactions in China accounts for less than 40%, while the scale of second-hand housing transactions in the United States accounts for 65%. Therefore, the scale of second-hand housing transactions in China has room for further development.

China's stock market (including second-hand housing transactions and leasing market) accounted for less than 50%, while the US second-hand housing market share has reached 65%, and the new house market share is only 8%. As China's real estate market continues to mature, the share of the new home market will inevitably decline, while the share of the stock market will increase.

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[1] China second-hand housing industry data report

Figure 2: China and the US real estate market structure[2]

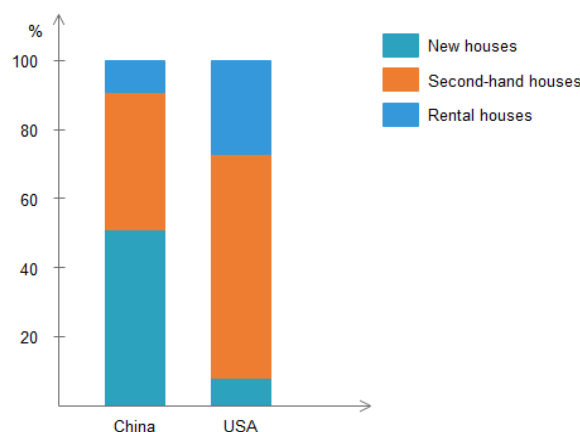The volume of second-hand houses in Shanghai surpassed that of new houses for the first time in 2004. In 2018, the total volume of second-hand houses in Shanghai, both in terms of transaction area and number of units, was about twice that of new houses. Since 2015, the transaction volume of second-hand houses in Beijing has gradually exceeded that of new houses. In 2018, the transaction volume of second-hand houses in Beijing is 1.98 times of that of new houses, and the area of second-hand houses is 1.84 times of that of new houses, and the growth trend is maintained. At present, the transaction volume of second-hand housing in China's core cities has exceeded that of new housing, and China's real estate is entering an era of second-hand housing transactions and leasing.

With the development of the second-hand housing market, and purchasing and selling house becomes more and more common today. However, in China's second-hand housing transaction market, there is almost no professional and transparent information platform between buyers and sellers. They often purchase or sell housing or renting through second-hand housing trading agents, which is the primary way for China's second-hand housing transaction. People register their housing information in the second-hand housing trading agents and commission them to resell. Buyers also understand the property information and purchase housing through agents.

At present, most of the intermediary fees in China are not less than 2%, and the fees are basically concentrated between 2% and 3%, while in the United States, the fees are between 5% and 6%. Intermediary costs for home purchases in the United States are generally borne by sellers. American agency is bilateral, that is, the seller and the buyer have their own agency agent to protect the interests of buyers or sellers. A house can only be entrusted to a sales agent, the real estate agent will be signed with the sale of official documents, determine the amount and details of the commission, and then take photos, put on the real estate agent's special MSL system. After the release of many buyer intermediary will see the new room information, according to

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[2] China second-hand housing industry data report

the situation of the guests to recommend, booking room. Buying and selling houses, including looking at houses, need to be done through intermediaries. If you find a homeowner, you cannot do so either. You must do so through an intermediary property management company. In China, the agency of the house is unilateral, the buyer does not have its own independent agency agent, China's real estate agent is usually the agent of the buyer and seller, responsible for both buyers and sellers. After the successful transaction, the intermediary company shall charge the corresponding commission. General real estate agents will help sellers fight for benefits, because China's real estate intermediary fees are almost all borne by the buyer, the buyer in addition to paying for the house, but also out of intermediary fees paid separately to intermediary companies. Also need to pay taxes, fees and so on. Buyers generally feel that intermediary fees are too high. A house can be put up for sale at multiple real estate agencies. Real estate intermediaries can only see their own company system within the house source information, do not understand the information of others, the market grasp is not comprehensive. And intermediaries often deliberately raise prices for more commissions. In addition, in China, the sale of housing does not have to be through intermediaries, if you can find the owner, direct transactions is also allowed.

With the rapid development of Internet technology and software industry, there are various software development methods and model, resulting in higher quality and lower cost of software engineering. The application of system platform not only increases the work efficiency of people, but also standardizes work procedure and reduces the effect of human factors on work process.

On the basis of the above background and the traditional second-hand housing transaction mode, the software technology was applied to second-hand housing transaction process to develop a platform for buyers and sellers of second-hand housing, so as to make the property information more transparent and real and reduce transaction costs.

1.2 Purpose and significance of the research

Based on the problems about the second-hand housing transaction market, by designing transparent and efficient Internet platform, the following problems can be solved through the online second-hand housing transaction platform: 1) to increase the transparent of the second-hand housing transaction market; 2) to enhance both sides' understand of the transaction process; 3) to reduce the transaction costs.

By seriously analysis, the purpose of the paper is to: analyze the demands of users, develop the second-hand housing transaction system, register, update, delete, amend and release housing information, manage customers' data, as well as analyze, summarize and check property information.

Open query platform is provided to check the information including the basic information of second-hand house (construction time, area of structure, construction structure, purpose, storey), fundamental right (proprietary rights, right of use,

mortgage and lease), so as to improve the information symmetric.

1.3Main contents and framework of the paper

Based on the analysis on the features and problems of second-hand housing transaction at present, in accordance with the popular e-commerce mode, the second-hand housing was regarded as a commodity for sale. The advanced management concept was integrated into web technology to develop the second-hand housing transaction system.

The primary contents and framework of the paper are as follows:

1) Analysis stage

At the stage of demand analysis, first, the stakeholders referring were analyzed. Besides, the features and problems of the present second-hand housing transaction were analyzed and summarized and the problem tree was drawn.

Moreover, according to the problems of the present second-hand housing transaction, the solutions were proposed and the solution tree was built. At last, strategies were analyzed and selected, and the object tree was built.

2) Design stage

At the stage of system design, the functional framework of the system was designed, including technological and functional framework. On the basis of the overall framework of the system, the functional modules of the system were designed, and analyzed by UML (Use Cases Diagram, Activity Diagram, Class Diagram, Sequence Diagram and State Chart).

3) Implementation stage

At the system implementation stage, the primary function modules of the second-hand housing transaction system include: user registration, management personal data, release housing information, and search information.

Chapter 2

Lean Business Model Canvas

The inventor of the lean canvas was Ash Maurya, a serial entrepreneur in the United States and the flag bearer of the Lean Entrepreneurship movement. He detailed the tool in his book, (Scaling Lean). Lean canvas is the description and refinement of the business model, a very concise business plan, guide the direction of product development and path of strategic planning. Lean canvas is divided into a total of nine grid, the nine grids are: (1) Problems; (2) Customer segments; (3) Unique value proposition; (4) Solution; (5) Channels; (6) Income analysis; (7) Cost analysis; (8) Key Metrics; (9) Unfair advantage.

Problem:	Solution:	Unique Value Proposition:	Unfair Advantage:	Customer Segments:
1, Information asymmetry 2, Lack of trust each other 3,Lack of direct communication each other	1, Open and transparent information platform 2, Real display of housing information list 3,direct communication.	Provide a free, reliable, transparent and efficient information platform for housing traders.	Brand reputation Users' support and praise.	1, the head of the house that needs to sell or rent a house 2, consumers who need to buy or rent a house
	Key Metrics: **AARRR Model** 1,Acquisition 2,Activation 3, Retention 4, Revenue 5, Referral		**Channels:** 1, search engine optimization (SEO) 2, online social platform 3, brand, word of mouth (need to strengthen) 4, search engine marketing (SEM) 5, traditional media advertising	
Cost Structure: 1, the cost of marketing promotion 2, website development and operating expenses 3, human resources costs		**Revenue Streams:** 1, advertising fee 2, value-added service fee		

2.1 Issues and Customer Groups

Matching the problem with the customer group is usually the core of the canvas. For each target customer group, this paper expounds three problems that they need to solve most. In the second-hand housing market, the main customer groups are buyers and sellers of second-hand housing, including renters and leaseholders of housing, such as students, white-collar urban workers, heads of household, and so on. However, in the current market situation, due to the excessive participation of intermediaries, buyers and sellers lack many opportunities for direct communication, resulting in information asymmetry and because of the lack of a reliable direct trading platform, buyers and sellers also cause a lack of trust in each other, virtually increasing the transaction costs. The existing market solution is for buyers or tenants to use search

engines, Acquaintances, communities, intermediaries and so on to obtain housing information, and sellers or rentals are often through intermediary structure, charging websites to publish housing information, provide intermediary agencies with housing qualifications, certification and pictures, buyers through intermediary structure to understand the acquisition of housing information and prices. Buyers and sellers lack opportunities for direct communication.

2.2 Unique value proposition

The purpose of unique value is to attract the attention of users. In order to write good unique value, we can take Google and Facebook as the research object, we can find that when Google appeared, it seems to provide us with better and fairer results, so in the short term, no matter what we used to use Google, we changed to Google, making it the first choice for search, and eventually Google became the most popular platform for advertisers. When Google finally advertises on its search results page, it has gained a reputation for accurate, credible and complete search results. Moreover, its ads do not take precedence over real search results, nor do they directly affect the ranking of results. Google's unique value is to provide users with accurate, trustworthy and complete search results. Facebook introduces more possibilities and imagination for business development and marketing, enriches access to the consumer population, expands user coverage, reduces marketing costs, and speeds up feedback times. Its unique value is to connect and share your life with the rest of the world.
In the second-hand housing market, intermediary agencies often deliberately improve the price of housing for their own interests, so that they can charge a higher royalty, so our unique value is to provide a free and reliable, transparent and efficient information platform for housing traders.

2.3 Solution

Provide a free, open and transparent information platform for sellers to publish their own house information packages, through authentication to achieve the real display of house pictures, and information browsers can communicate directly with sellers via email and telephone, so as to improve the efficiency of house transactions and reduce transaction costs.

2.4 Channels

In the early days, you can promote website through different channels to attract potential users, usually inbound channels and outbound channels. Inbound channels are use "pull strategies" to let customers naturally find you. Outreach channels, on the other hand, use "push strategies" to "reach" customers. Inbound channels include network media, SEO and social networking platforms. Outbound channels include traditional media or television advertising, as well as direct telephone calls. Brand word-of-mouth marketing is also a very effective means.

## 2.5 Revenue analysis and cost analysis

The main profit models include: advertising model and potential value-added services.

Cost analysis mainly includes：

1) Costs of human resources
2) Web site development and operation costs, servers, bandwidth, and other equipment costs.
3) The cost of obtaining the customer's operating requirements can be calculated by multiplying the average cost of developing a registered user by the target number. For example, if we want to do 100,000 users this year, we know that the average cost of developing a registered user is 1 euro, and we can get the operating budget of 100,000 euros. Then, there are three main methods to get the average cost of developing a registered user：One is to look at the industry average; The second is to look at competitors; The last is the lean approach, assuming that 10,000 euros brings 10,000 registered users, the average cost of developing a registered user is 10,000/10,000 = 1 euro.

2.6 Key indicators

The performance of a product after it is launched needs to be measured by indicators that will help you not only measure the company's growth, but also identify key points in the customer's life cycle. The assessment framework used here is Dave McClure's AARRR model.
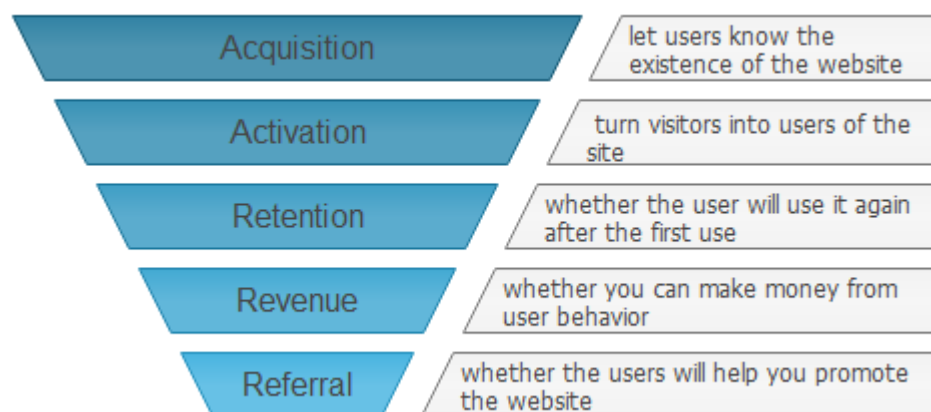
1) Get users, let users know the existence of the website, SEO, SEM, social platforms, traditional media advertising and other ways to attract customers.
2) Increase activity, turn visitors into users of the site, and increase the credibility of information by optimizing the design of the site.
3) Increase the retention rate, whether the user will use it again after the first use, through messages, reminders, e-mails, etc.
4) Gain revenue, whether you can make money from user behavior, such as ad clicks, subscriptions, etc.
5) Referral, whether the users will help you promote the website through e-mail,

plug-ins, advertising, forwarding and word-of-mouth.

2.7 Threshold advantage

There are two ways to realize subversive innovation: one is to make expensive ones cheaper, and the other is to make them free and another one is complicated to simplify. Slowly expand market share by developing a new market and then letting many users in. The threshold advantage in the second-hand housing market is to de-intermediation, reduce housing transaction costs, accumulate brand reputation to obtain the support and praise of users.

Chapter 3

Domain analysis

3.1 Stakeholder analysis

Stakeholder analysis is used to analyze the individuals and organizations that are likely to affect or be affected by a proposed action, and identify the impact of significant stakeholders on the action when develop the strategy.

Stakeholders can influence the organization, and their opinions must be taken into account when making decisions. It is impossible for all stakeholders to agree on all issues, some of which are more influential than others, and how to balance the interests of all parties is the key issue in the strategic development.

Stakeholder analysis is composed of four tools:

Description Matrix,

SWOT Analysis,

Spider Diagram,

Venn Diagram.

Stakeholders refer to the individual or organization related to customers. In the second-hand housing transaction system, the primary stakeholders are: Users (Buyers, Sellers, Enterprises), Visitors, Administrators (Managers, Technicians). Users are some customers/companies who want to provide or access services through the web platform, including sellers, buyers, and enterprises. Buyers are the people who want to sell their houses on the internet, the ultimate goal of the buyers is to buy or rent a satisfactory house at a reasonable price. They want to reduce other unnecessary expenses, and can directly contact the seller to view the housing information; Sellers are the people who want to sell their houses through the internet, sellers want to sell or rent their homes on a free platform, and can directly contact buyers or tenants to improve communication efficiency; Enterprises are the companies that want to advertise their products or services through online platforms, companies can use the platform to promote their products, increase their visibility and reputation; Visitors are someone who random access to the website platform without a clear purpose, it is also the main task for the website to attract this part of the viewer, as they can also increase the traffic and click rate of the ads, increase the exposure of the websites, and bring potential benefits, they are potential customers; In addition, Administrators include technicians and managers. The technicians are responsible for the development and maintenance of the website, in order to ensure the security and reliability of the website and improve the efficiency of the website, they have to control, update, website system, change the system error. The managers are responsible for website operations and back-office management, they are responsible

for checking the housing information, and the customer's authority to determine whether the housing information can be released or cancelled. They have the highest authority for website management.

3.1.1 Description Matrix

Stakeholder and basic characteristics	Interests and how affected by the problems	Capacity and motivation to bring about change	Possible actions to address stakeholder interests
Buyers: All the people who want to buy the house through the internet.	They are interested in: ● Browse and search information about house ● Saving money ● Finding house and sellers' information easily in the website ● Contact the sellers	● Want to buy a house at a relatively low price ● Make some suggestions to improve website	● The website services are always free ● Share some of their views after seeing the house ● Can contact the sellers directly
Sellers: All the people who want to sell the house through the internet.	They are interested in: ● Upload and share their house information ● Browse information ● Finding the buyers ● Contract the buyers	● Offer the houses' information on the website ● Want to sell their house ● Make some suggestions to improve website	● The website services are always free ● Can contact the buyers directly
Enterprises: The companies which want to advertise their products or services through online platforms	They are interested in: ● Advertising their services and goods on the website ● Making profits ● Organized or sponsor some activities	● Public the ads in an effective way ● Sponsor some activities ● Want to earn a profit	●Ads or activities can improve company's reputation
Visitors: People who browse the website without the username and password or do not log in their accounts.	They are interested in: ● Browse and search houses' information		●potential customers
Managers: They are responsible for website operations and back-office management	They are interested in: ● Browse information ● Add users and authorize jurisdictions ● Manage housing information (certification, approve and delete)	●They should check the user accesses	●Provide suggestions put forward by users to technical assistants
Technical assistants: They supply to the website: Safety assistance; Maintenance of website.	They are interested in: ● Provide an efficient, effective and safety establishment ● Have the appropriate software and hardware to meet the needs of customers	●Have to control, update and correct errors of the system; to ensure the security of information, the availability, integrity and maintainability of website	●Have to maintain any parts of the software, update the database store

3.1.2 SWOT analysis

The SWOT theory is one of the main analytical theories of current market research. The analysis of advantages and disadvantages mainly focuses on the strength of the enterprise itself and its comparison with competitors. SWOT analysis refers to a method that integrates and summaries the internal and external conditions of enterprises, including strengths and weakness of organizations, opportunities and threats faced by organizations. The opportunity and threat analysis is the impact that changes in the external environment may have on the enterprise. In the analysis, all internal factors (ie, advantages and disadvantages) should be brought together, and then external forces should be used to evaluate these factors.

The basic theory of SWOT was adopted to analyze the competition for the second-hand housing transaction platform.

SWOT		
Internal analysis External analysis	**Strengths** 1) The completely free information platform is built to minimize the transaction costs of customers,and can attract a large number of network users. 2) The system can cancele the intermediate link and make housing information more transparent compared with competitors. 3) A simple and friendly interface can helps users get useful information. 4) The system platform provides buyers with the seller's contact information, and the buyers can save a lot of unnecessary expenses by directly communicating with the sellers.	**Weaknesses** 1) In the early stage, certain promotion expenses are required. At the initial stage, it is difficult to accumulate a great deal of housing information within a short time because the page view is little. 2) Substantial return visits or numerous technological meas are necessary for identifying the authenticity of housing information. 3) Because the system platform makes the housing and sellers' information transparent and provides convenience for agencies to abtain information, it is easy to be disrupted by other second-hand housing intermediaries
Opportunities 1) With the periodical development of real estate, the new housing transaction in China gradually slows down and the volume of business of second-hand housing increase constantly. This provides considerable market. 2) The rapid development of the Internet has made people increasingly reliance on the Internet. 3) The popularity of Internet technology has also provided the Internet industry with many Internet technology talents, which are potential human resources. 4) Integrating traditional industry and Internet technology can offset the limits of geographic regions and expend the market size.	SO combined analysis: Users; Marketing; Managers 1) Now that Internet technology is relatively mature, it can provide many useful tools for the development and design of websites, and people's demand for the Internet is getting higher and higher, making the market promotion of websites relatively easy, and people are more likely to accept new things. 2) The demand for the second-hand housing market is growing, but most of the second-hand housing is in the hands of the intermediary, making people have to bear the agency fee, and people need an open and transparent platform. 3) It has a great advantage compared with traditional trading mode, such as open and transparent information and low transaction cost. It can obtain certain market share depending on it advantage.	WO combined analysis: Users; Marketing; Managers 1) In addition to providing free services to customers, website also need to provide consumers with more accurate services. 2) Enhance cooperation with advertisers, use Internet social platforms to promote and expand the visibility of information platforms. Free agency fees, direct communication between buyers and sellers as the focus of marketing. 3) Improve user experience, such as simple registration, clear pages, and accurate information.
Threats 1) The cost of entering the market is low and more late comers will enter the market, leading to unfair competition, disordered industrial order and deteriorated industrial environment. 2) The regulatory policy of the government is unpredictable. New housing policy might bring not only active and promoting effect and also adverse influence.	ST combined analysis: Users; Marketing; Managers 1) Strengthen brand service features. 2) Maintain differences with competitors in brand services and avoid homogenization.	WT combined analysis: Users; Marketing; Managers 1) Improve the accuracy of search by categorizing page sections. 2) Highlight the advantages of the information platform. 3) Customer-oriented, let users have a good impression and trust on the information platform, increasing user stickiness.

Environmental development trends fall into two categories: one is environmental threats and the other is environmental opportunities. Environmental threats refer to the challenges posed by an unfavorable development trend in the environment. If no decisive strategic behavior is taken, this unfavorable trend will lead to a weakening of the competitive position of the product. Environmental opportunities are an attractive area in which the product will have a competitive advantage. A common method of analyzing the environment is the Porter five-force analysis.

Opportunities
1) With the periodical development of real estate, the new housing transaction in China gradually slows down and the volume of business of second-hand housing increase constantly. This provides considerable market.
2) The rapid development of the Internet has made people increasingly reliance on the Internet.
3) The popularity of Internet technology has also provided the Internet industry with many Internet technology talents, which are potential human resources.
4) Integrating traditional industry and Internet technology can offset the limits of geographic regions and expend the market size.

Threats
1) The cost of entering the market is low and more late comers will enter the market, leading to unfair competition, disordered industrial order and deteriorated industrial environment.
2) The regulatory policy of the government is unpredictable. New housing policy might bring not only active and promoting effect and also adverse influence.

In the analysis of advantages and disadvantages, the product can be compared with competitors in detail, such as whether the website is novel, the operation is convenient, and whether the price is competitive.

Internal analysis: Strengths
1) The completely free information platform is built to minimize the transaction costs of customers, and can attract a large number of network users.
2) The system can cancel the intermediate link and make housing information more transparent compared with competitors.
3) A simple and friendly interface can helps users get useful information.
4) The system platform provides buyers with the seller's contact information, and the buyers can save a lot of unnecessary expenses by directly communicating with the sellers.

Weaknesses
1) In the early stage, certain promotion expenses are required. At the initial stage, it is difficult to accumulate a great deal of housing information within a short time because the page view is little.

2) Substantial return visits or numerous technological means are necessary for identifying the authenticity of housing information.

3) Because the system platform makes the housing and sellers' information transparent and provides convenience for agencies to obtain information, it is easy to be disrupted by other second-hand housing intermediaries.

SO combined analysis: User requirements; Marketing; Administrators

1) Now that Internet technology is relatively mature, it can provide many useful tools for the development and design of websites, and people's demand for the Internet is getting higher and higher, making the market promotion of websites relatively easy, and people are more likely to accept new things.

2) The demand for the second-hand housing market is growing, but most of the second-hand housing is in the hands of the intermediary, making people have to bear the agency fee, and people need an open and transparent platform.

3) It has a great advantage compared with traditional trading mode, such as open and transparent information and low transaction cost. It can obtain certain market share depending on it advantage.

ST combined analysis: User requirements; Marketing; Administrators

1) Strengthen brand service features.

2) Maintain differences with competitors in brand services and avoid homogenization.

WO combined analysis: User requirements; Marketing; Administrators

1) In addition to providing free services to customers, website also needs to provide consumers with more accurate services.

2) Enhance cooperation with advertisers, use Internet social platforms to promote and expand the visibility of information platforms.

3) Improve user experience, such as simple registration, clear pages, and accurate information.

WT combined analysis: User requirements; Marketing; Administrators

1) Improve the accuracy of search by categorizing page sections.

2) Highlight the advantages of the information platform.

3) Customer-oriented, let users have a good impression and trust on the information platform, increasing user stickiness.

3.1.3 Spider Diagram

Spider Diagram is used to show how much of each requirement related to the website is important for each stakeholder. These requirements represent different aspects of the information system. Stakeholders also can be divided into two categories: Users and Administrators. The spider diagram was made from the main stakeholders' point of view.

1. Friendly interface: stakeholders desire a website that is easy to use.

2. Service fee: stakeholders require free services.

3. Reliability of information: stakeholders desire to get the right information.
4. Classification of house resources: it is easy to find what you want.
5. Efficiency of website: stakeholders want the website to run smoothly.
6. Technical support: stakeholders want Website provide assistance to solve customers' problems as quick as possible.
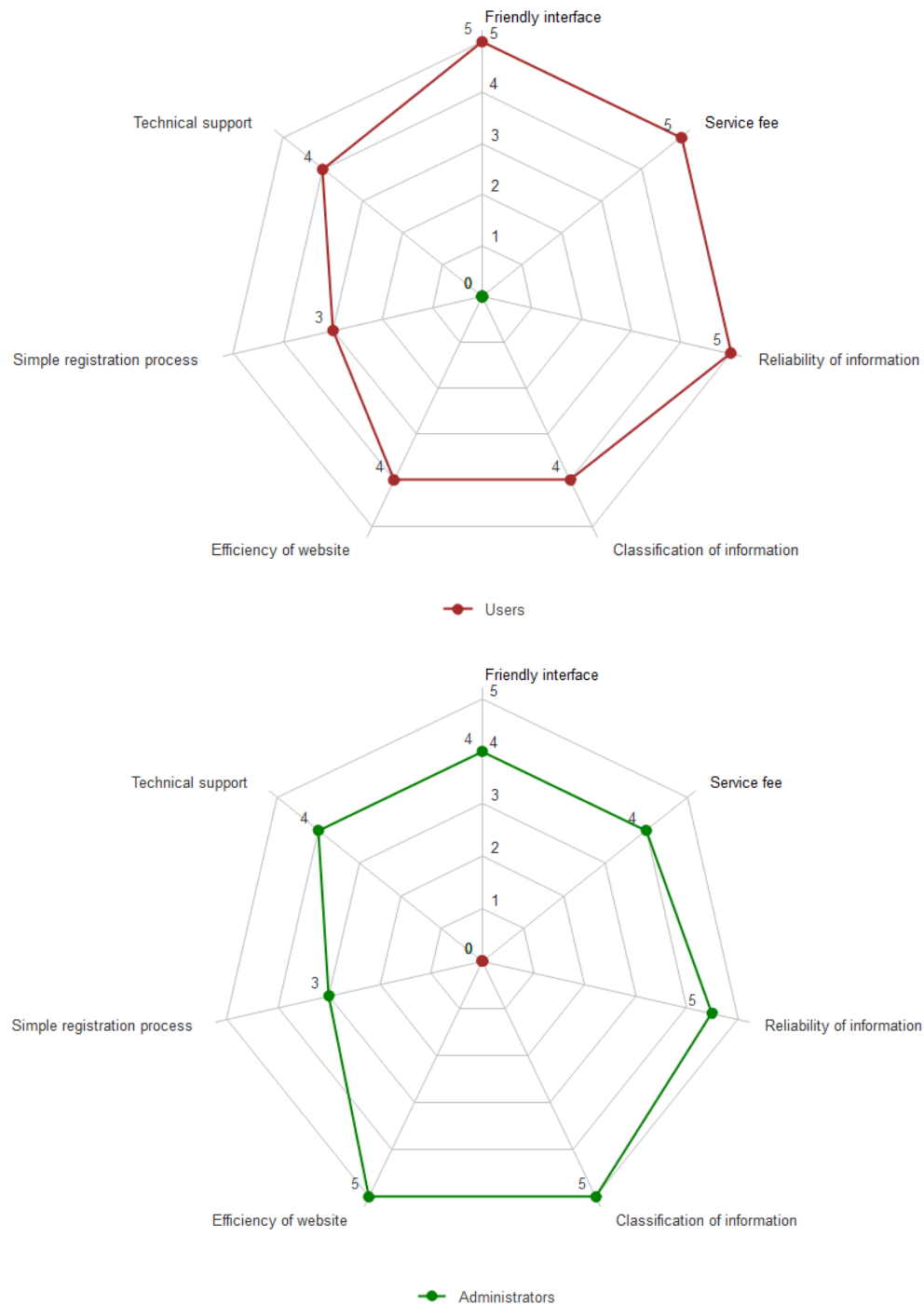7. Simple registration process.

Figure 3—Spider Diagram

3.1.4 Venn Diagram

Venn diagram can show the relationship between the various stakeholders.
The administrators are responsible for the operation, promotion and maintenance of the website. Users can make recommendations to managers based on their usage. Managers will also make adjustments based on their usage feedback to improve the comfort of the website. Companies can contact the website manager to discuss business cooperation. For example, post some advertising information on the homepage of the website. Similarly, visitors can also become potential users, they may become sellers or buyers of houses, or other customers who want to cooperate.
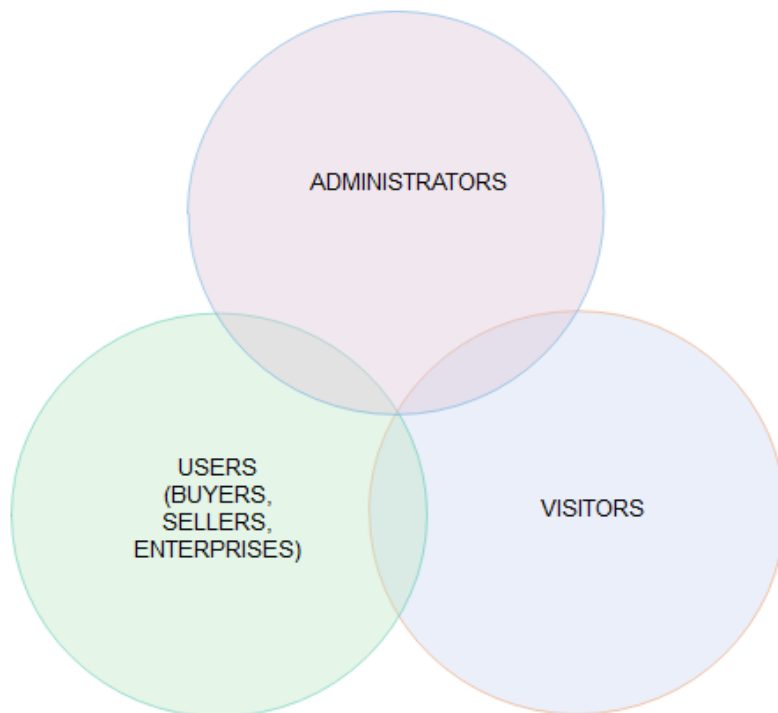

Figure 4—Venn Diagram

3.2 Problem Analysis

Problem analysis is to give a representation of the problem that stakeholders are facing in the present situation, and then evaluate the main characteristics of these problems, according to these analyzes to develop a strategy.

3.2.1 Problem Tree

The problem tree is a commonly used method of analyzing the problem. Its principle is to list all the sub-problems of the main problem, start at the highest level and gradually expand downwards.

Problem tree reflects negative aspects of existing situation, identify causes of them and relate effects, those come from the problem.

Problem tree implementation steps

1) To identify the "core problem" or "starting question" that exists in the project.

2) Identify the main causes of "core issues" or "starting problems".

3) To determine the "core issues" or "starting problems" lead to the main consequences.

4) According to the above causal relationship to draw the problem tree.

5) Repeated review of the problem tree, and according to the actual situation to be added and modified

Definition of framework: Information System for Second-hand Housing Transactions.

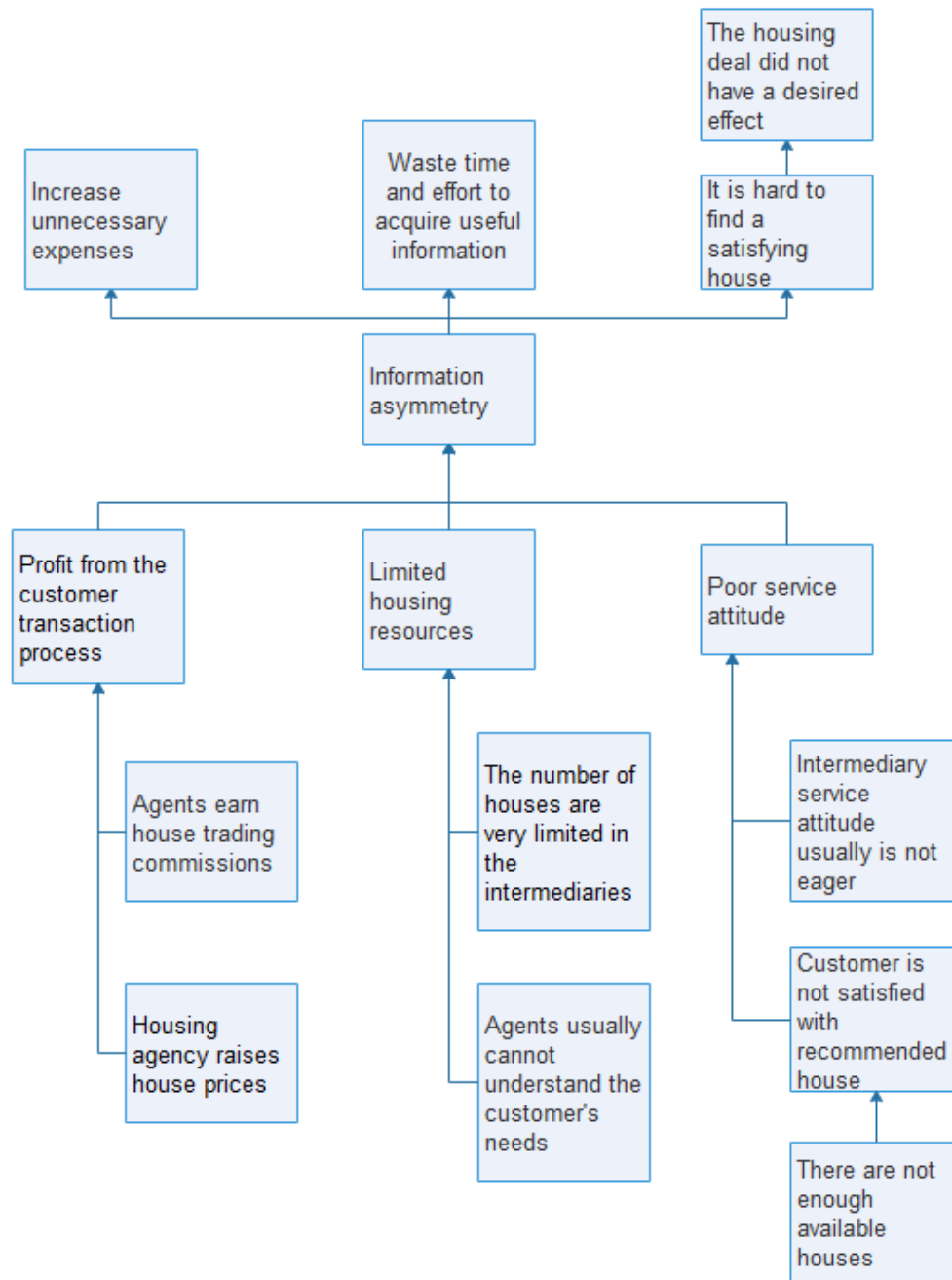Problems: The main problem is information asymmetry.

Figure 5—Problem Tree

With the increase of housing transaction, the more and more housing information increases the agents' workload of registration and statistics of customers and housing information and takes the agents a lot of time. In addition, this might lead to human error. At the same time, some property agencies and staffs might provide false information and charge unreasonably driven by interests. In China, the agency of the house is unilateral, the buyers do not have their own independent agency agent, China's second-hand housing agent is usually the agent of the buyer and seller, responsible for both buyers and sellers. After the successful transaction, the intermediary company shall charge the corresponding commission. General real estate agents will help sellers fight for benefits, because China's real estate intermediary fees are almost all borne by the buyer, the buyer in addition to paying for the house, but

also out of intermediary fees paid separately to intermediary companies. Buyers generally feel that intermediary fees are higher.

In the process of second-hand housing transactions, intermediary fees are high, because of the temptation of high intermediary fees, especially in the cycle of rising house prices, there are also many non-standard or even harmful behaviors to buyers. For example, a small number of intermediary service personnel will unite sellers to default, increase the proportion of intermediary fees charged, excessive charges, arbitrary charges, resulting in huge losses to buyers. This is the second housing intermediary business model to bring about some drawbacks. In China, it is a bilateral agency system. An intermediary manages buyers and sellers at the same time. Transaction is the most important thing. This mode of operation is the main reason for a series of disadvantages.

The asymmetric information between buyers and sellers reduces the transparency of second-hand housing transaction and increases transaction costs. Meanwhile, because the housing resources are controlled by some large intermediary companies, China's second-hand housing market has not formed sufficient competition. A city is monopolized by one or two institutions, it is certainly not conducive to consumers, so reasonable competition and sufficient competition can promote the healthy development of the market.

3.3 Solution Analysis

The solution analysis gives the representation of the features and the goals that the project will reach.

3.3.1 Solution Tree

The solution tree is symmetrical to the problem tree and it follows the same hierarchical structure but here the weaknesses and issues become positive and they are considered as strengths and opportunities.
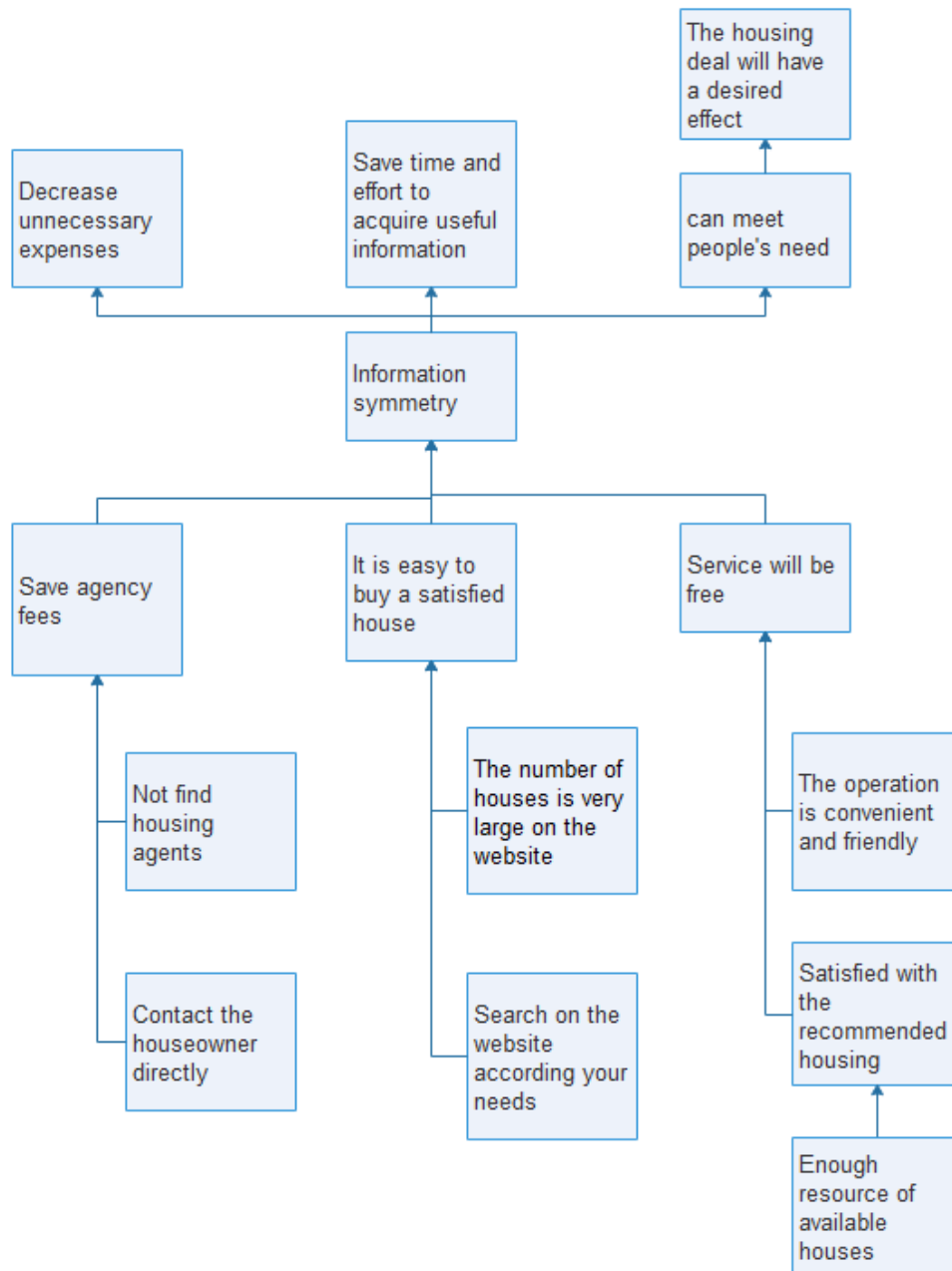
Figure 6—Solution Tree

3.4 Strategy Analysis

During the solution analysis, focusing on development of Information system which includes following parts: feasibility, analysis, design and implementation.

3.4.1 Strategy Selection

Strategy tree represents the strategy choice. It is the solution tree with cut branches
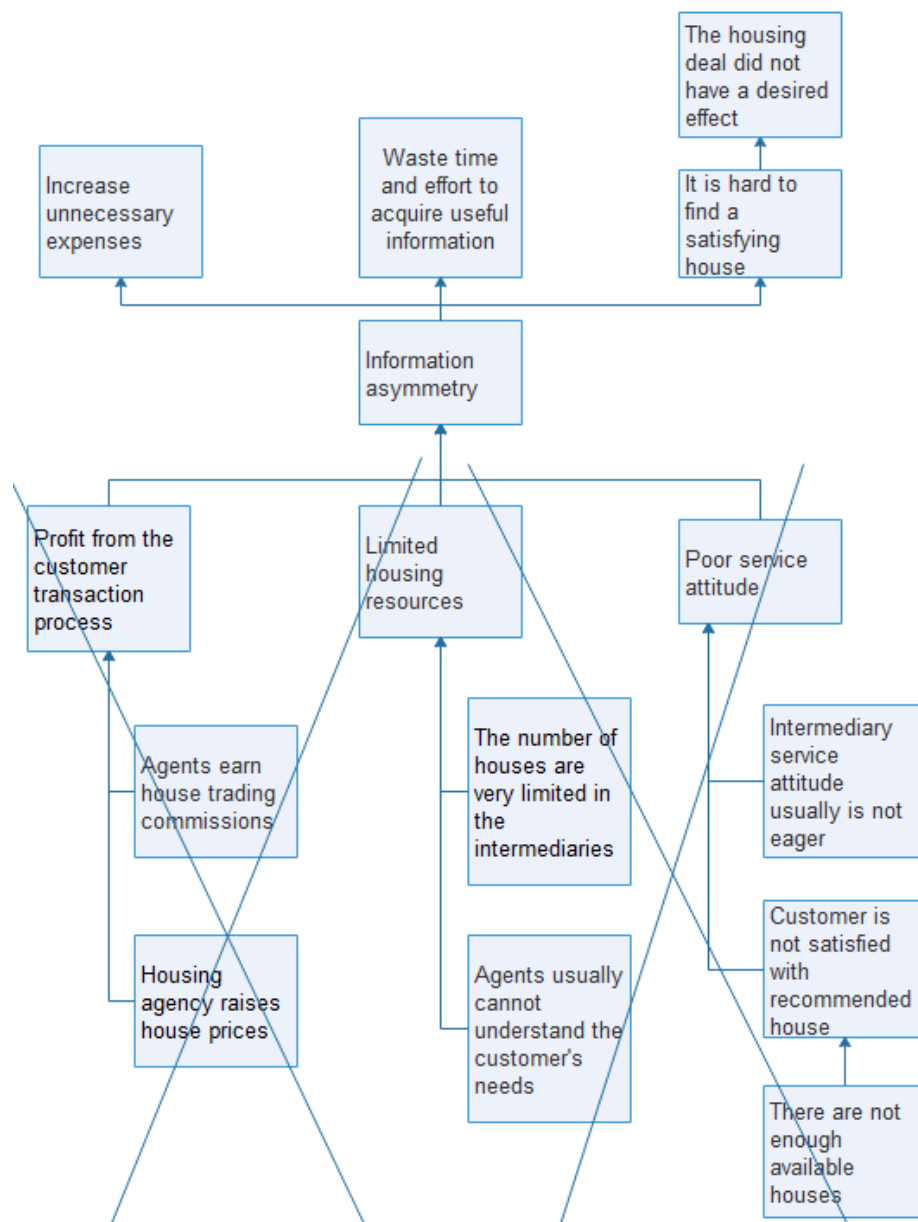
that indicate what features have been overlooked.

Figure 7— Strategy Selection

3.4.2 Objective Tree

In order to implement information systems solutions, the problem can be solved by the following way:

1) Feasibility phase － using logical framework analysis and answering 7 Ws, we identify who our stakeholders are;

2) Analysis phase － at this phase, analysis customer requirements and technical features, determine what the function that the system needs to implement and enhance.

3) Design phase － In the design stage of the system, completing housing

management function design, search function design, publish information function design and user management function design;

4) Implementation phase – DedeCMS: A free and open source content management system and PHP as programming language.
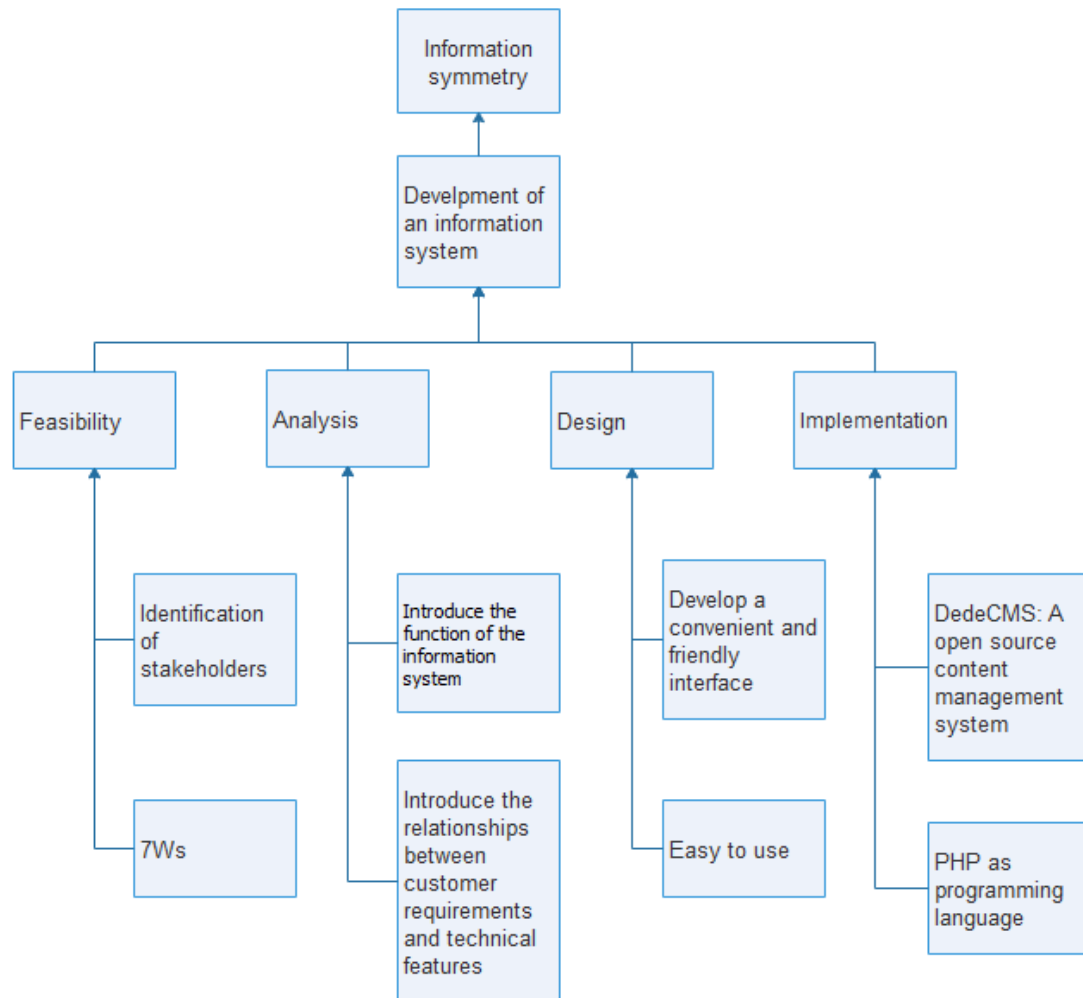

Figure 9— Object Tree

3.5 Planning Phase

Starting from the core issues to be addressed, the method develops upward step by step to obtain its influences and results, and deduces downward layer by layer to find the causes and obtain the so-called problem tree. The problem tree is transformed, that is, the causal relationship described in the problem tree is transformed to corresponding means --- objective relation, to obtain the so-called objective tree. After obtaining the objective tree, further work will be finished through "programming matrix".

3.5.1 Logical Framework Matrix – LFM

LFA is a process involving the following steps and contents: Problem analysis, Objective setting, Strategy selection, Monitoring indicator and method development.

The logical framework table is a table that records all the processes and information of the LFA.

-Vision: A brief description of the state that you want to implement over a longer period of time.

-Goal: A specific statement detailing a desired impact of a project.

-Objective.

-Strategy Activity.

-Indicator: Used to measure the effectiveness of the action, whether the goal is achieved or not.

-Methods or Source of Verification.

-Risks and Assumption.

Project description	Indicators	Verification	Assumptions
Overall objective: To provide a free second-hand housing information platform to users, so that they can buy or sell house by themselves.	User satisfaction, platform visibility, market share, reduce transaction fees	Conduct user surveys in major cities in China by email, telephone interviews, street interviews, etc. Increase in advertising revenue	
Purpose: To achieve information symmetry and reduce second-hand housing transaction costs.	The market share increase because of the more efficient communication process during the transaction process. The demand of the users is increasingly satisfied.	The number of second-hand housing listing information	Improve website brand awareness, expand website scale, and integrate second-hand housing resources
Results: To creat a second-hand housing information platform and buyers and sellers can communicate directly	Website usage rate	Website click rate and number of registered users	Ensure the accuracy of second-hand housing information and customer contact information
Activities: Feasibility study(Stakeholder analysis, Problem analysis, Solution analysis, Strategy selection), Development life cycle(Specific feasibility study, System analysis, Design, Implementation)			The administrator of the website should update the website according to the user requirements, users are interesting in improving transaction process and participate in questionnaires.

Chapter 4

System analysis

## 4.1 Specific Feasibility Study: 7Ws analysis

|	
Why: the goal that website will achieve	To help people buy satisfied house at a relatively low price.
What: the function of website and its' service	Build a website that people can publish houses information on it.
Who: the actors involved in the project	House buyers, house sellers, enterprises, visitors, technical assistants, managers.
Where: the place in which web site can be found	On the internet.
When: the duration of the project and the date from which the web site is available for users	The duration of the project lasts about six months, the web site will be available for users at next year.
How: the activities that be performed to realize the website	Feasibility study: (Stakeholder analysis, Problem tree, Solution tree, Strategy selection).Development life cycle: (Specific feasibility study, System analysis, Design, Implementation, Operation).
How much: the effort required to realize web site	It needs a lot of time and energy to create the information paltform.

4.2 System Analysis

4.2.1 IDEF0

Using IDEF0 diagram AS-IS to analyze the process of publishing information service offered by fang.com. In fang.com general users can search and find information related to houses for rent or sell. If a user wants to publish house information, he must be registered. If he just browses some information, he is not required to be registered at the website or login by other social network account.

The registration process requires the full name, the cell phone number, the cell phone verification code and the password. When the registration is successful, the user needs to refill in account name and password to enter personal page. On the personal page user can fill in personal date, name, phone number and address, while if user wants to search houses information he can come back to the page of the page of fang.com by the link. If a user wants to publish housing ads, he can click reserved area where user can publish housing ads.
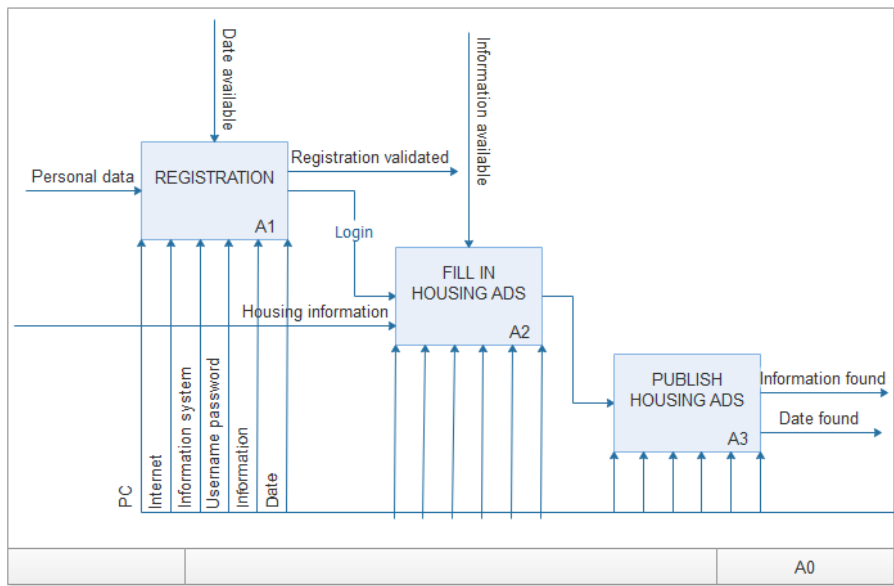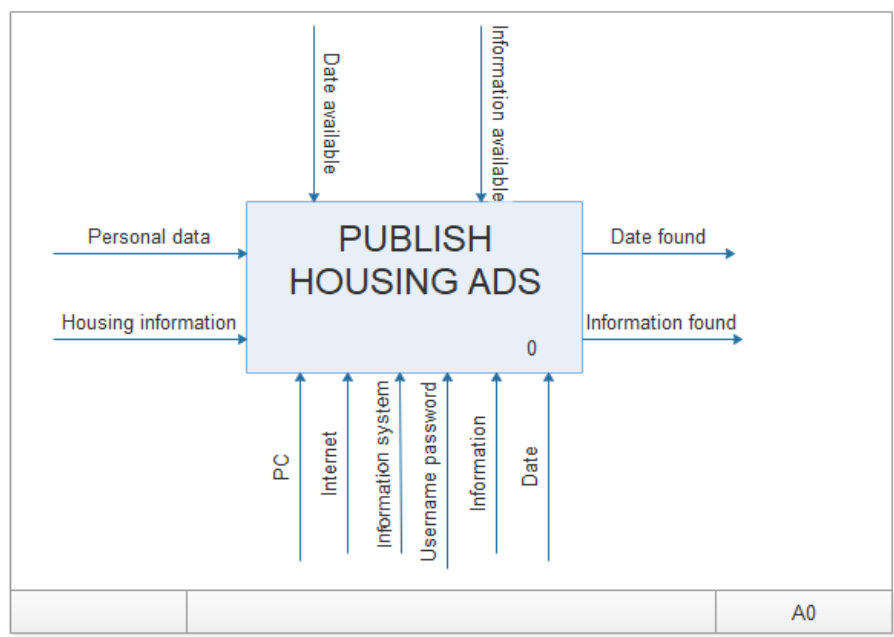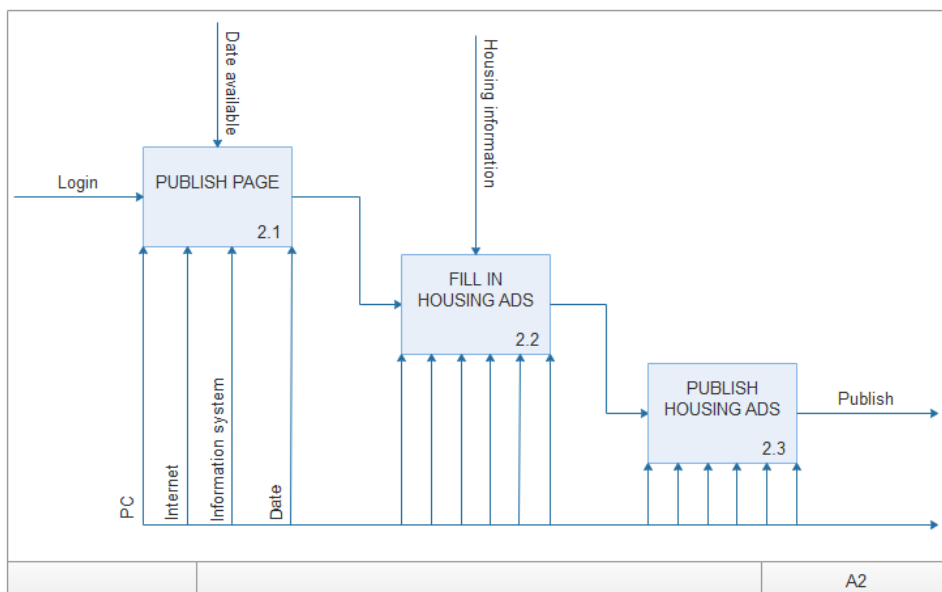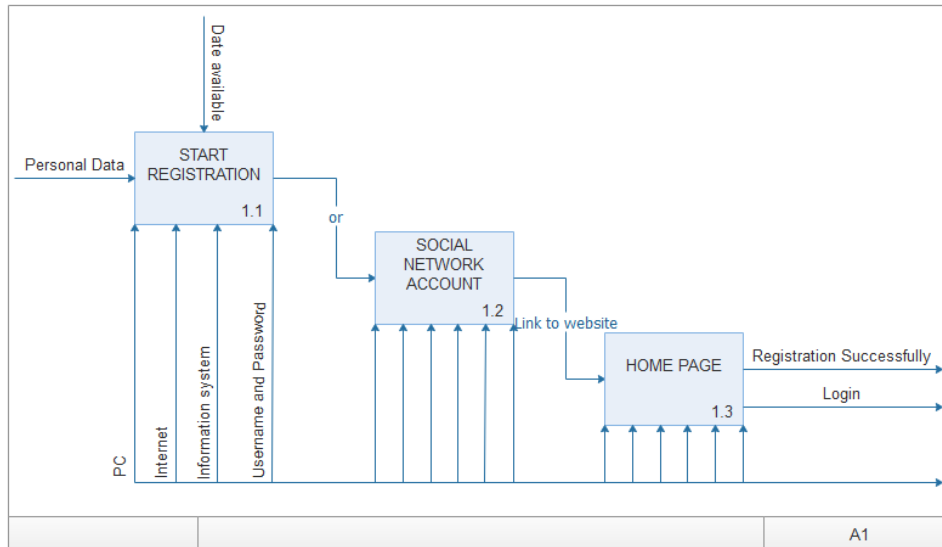
IDEF0 TO-BE represents how new Information system will be after the implementation phase and having considered some aspects emerged in the previous analysis. IDEF0 TO-BE is usually made using the template obtained with IDEF0 AS-IS as starting point so that it is possible to compare the actual scenario with the future one. But in this case IDEF0 AS-IS and IDEF0 TO-BE are not correlated because the first diagram has been drawn observing how an existing web site, fang.com works, while the IDEF0 TO-BE has been built with the intent to create a completely new IS.
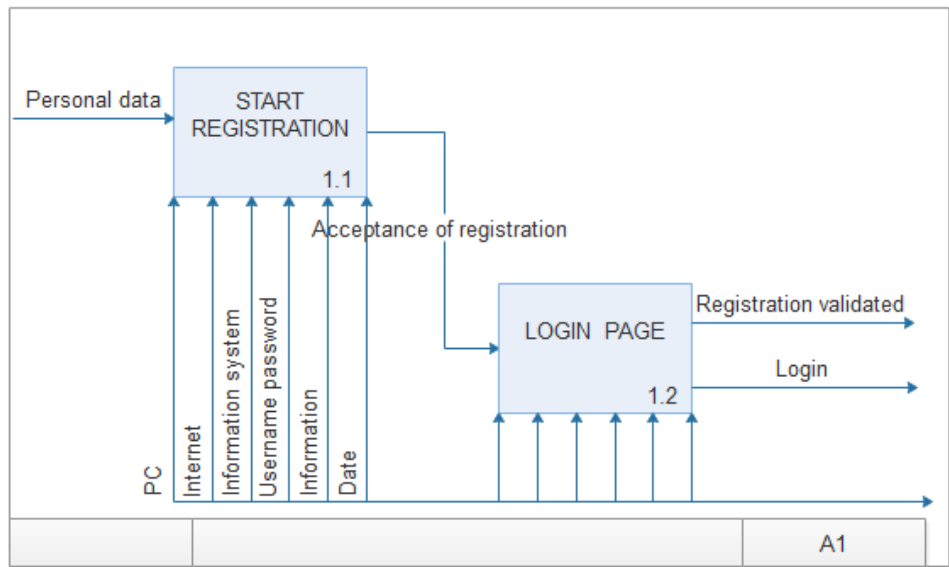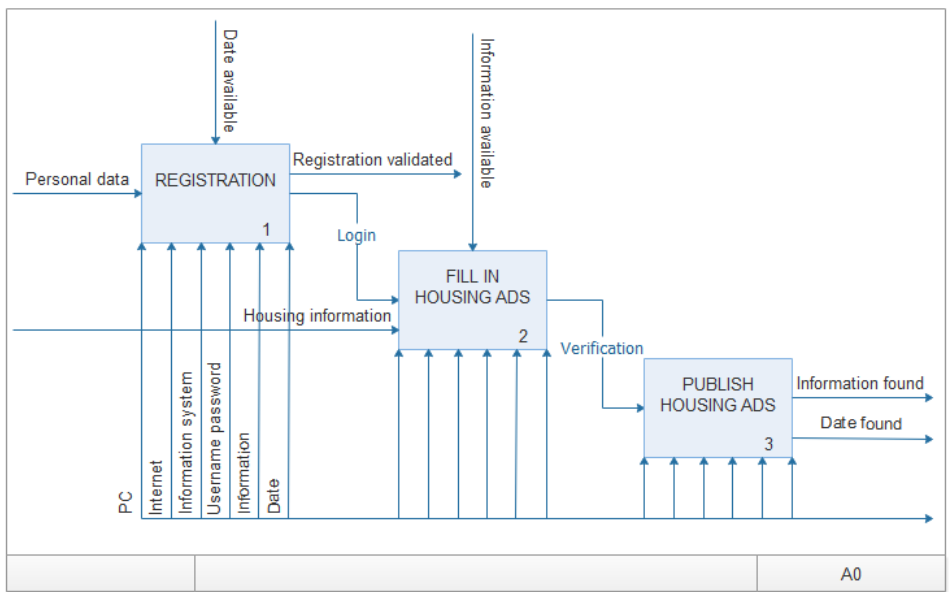
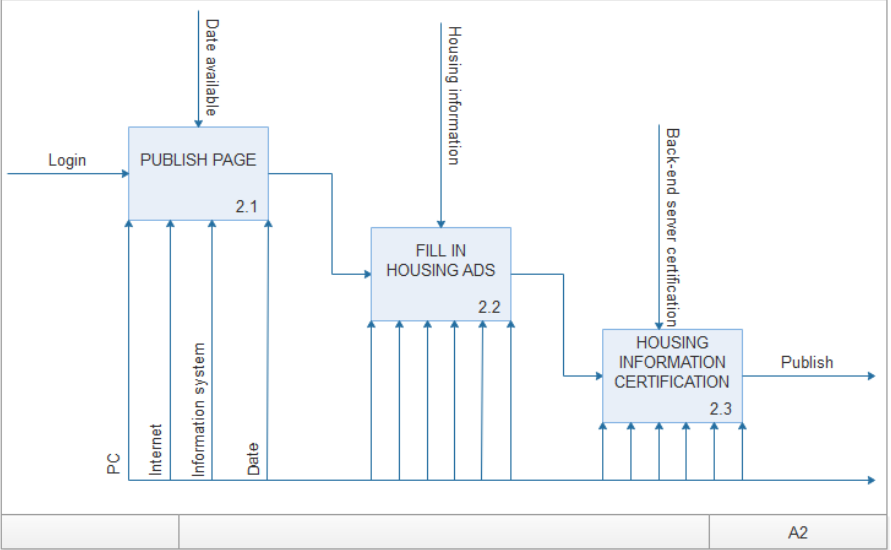Website is to provide a really free service and intended to a wider target of people.

In new website the general user can perform following main functions: the search, publish housing ads freely and manage personal data. According to the first action, the user can find all the information related to houses for sell or rent. If he wants to publish housing ads he has to register first. In the registration page some personal data

should be inserted: user name, password and e-mail. After the registration, the general user can manage personal data and housing information.

When the seller publishes the housing information, the Website back office manager will evaluate the unpublished housing information. If confirmed, the website database will be updated; the final housing information will be released.

Buyers can easily find the seller's contact information, phone number, email address, etc., buyers and sellers can communicate effectively.

PUBLISH PAGE 2.1

FILL IN HOUSING ADS 2.2

HOUSING INFORMATION CERTIFICATION 2.3

Date available

Housing information

Back-end server certification

Login

Publish

PC

Internet

Information system

Date

A2

4.2.2 Quality function deployment

QFD is a simple, logical method including a set of matrix which helps to determine demand characteristics of customers. It adopts the method to ensure to accurately transfer demands from customers or the market to related technology and measure in every stage product life cycle, so as to better meet and develop market, also help to determine whether the company is able to develop these market successfully.

By analyzing and consulting second-hand housing market and related well-known website (Fang.com and Anjuke.com are very famous Chinese housing transaction website), get some basic customer needs about second-hand housing transactions website.

Conduct market research, collect intelligence:

There are two main types of market research methods, one is the questionnaire survey and interview research methods directly to the user; the other is the use of the company's existing intelligence, which mainly includes user complaints and internal industry information. In order to collect direct voices from customers, interviews with surveys are used.

The answer in column 1 indicates how important each item is in influencing your use decision. The answer in column 2 asks you to evaluate each website on each item, after you have tried each one.
Question 1: The listed here may influence your using decision for a website. In column 1, please rank how much influence these items have on your use decision.
Please circle the appropriate level.
1 No influence at all; 2 Minor influence; 3 Some influence; 4 Strong influence; 5 Very strong influence.
Question 2: Which website have you used?
Website 1: fang.com ( ); Website 2: anjuke.com ( ); Website 3: casamiahelp.com ( )
In column 2, please evaluate each Website after using it.
Please circle the appropriate level.
1 Very bad; 2 Bad; 3 Fair; 4 Good; 5 Very good.

Items to judge the website.	please rank how much influence these items have on your use decision.	please evaluate each Website after using it. Fang.com(F) Anjuke.com(A) Casamiahelp.com(C)
1,Housing information is accurate	1( ) 2( ) 3( ) 4( ) 5(✓)	1( )( )( ) 2( )( )( ) 3( )( )(C) 4(F)(A)( ) 5( )( )( )
2,Contact information is accurate	1( ) 2( ) 3( ) 4( ) 5(✓)	1( )( )( ) 2( )( )( ) 3(F)(A)(C) 4( )( )( ) 5( )( )( )
3,Simple registration process	1(✓) 2( ) 3( ) 4( ) 5( )	1( )( )( ) 2( )( )( ) 3(F)(A)( ) 4( )( )(C) 5( )( )( )

4,Has a user-friendly interface	1( ) 2( ) 3( ) 4(√) 5( )	1( )( )( ) 2( )( )( ) 3(F)( )( ) 4( )(A)(C) 5( )( )( )
5,Publish housing information is convenient	1( ) 2( ) 3( ) 4( ) 5(√)	1( )( )( ) 2( )( )( ) 3(F)( )(C) 4( )(A)( ) 5( )( )( )
6,Manage housing information is very convenient	1( ) 2( ) 3( ) 4(√) 5( )	1( )( )( ) 2( )( )( ) 3( )( )( ) 4(F)(A)(C) 5( )( )( )
7,Website is always available	1( ) 2( ) 3(√) 4( ) 5( )	1( )( )( ) 2( )( )( ) 3( )( )(C) 4(F)(A)( ) 5( )( )( )
8,Have enough housing information	1( ) 2( ) 3( ) 4(√) 5( )	1( )( )( ) 2( )( )(C) 3(F)( )( ) 4( )(A)( ) 5( )( )( )
9,Provides assistance	1( ) 2(√) 3( ) 4( ) 5( )	1( )( )( ) 2( )( )(C) 3(F)(A)( ) 4( )( )( ) 5( )( )( )
10,Website is for free	1( ) 2( ) 3( ) 4( ) 5(√)	1( )( )( ) 2(F)( )( ) 3( )(A)( ) 4( )( )(C) 5( )( )( )
11,Has an attractive design	1( ) 2( ) 3(√) 4( ) 5( )	1( )( )( ) 2( )( )( ) 3(F)( )(C) 4( )(A)( ) 5( )( )( )
12,Buyers and sellers can communicate directly	1( ) 2( ) 3( ) 4( ) 5(√)	1( )( )( ) 2(F)( )( ) 3( )( )( ) 4( )(A)(C) 5( )( )( )
13,Protects website data	1( ) 2( ) 3(√) 4( ) 5( )	1( )( )( ) 2( )( )( ) 3( )(A)(C) 4(F)( )( ) 5( )( )( )
14,Guarantees the security of database	1( ) 2( ) 3( ) 4(√) 5( )	1( )( )( ) 2( )( )( ) 3( )( )(C) 4(F)(A)( ) 5( )( )( )
15,Website is as by law enacted	1( ) 2(√) 3( ) 4( ) 5( )	1( )( )( ) 2( )( )( ) 3( )( )( ) 4( )( )( ) 5(F)(A)(C)

Classify and organize the information collected from users and remove the useless information. Get the above information.

The customer's demand information and form are as follows:

1) The information provided by the website is accurate.	1.1)Housing information is accurate
	1.2) Contact information is accurate
2) The website is easy to use.	2.1)Simple registration process
	2.2)Has a user-friendly interface
	2.3)Publish housing information is convenient
	2.4)Manage housing information is very convenient
3) The website is efficient.	3.1)Website is always available

	3.2)Have enough housing information
	3.3)Provides assistance
4) The service provided by the website is free.	4.1)Website is for free
6) The website is attractive.	6.1)Has an attractive design
	6.2)Buyers and sellers can communicate directly
7) The website is safe.	7.1)Protects website data
	7.2)Guarantees the security of database
	7.3)Website is as by law enacted

1) Customer requirements are summarized as following:

- Reliability of information: Houses' information should be reliability in order to provide successful service.

- Assistance: Website should provide assistance to solve customers' problems as quick as possible.

- The website is easy to use: It is very important to provide users with a good experience.

- The website is attractive: Website has a user-friendly interface and an attractive design. Buyers can find sellers' contact information to communicate.

- Efficiency of website: Whether the website can run smoothly or not, it directly affects the user experience. Have enough housing information. Provides assistance

- The service provided by the website is free.

- The website is safe: Protects website data; Guarantees the security of database; Website is as by law enacted.

Technical characteristics:

In order to satisfy customer requirement, the next step in QFD is the definition of system technical features. The following list is technical characteristics.

- Interface design

- Search column classification

- Server configuration

- Monitoring

- Customer information management

- Technical actions

- Public contact information

- Policy of website

- Database

2) Relationships between customer requirement and technical characteristics.

Use symbols to represent weak, medium, and strong relationships between customer requirements and technical characteristics. And in order to compute technical characteristics relative importance moving from customer requirements, 1,3,9, respectively, to indicate the degree of relationship.

3) Benchmarking

Select Fang.com and Anjuke.com as basic technical benchmarking. Define the requirement satisfaction from 1 to 5 of this website and competitive products according to customer requirement. It is helpful to get access to the targets for the new website.

4) Results of the analysis

Confirm new product targets and customer requirement improvement ratio according to the benchmarking, and customer requirement weight can be arrived through the following formula:

Improvement ratio R_i = Target new model T_i/Current model U_i

Absolute weight W_{ai} = improvement ratio R_i * customer importance level I_i * strength point S_i.

Relative weight $W_i = (I_{ai} / \sum I_{ai}) \times 100\%$

i indicates the number of customer requirements

Strength point is used to evaluate the impact of product improvements on sales. Strength point is 1.5 means significant impact, 1.2 means medium, 1.0 means no effect.

The configuration of the technical assessment is mainly to complete the calculation and evaluation of the technical level and importance of each technical requirement. Evaluate the state of the art of these technical requirements proposed by the company by comparing with the state of the relevant enterprises; use the results of the competition analysis and the information in the relationship matrix to calculate the importance (absolute value and percentage) of each technical demand, In order to be the basis for the development of specific technical indicators or parameters of technical needs.

The absolute value of importance Taj = $\sum r_{ij} \cdot I_i$

The relative value of importance Taj = $(T_{aj} / \sum T_{aj}) \times 100\%$

j indicates the number of the technical requirement

rij is the relationship matrix value, and Ii is the weight of the customer's demand.

The roof is the correlation between the various functions, plus sign represents a positive correlation between functions, minus sign represents negative correlation.

The House of Quality Matrix as the following:

key to roof/correlation matrix symbols

✚	Positive
✖	Negative

key to interrelationship matrix symbols

◉	Strong	9
O	Medium	3
▲	Weak	1
	No	0

Customer Demanded Quality	Degree of importance	Relative importance	Search column classification	Interface design	Server configuration	Monitoring	Customer information management	Technical actions	Public contact information	policy of website	Database	Current model	Website1 (fang.com)	Website2 (anjuke.com)	Target new model	Improvement ratio	Strength	Absolute weight	Relative weight
Housing information is accurate	5	9%	◉			◉	O		O			3	4	4	4	1.33	1.5	9.98	0.11
Owner's contact information is accurate	5	9%				◉	O		▲			3	3	3	4	1.33	1.5	9.98	0.11
Simple registration process	1	2%			O					▲	O	4	3	3	4	1	1	1	0.01
Has a user-friendly interface	4	7%	◉	◉			▲	▲	◉			4	3	4	5	1.25	1.2	6	0.07
Publish housing information is convenient	5	9%		▲	◉		◉				O	3	3	4	4	1.33	1.2	7.98	0.09
Manage housing information is very convenient	4	7%	▲	O	O		◉		▲		O	4	4	4	4	1	1.2	4.8	0.05
Website is always available	3	5%		O	◉	◉	O	◉	O	O	O	3	4	4	4	1.33	1	3.99	0.05
Have enough housing information	4	7%			O							2	3	4	3	1.5	1.2	7.2	0.08
Provides assistance	2	4%	O			▲	O	◉	O	O	▲	2	3	3	3	1.5	1	3	0.03
Website is for free	5	9%							◉	◉		4	2	3	4	1	1.5	7.5	0.09
Has an attractive design	3	5%	◉	◉		O						3	3	4	4	1.33	1.2	4.79	0.05
Buyers and sellers can communicate directly	5	9%		◉		▲		O	◉	◉		4	2	4	5	1.25	1.5	9.38	0.11
Protects personal data	3	5%				O		O			◉	3	4	3	4	1.33	1.2	4.79	0.05
Guarantees the security of database	4	7%				O		◉			◉	3	4	4	4	1.33	1	5.32	0.06
Website is as by law enacted	2	4%						▲		◉		5	5	5	5	1	1	2	0.02
Absolute value of importance			112	140	99	145	141	109	165	124	104								
Relative value of importance %			9.8	12.3	8.7	12.7	12.4	9.7	14.5	10.9	9.1								
Absolute Weight			191.7	224.9	146.7	258.3	218.2	159.3	271.6	192.9	147.3								
Relative Weight %			10.59	12.42	8.10	14.26	12.05	8.80	15.00	10.65	81.33								

Prioritized Technical Descriptors

Through the calculation of the importance of technology, the next steps of the developing process the following considerations:
Implement the interface design of IS; Implement website monitoring and customer information management; Public users' contact information.

Chapter 5

System design

5.1 Design

This article describes the design activity of the system by using the UML (Unified Modeling Language), UML models consist of several graphs and diagrams:

- Use Cases Diagrams

- Activity Diagrams

- Class Diagrams

- Sequence Diagrams

- State Charts

5.1.1 Use Cases Diagram

The use case diagram describes the usage requirements for a system. It represents the users' interaction with the users and the system. Actor is a person, an organization, or an external system, in the first use case diagram is the general user mainly including house buyers, sellers. Their authority is not as high as the system manager, through the basic information management interface, house buyers and sellers can manage their own basic information, including personal information registration, information deletion and information inquiry, sellers also can register the housing information, and check the relevant registration information.

The second use diagram is the controller including managers and technical assistants.

The technical assistants are responsible for maintaining and upgrading the system, they also supply information and help to users, in charge of updating DB and statistic analysis, etc.

Managers have the highest authority that they can authorize the technician to perform some operations. When the site development encounters some problem, they can make the final decision.
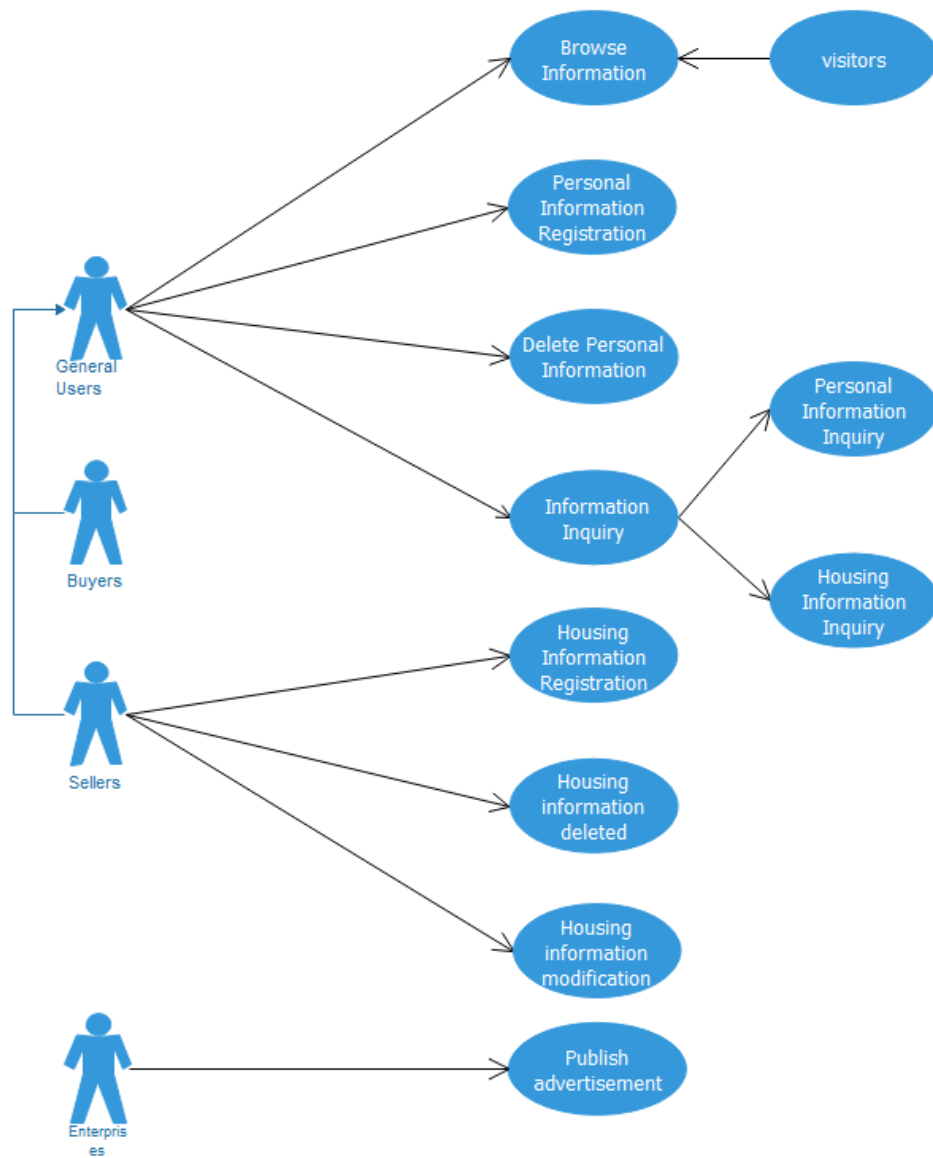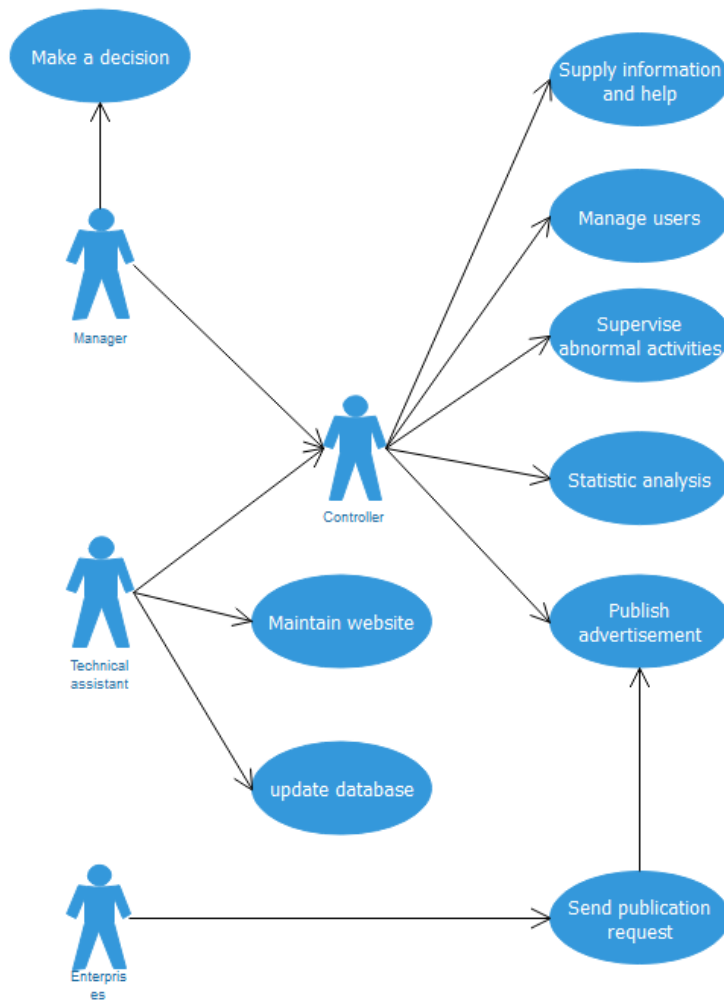
Figure 10—Use Cases Diagrams

Figure 11—Use Cases Diagrams

5.1.2 Activity Diagram

The activity diagram is another common tool used by UML to model the dynamic behavior of a system. It describes the order of activities that show the flow of control from one activity to another. The chart is essentially a flow chart. The activity graph focuses on the flow of control from one activity to another. Activity diagrams are constructed from a limited number of shapes, connected with arrows.

The action state diagram in UML is represented by a rounded rectangle.

Decisions and merge nodes are represented by Diamonds

Start node is represented by a solid black dot.

Final node is represented by a dot within a circle.

The transition between actions is called an action flow, and the transformation of the activity diagrams are connected with arrows.

Objects may have two or more concurrent control flows at run time. In order to model concurrent control flows, UML introduces the concept of fork and join nodes. Fork nodes is used to divide an action stream into two or more concurrently running branches, while join nodes is used to synchronize these concurrent branches to perform some operations.
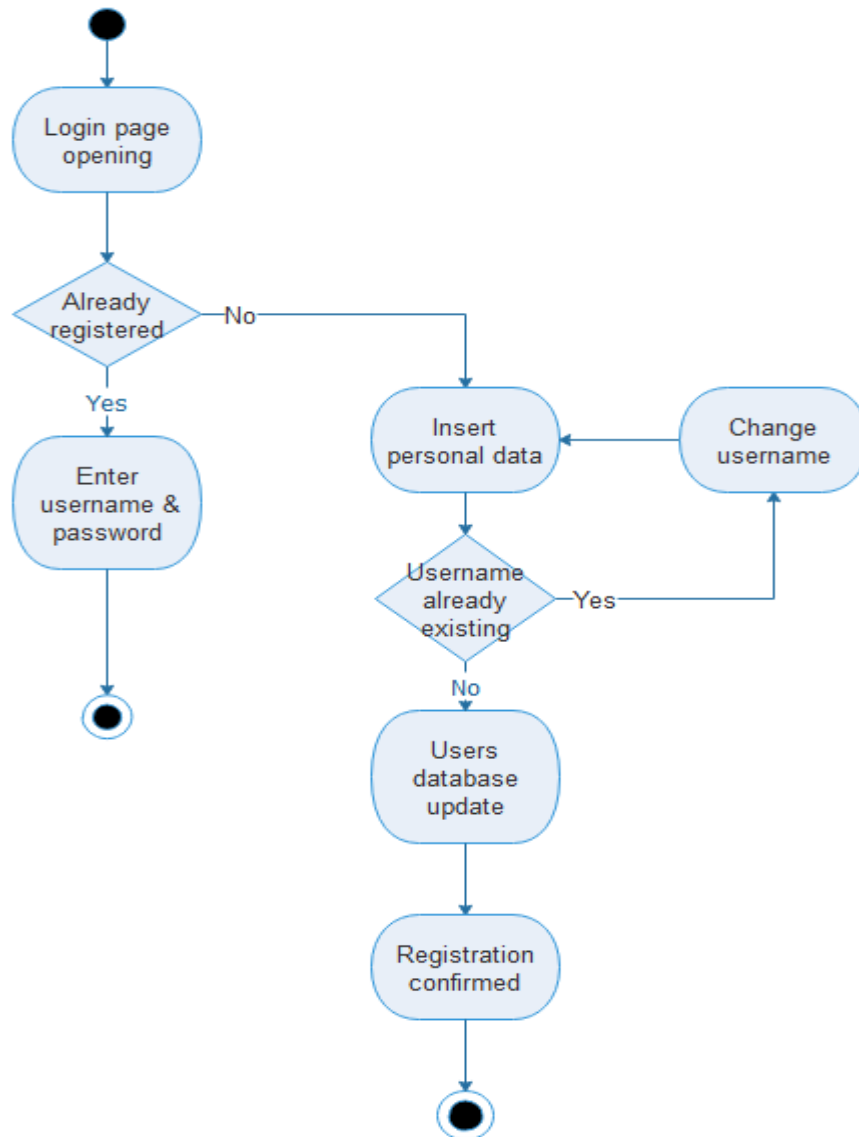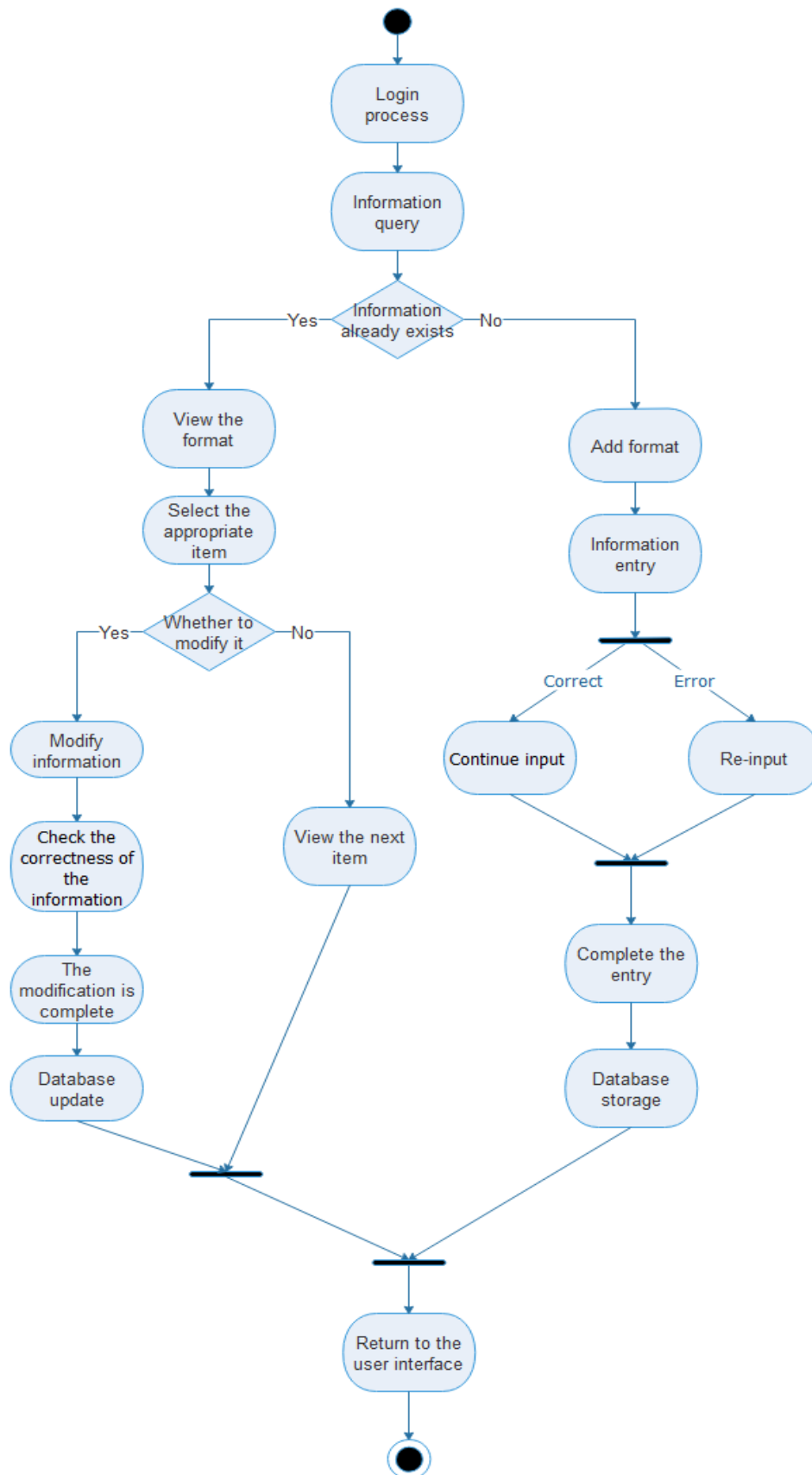

Figure 12—Login process
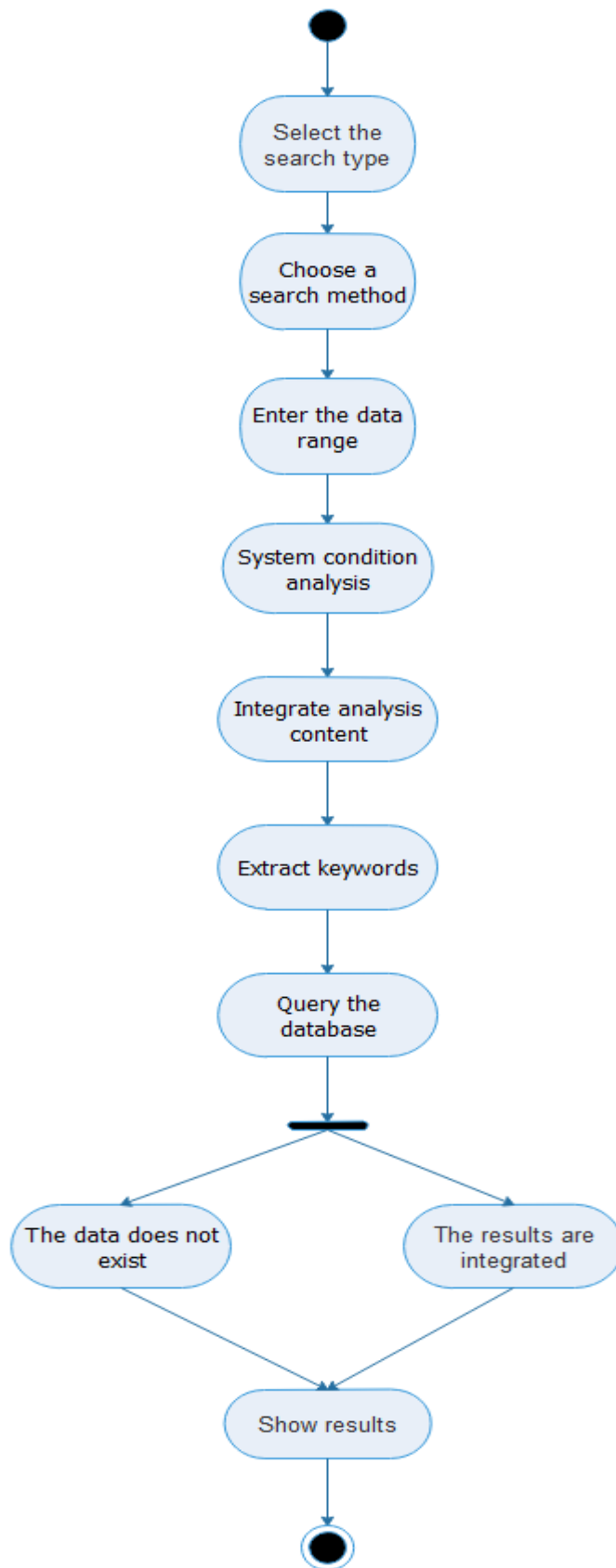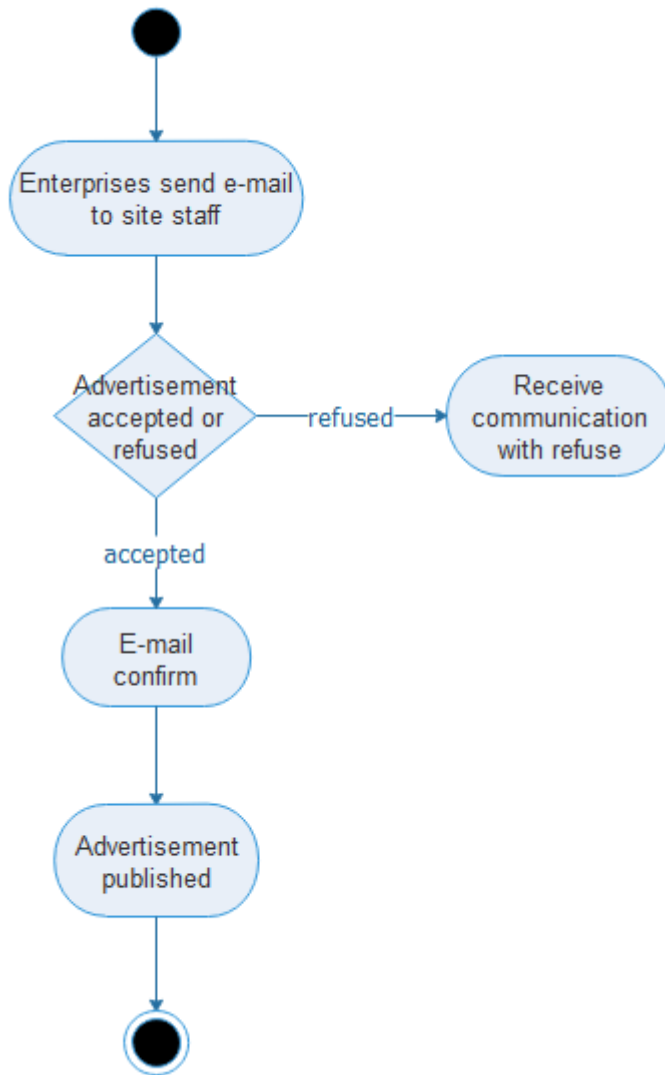
Figure 13—Publish process

Figure 14—Search process

Figure 15—Advertisement process

5.1.3 Entity Relationship Model and Class Diagram

Entity - Relationship Diagram is used to build mathematical model. Entity - Relationship Diagram can be referred to as ER diagram which includes 3 basic components such as entity (namely data object), relation and attribute, typically using rectangle box to represent entity, using rhomb box connecting related entities to represent relation, using oval or fillet rectangle to represent attribute of entity (or relation), and connecting entity (or relation) with their attributes with straight line.

Entity: entities with the same attribute have the same characteristics and nature, abstracting and describe entities of the same kind by combining the name of entity and name of attribute;

Attribute: A characteristic of the entity, an entity can be described by several attributes.

Connection: the mode of connection between data objects is called connection, also called relation. Connection can be divided into the following 3 types: one to one connection, one to multiple connection and multiple to multiple connection.

Entity	Descriptions	Attributes
Housing information	The basic situation of the house.	ID Heading Issuer Description Type Name
visitors	People who have not log in the IS, but want to search for useful information.	ID Status
Users(sellers, buyers)	People who log in the IS and can buy or sell house on the website.	ID Name Surname Sex Nationality Adress Profession Email Telephone Type
Staffs	People who maintain and manage the website.	ID Name Surname Sex Telephone Email Role
Enterprises	All companies who want to put advertisement on the website.	ID Name Adress Email Phone number Category

Relationship Dictionary

| Entity	Descriptions	Attributes	Link
Issue	Users issue the housing information on the website (Sellers).	Date Validity	Users Information
Help	Staff offer help to solve users' problems	Date Type	Users Staff
Maintain	Staffs maintain the servers	Date	Staffs Website
Order	Enterprise order the web page administrations to update advertisements.	Date Subject	Enterprises Staff
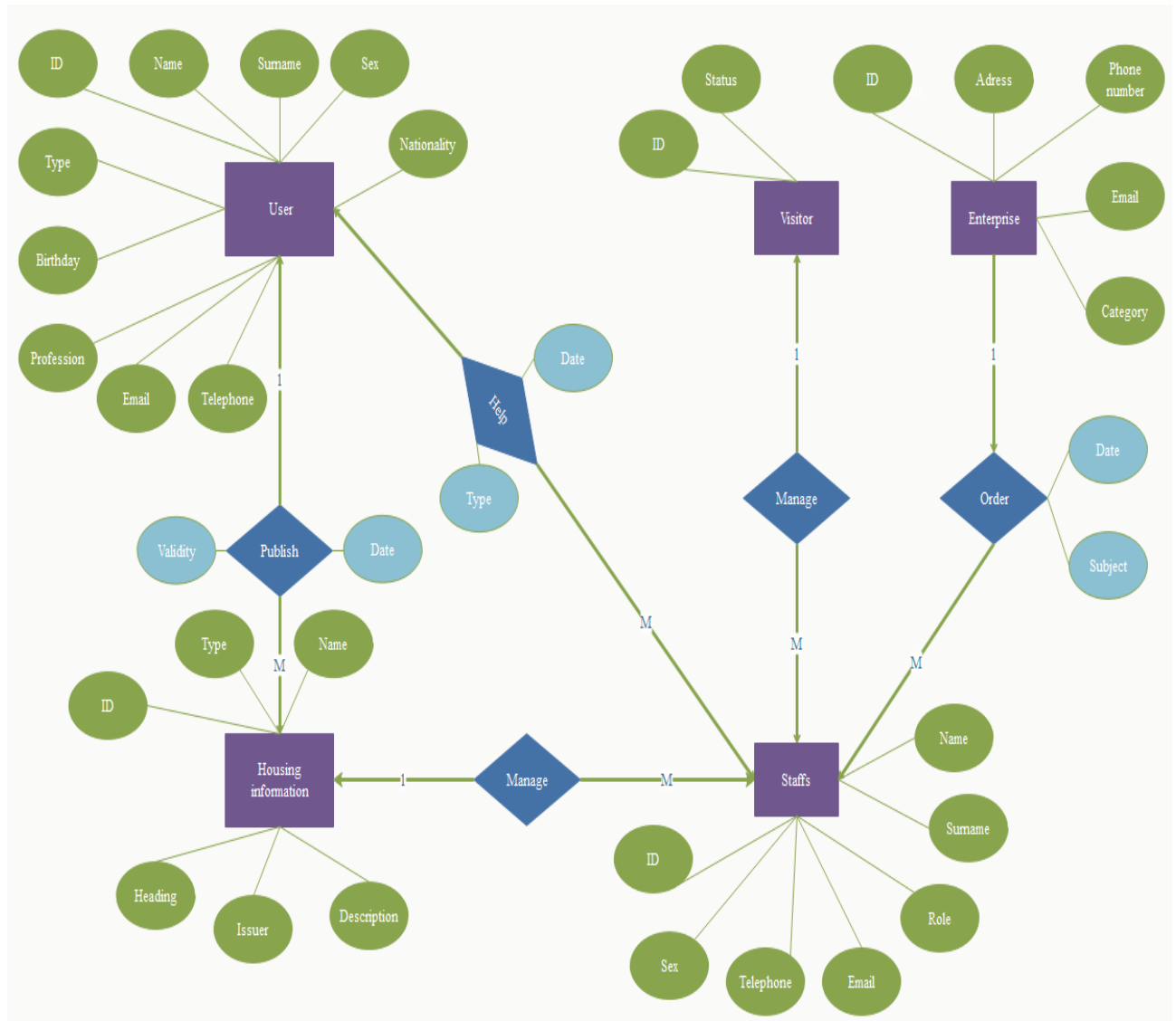
Figure 16—E-R model

Class diagram is the common UML diagram, showing the static structure and relation of classes, interfaces and between them, especially the class in the model, internal structure of class and relation between them and other classes. Class diagram shows static structure of model, used for describing structural design of system.

Typical relations include: inheritance, association relation, aggregation relation, composite relation, dependency relation and realization relation.

Aggregation relation, composition relation belong to association relation

Generalization relation: it is expresses as inheritance relation between classes, inheritance between interfaces, realization relation between class and interface. Expression method: use a hollow arrow + full line with arrow pointing to parent class. Or a hollow arrow + dotted line,   if parent class is interface.

Association relation: connection between classes, it enables a class to know the

attribute and method of another class. Expression method: use full line + arrow with arrow pointing to the class used.

Aggregation relation: is one kind of correlation relation, a strong correlation relation. Aggregation relation is the relation between entirety and individual. Two classes of correlation are at the same level, while two classes of aggregation relation are at different levels, one is the entirety, one is part. Expression method: hollow rhomb + full line + arrow, with arrow pointing to part.

Composition relation: is a kind of correlation relation stronger than aggregation relation. It requires the object representing entirety of general aggregation relation to represent the life cycle of the object of part, composite relation cannot share. Expression method: solid rhomb + full line + arrow.

Dependency relation: is connection between classes, a definition expressing reliance of one class on another class. Expression method: dotted line + arrow, with arrow pointing to the class relied on, namely pointing to local variable.
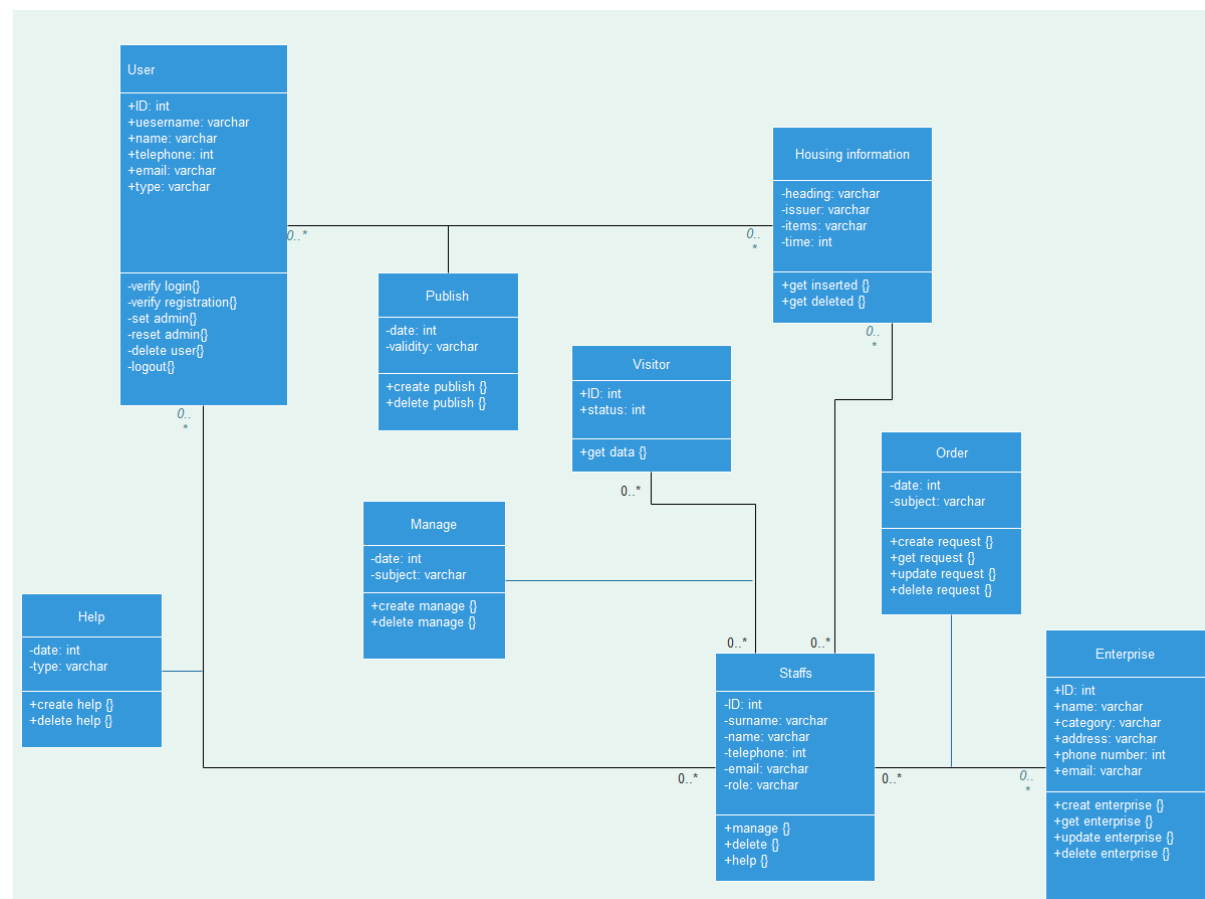

Figure 17—Class diagram

5.1.4 Sequence Diagram

Sequence diagram is a diagram showing interaction between objects which are ranked by time sequence. Sequence diagram shows the sequence of information interaction between objects participating in interaction. Sequence diagram mainly includes modeling elements such as object, lifeline, control focal point, message, etc.

System role is, maybe a person, and even his system or subsystem.

Lifeline is expressed as a dotted line downward extending from object icon in the sequence diagram, expressing the existence time of object.

Control focal point is a symbol expressing time quantum in sequence diagram, object will perform corresponding operation during the time quantum, expressed by a small rectangle.

Message typically is divided into synchronous message, asynchronous message and return message.

1) Synchronous message

Message sender transmits control to information receiver, then stops waiting for message receiver to give up or return control. It is used to express the meaning of synchronization.

2) Asynchronous message

Message sender transmits signal to message receiver through information and go on its activity without waiting for receiver to return the message or control. The receiver and sender of asynchronous message work simultaneously.

3) Return message

Return message expresses returning from procedure call

4) Self-message

Expresses self-call and a method calling another method within an object.

In this website focus on two main processes: the publish process, in which seller need to fill in housing information, in order to publish it on website, and browse process, in which user searches the housing information, in order to buy or rent it.
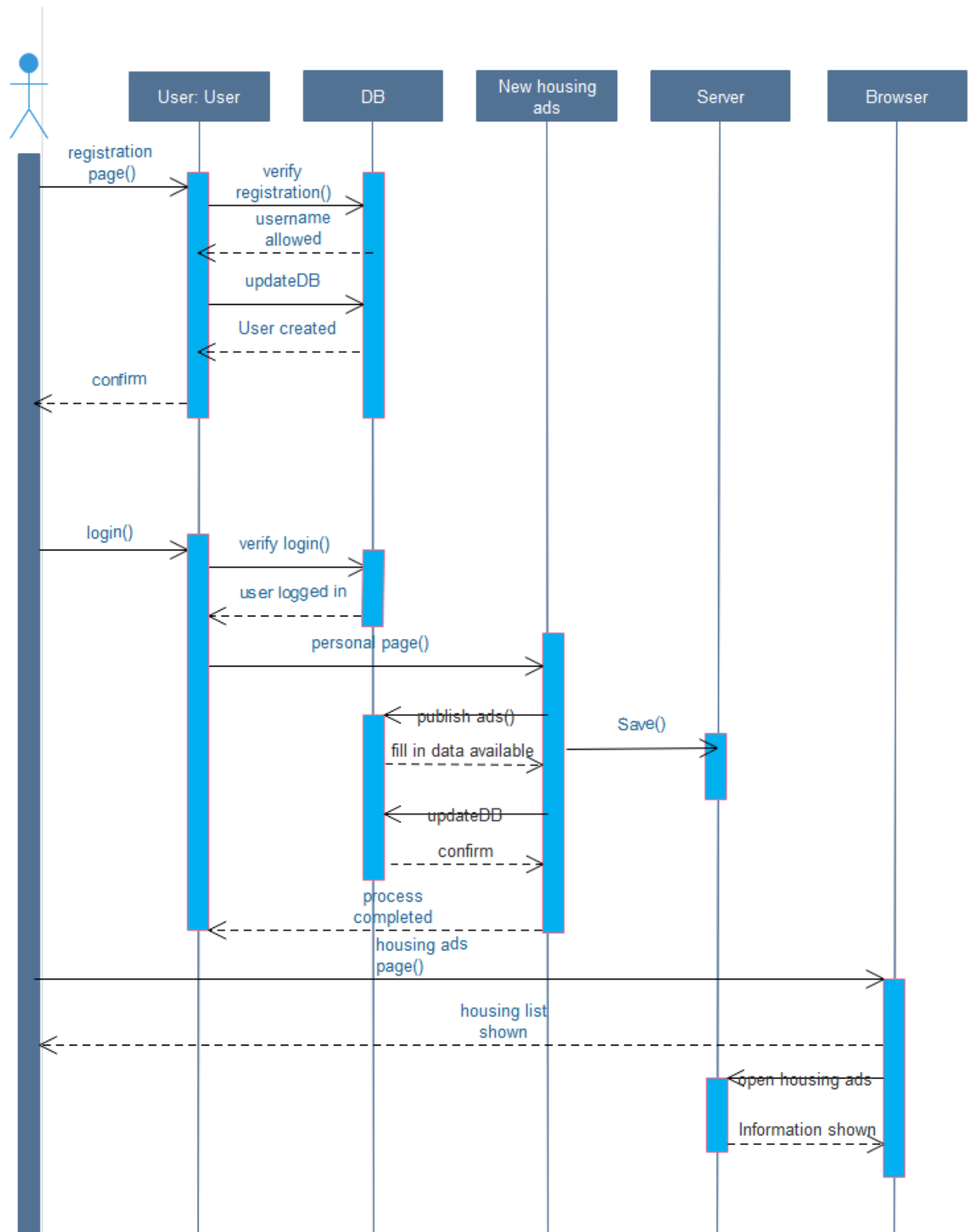
Figure 18—Sequence Diagram

5.1.5 State Chart

State chart diagram is mainly used to describe dynamic behaviour of an object during its existence period, expressed as the sequence of state experienced by an object, event resulting in state transformation and action accompanying state transformation.

State is the result of object performing a series of activities. When an event occurs, the state of object will change.

State is expressed with fillet rectangle, initial state is expressed by a solid dot, final state is expressed by a dot within a circle.

Transitions is a kind of relation between two states, expressing object performing certain action at source state and entering target state when a specific event occurs and a specific condition is met.

State diagram can be divided into region which includes exited or current sub-state. It indicates that combination state can reach multiple sub-states simultaneously at a moment.
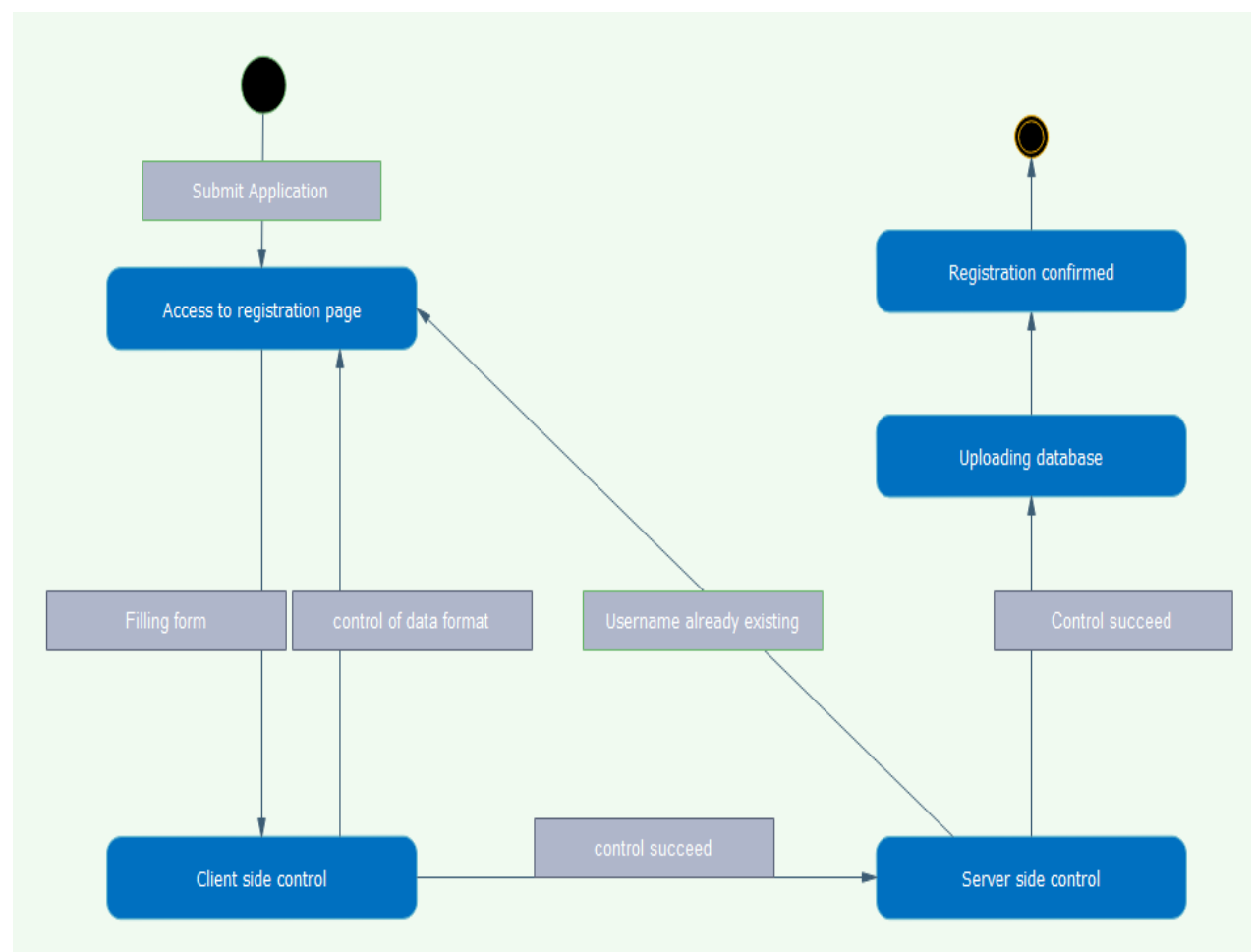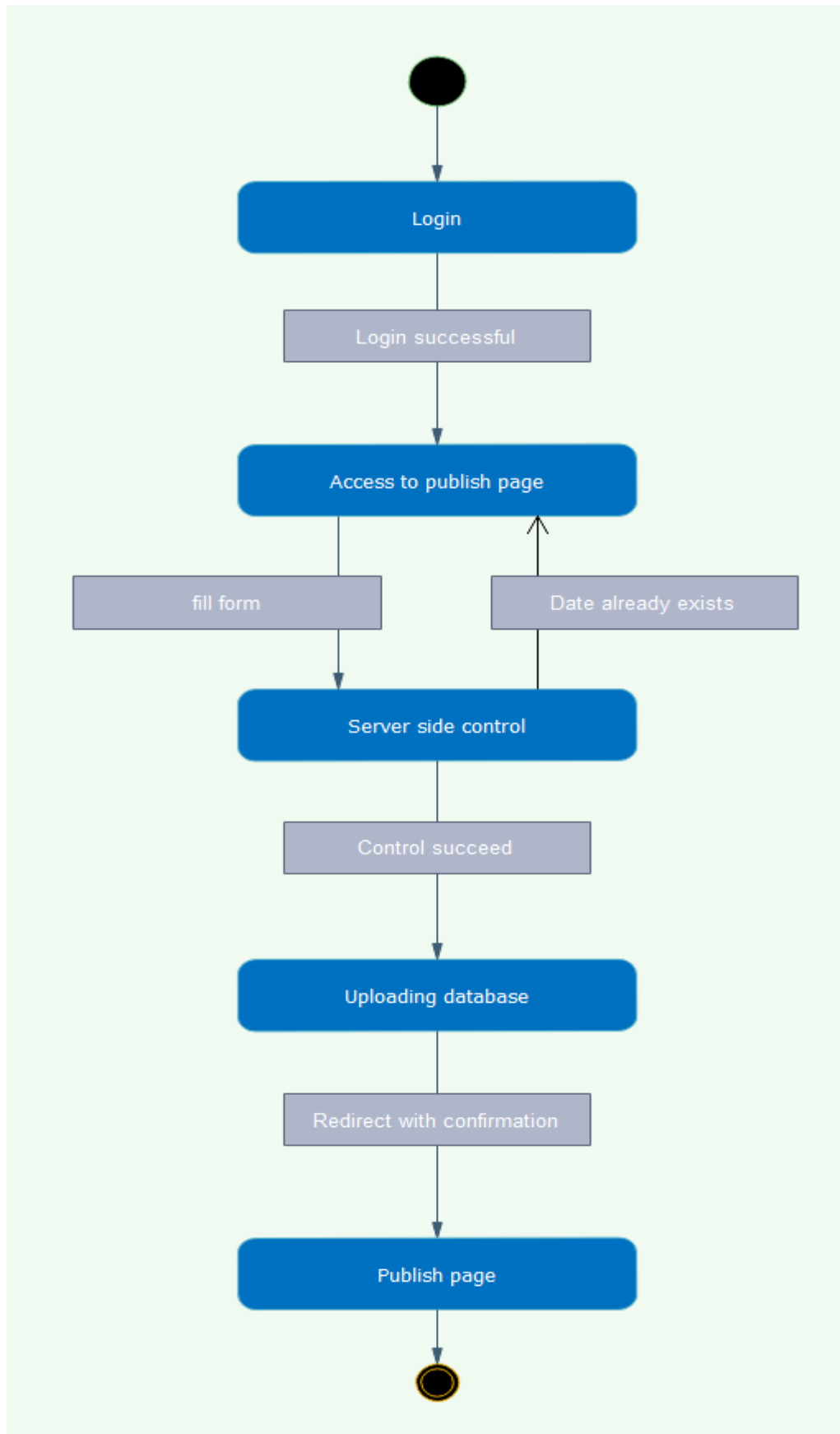

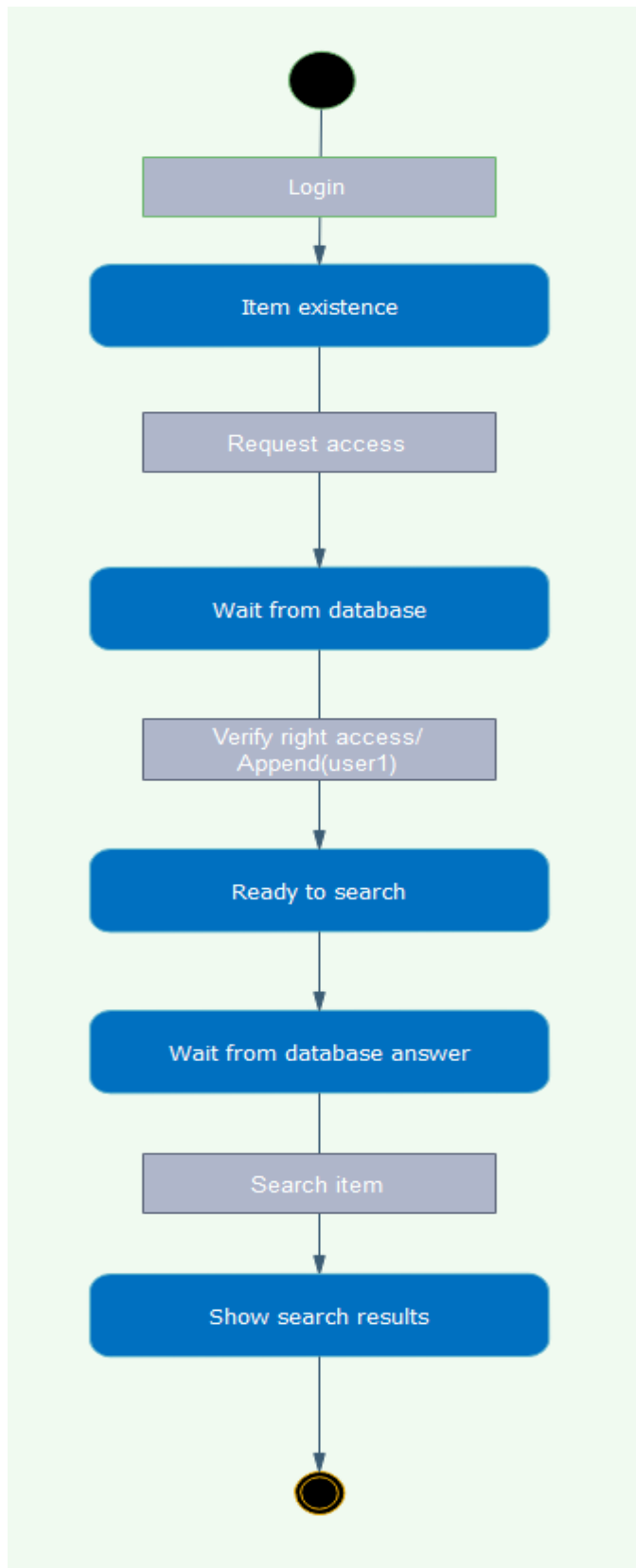Figure 19—Registration

Figure 20—Publish

Figure 21—Search

Chapter 6

System Implementation

6.1 Software used for implementation

DedeCMS: DedeCMS is a free and open source content management system which is a CMS used independently. DedeCMS is developed based on PHP and MySQL, is the most famous PHP open source website management system in China, also a PHP type CMS system with most users, DedeCMS free version locks main target users in personal website administrator, with function more focusing on construction of personal website or small-medium sized portals.

PHP is a universal open source script language, founded in 1994 by Rasmus Lerdorf. At the beginning it was a simple program compiled with Perl language to maintainpersonal web page. Later it was rewritten using C language, PHP's grammarcombines grammars of C, Java, Perland that created by PHP. PHP is used widely, mainly suitable for Webdevelopment.

PHPStudy: PHPStudy is an integrated package of the latest Apache Web servers, PHP , MySQL, phpMyAdmin and ZendOptimizer. One-time installation, it is very convenient, easy to use . It helps developers save time in the tedious process of configuring the environment, freeing up more energy for development.

Adobe Dreamweaver: Adobe Dreamweaver is a webpage editor developed by the MACROMEDIA company in the United States. DW is a visual web development tool developed specifically for professional web designers that makes it easy to create dynamic web pages that span platform limitations and browser limitations.
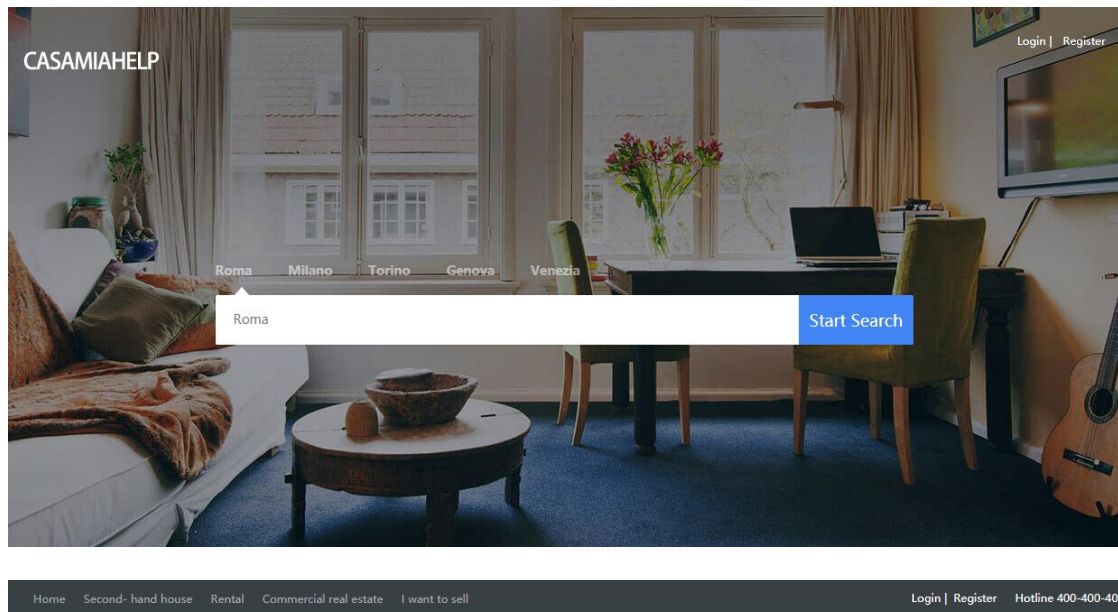
Notepad ++: Notepad ++ is a text editor for Windows operating systems.

Edraw: Edraw is a drawing software, which can be used for many drafting, example house of quality, problem tree, solution tree, objective tree, spider diagram, venn diagram and UML (Case Diagrams, Activity Diagrams, Class Diagram, Sequence Diagrams, State Charts) and so on.

6.2 Implementation of basic functions

6.2.1 System login

First, the user enters the system by inputting the username and password and passing identification of the system. The visitor cannot release housing information and view seller's phone number, visitor only be allowed inquire and browse housing information.

6.2.2 Publish Housing Information

After register and login, housing seller or renter can enter its personal page to manage housing information, at housing information publish interface (I want to sell), housing seller needs to fill in detailed information about house and its own contact information so that the buyer can contact the seller in time. The housing information is automatically saved in background database after being released by the seller. The

seller should fill in detailed house information in the following tables.

There are three functional areas on the front page of the website, rental, second-hand housing, commercial real estate. Users can choose the information that is useful to them according to their needs.

Housing buyers can search information through key word, retrieve related housing information. The user can select related retrieval conditions such as the city that house is located in, total price, area, age of house, etc.

Then, single click the list of housing information to view detailed information on housing, as shown in the figure.

Meanwhile renting information can also be inquired on the website

In order to protect personal information of the owner, avoid unnecessary disturbance, unregistered users can only view email of the owner, without mobile phone number.

The background management system interface, the background management system can manage the registration information of the registered users and the published listing information, and has the authority to verify and review the users.

6.3 Code

Registration: function Case user:

```
 9   require_once(dirname(__FILE__)."/config.php");
10   if(empty($dopost)) $dopost = '';
11   if(empty($fmdo)) $fmdo = '';
12   //Write function library
13   require 'foncti.php';
```

Check if the user name exists:

```
83   /*********************
84   function Case_user()
85   *******************/
86   else if($fmdo=='user')
87   {
88
89       //Check if the user name exists
90       if($dopost=="checkuser")
91       {
92           AjaxHead();
93           $msg = '';
94           $uid = trim($uid);
95           if($cktype==0)
96           {
97               $msgtitle='User a pseudonym';
98           }
99           else
100          {
101              #api{{
102              if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
103              {
104                  $ucresult = uc_user_checkname($uid);
105                  if($ucresult > 0)
106                  {
107                      echo "<font color='#4E7504'><b>√ Username available</b></font>";
108                  }
109                  elseif($ucresult == -1)
110                  {
111                      echo "<font color='red'><b>× user name is not valid</b></font>";
112                  }
113                  elseif($ucresult == -2)
114                  {
115                      echo "<font color='red'><b>× contains the words to be allowed to register</b></font>";
116                  }
117                  elseif($ucresult == -3)
118                  {
119                      echo "<font color='red'><b>× user name already exists</b></font>";
120                  }
121                  exit();
122              }
123              #/aip}}
124              $msgtitle='User name';
125          }
126          if($cktype!=0 || $cfg_mb_wnameone=='N') {
127              $msg = CheckUserID($uid, $msgtitle);
128          }
129          else {
130              $msg = CheckUserID($uid, $msgtitle, false);
131          }
132          if($msg=='ok')
133          {
134              $msg = "<font color='#4E7504'><b>√ {$msgtitle}可以使用</b></font>";
135          }
136          else
137          {
138              $msg = "<font color='red'><b>×{$msg}</b></font>";
139          }
140          echo $msg;
141          exit();
142      }
143
```

Check email exists:

```
144      //Check email exists
145      else  if($dopost=="checkmail")
146      {
147          AjaxHead();
148
149          #api{{
150          if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
151          {
152              $ucresult = uc_user_checkemail($email);
153              if($ucresult > 0) {
154                  echo "<font color='#4E7504'><b>√ can be used</b></font>";
155              } elseif($ucresult == -4) {
156                  echo "<font color='red'><b>×Email Wrong format!</b></font>";
157              } elseif($ucresult == -5) {
158                  echo "<font color='red'><b>×Email Not allowed to register!</b></font>";
159              } elseif($ucresult == -6) {
160                  echo "<font color='red'><b>× this Email Already registered!</b></font>";
161              }
162              exit();
163          }
164          #/aip}}
165
166          if($cfg_md_mailtest=='N')
167          {
168              $msg = "<font color='#4E7504'><b>√ can be used</b></font>";
169          }
170          else
171          {
172              if(!CheckEmail($email))
173              {
174                  $msg = "<font color='#4E7504'><b>× Email format is incorrect</b></font>";
175              }
```

```
176              else
177              {
178                  $row = $dsql->GetOne("SELECT mid FROM `#@__member` WHERE email LIKE '$email' LIMIT 1");
179                  if(!is_array($row)) {
180                      $msg = "<font color='#4E7504'><b>√ can be used</b></font>";
181                  }
182                  else {
183                      $msg = "<font color='red'><b>Email has been occupied by another account!</b></font>";
184                  }
185              }
186          }
187          echo $msg;
188          exit();
189      }
190
191      //Import registration page
192      else if($dopost=="regnew")
193      {
194          $step = empty($step)? 1 : intval(preg_replace("/[^\d]/",'', $step));
195          require_once(dirname(__FILE__)."/reg_new.php");
196          exit();
197      }
```

User login:

```
245      //User login
246      if($dopost=="login")
247      {
248          if(!isset($vdcode))
249          {
250              $vdcode = '';
251          }
252          $svali = GetCkVdValue();
253          if(preg_match("/2/",$safe_gdopen)){
254              if(strtolower($vdcode)!=$svali || $svali==''')
255              {
256                  ResetVdValue();
257                  ShowMsg('Verification code error!', 'index.php');
258                  exit();
259              }
260
261          }
262          if(CheckUserID($userid,'',false)!='ok')
263          {
264              ResetVdValue();
265              ShowMsg("The user name you entered {$userid} illegal!","index.php");
266              exit();
267          }
268          if($pwd=='')
269          {
270              ResetVdValue();
271              ShowMsg("The password cannot be empty!","-1",0,2000);
272              exit();
273          }
274
275          //Check account
```

Search:

Dede has its own search function, we just need to find the corresponding template, and then take out the code we want. details as follows:

First go to temples-->default-->search.htm to open the file and find the code.

```
19      <div class="search_box">
20          <form>
21              <input name="q" type="text" id="search-keyword" value="{dede:global name='keyword' function='RemoveXSS(@me)'/}"
                  onfocus="if(this.value=='Search here...'){this.value='';}"  onblur="if(this.value==''){this.value='Search
                  here...';}" />
22              <select name="searchtype" id="search-option">
23                  <option value="title" selected='1'>Retrieves the title</option>
24                  <option value="titlekeyword">Intelligent fuzzy</option>
25              </select>
26              <button type="submit" class="search-submit">search</button>
27              <a href="heightsearch.php">Advanced search</a>
28          </form>
29      </div>
```

The code is modified and placed in our search module.

Create a new search.htm template and put it in our custom template folder (used to show the search results) and then the code is called. In the place where you want to display the search results, add the call tag.

Registration:

```php
require_once(dirname(__FILE__)."/config.php");
if(empty($dopost)) $dopost = '';
if(empty($fmdo)) $fmdo = '';
//Write function library
require 'foncti.php';
/********************
function Case_user()
******************/
else if($fmdo=='user')
{

    //Check if the user name exists
    if($dopost=="checkuser")
    {
        AjaxHead();
        $msg = '';
        $uid = trim($uid);
        if($cktype==0)
        {
            $msgtitle='User a pseudonym';
        }
        else
        {
            #api{{
            if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
            {
                $ucresult = uc_user_checkname($uid);
                if($ucresult > 0)
                {
                    echo "<font color='#4E7504'><b> √  Username available</b></font>";
                }
                elseif($ucresult == -1)
                {
                    echo "<font color='red'><b>× user name is not valid</b></font>";
                }
                elseif($ucresult == -2)
                {
                    echo "<font color='red'><b>× contains the words to be allowed to register</b></font>";
                }
                elseif($ucresult == -3)
                {
                    echo "<font color='red'><b>× user name already exists</b></font>";
                }
```

```
                exit();
            }
        #/aip}}
            $msgtitle='User name';
    }
    if($cktype!=0 || $cfg_mb_wnameone=='N') {
        $msg = CheckUserID($uid, $msgtitle);
    }
    else {
        $msg = CheckUserID($uid, $msgtitle, false);
    }
    if($msg=='ok')
    {
        $msg = "<font color='#4E7504'><b> √ {$msgtitle}can be used</b></font>";
    }
    else
    {
        $msg = "<font color='red'><b>× {$msg}</b></font>";
    }
    echo $msg;
    exit();
}

//Check email exists
else   if($dopost=="checkmail")
{
    AjaxHead();

    #api{{
    if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
    {
        $ucresult = uc_user_checkemail($email);
        if($ucresult > 0) {
            echo "<font color='#4E7504'><b> √   can be used</b></font>";
        } elseif($ucresult == -4) {
            echo "<font color='red'><b>×Email Wrong format!</b></font>";
        } elseif($ucresult == -5) {
            echo "<font color='red'><b>×Email Not allowed to register!</b></font>";
        } elseif($ucresult == -6) {
            echo "<font color='red'><b>× this Email Already registered!</b></font>";
        }
        exit();
    }
    #/aip}}
```

```php
        if($cfg_md_mailtest=='N')
        {
            $msg = "<font color='#4E7504'><b> √  can be used</b></font>";
        }
        else
        {
            if(!CheckEmail($email))
            {
                $msg = "<font color='#4E7504'><b>× Email format is incorrect</b></font>";
            }
            else
            {
                $row = $dsql->GetOne("SELECT mid FROM `#@__member` WHERE email LIKE '$email' LIMIT 1");
                if(!is_array($row)) {
                    $msg = "<font color='#4E7504'><b> √  can be used</b></font>";
                }
                else {
                    $msg = "<font color='red'><b>Email has been occupied by another account!</b></font>";
                }
            }
        }
        echo $msg;
        exit();
    }

    //Import registration page
    else if($dopost=="regnew")
    {
        $step = empty($step)? 1 : intval(preg_replace("/[^\d]/","", $step));
        require_once(dirname(__FILE__)."/reg_new.php");
        exit();
    }
```

Login in:

```php
/********************
function login()
*******************/
else if($fmdo=='login')
{
    //User login
    if($dopost=="login")
```

```php
    {
        if(!isset($vdcode))
        {
            $vdcode = '';
        }
        $svali = GetCkVdValue();
        if(preg_match("/2/",$safe_gdopen)){
            if(strtolower($vdcode)!=$svali || $svali=='')
            {
                ResetVdValue();
                ShowMsg('Verification code error！', 'index.php');
                exit();
            }

        }
        if(CheckUserID($userid,'',false)!='ok')
        {
            ResetVdValue();
            ShowMsg("The user name you entered {$userid} illegal！","index.php");
            exit();
        }
        if($pwd=='')
        {
            ResetVdValue();
            ShowMsg("The password cannot be empty！","-1",0,2000);
            exit();
        }

        //Check account
        $rs = $cfg_ml->CheckUser($userid,$pwd);

        #api{{
        if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
        {
            //Check account
            list($uid, $username, $password, $email) = uc_user_login($userid, $pwd);
            if($uid > 0) {
                $password = md5($password);
                //When UC exists user, and CMS does not exist, it will register one
    $rs = 1;
                $row = $dsql->GetOne("SELECT `mid`, `pwd` FROM #@__member WHERE `userid`='$username'");
                if(isset($row['mid']))
                {
```

```
                $cfg_ml->PutLoginInfo($row['mid']);
                if($password!=$row['pwd'])        $dsql->ExecuteNoneQuery("UPDATE
#@__member SET `pwd`='$password' WHERE mid='$row[mid]'");
                }
                //Generate code for synchronous login
                $ucsynlogin = uc_user_synlogin($uid);
            } else if($uid == -1) {
                //When UC does not exist and the CMS exists, register one.
                if($rs) {
                    $row    =    $dsql->GetOne("SELECT    `email`    FROM    #@__member
WHERE userid='$userid'");
                    $uid = uc_user_register($userid, $pwd, $row['email']);
                    if($uid > 0) $ucsynlogin = uc_user_synlogin($uid);
                } else {
                    $rs = -1;
                }
            } else {
                $rs = -1;
            }
        }
        #/aip}}

        if($rs==0)
        {
            ResetVdValue();
            ShowMsg("Username does not exist!", "index.php", 0, 2000);
            exit();
        }
        else if($rs==-1) {
            ResetVdValue();
            ShowMsg("wrong password!", "index.php", 0, 2000);
            exit();
        }
        else if($rs==-2) {
            ResetVdValue();
            ShowMsg("Administrator account does not allow login from the front desk!",
"index.php", 0, 2000);
            exit();
        }
        else
        {
            // Clear member cache
            $cfg_ml->DelCache($cfg_ml->M_ID);
            if(empty($gourl) || preg_match("#action|_do#i", $gourl))
```

```
        {
            //ShowMsg("Login successfully, after 5 seconds to the system home
page...","index.php",0,2000);
            _location('A successful login','/member/');
        }
        else
        {
            $gourl = str_replace('^','&',$gourl);
            _location('A successful login','/member/');
            //ShowMsg("Login successfully, now turn to the specified
page...",$gourl,0,2000);
        }
        exit();
    }
}


//sign out
else if($dopost=="exit")
{
    $cfg_ml->ExitCookie();
    #api{{
    if(defined('UC_API') && @include_once DEDEROOT.'/uc_client/client.php')
    {
        $ucsynlogin = uc_user_synlogout();
    }
    #/aip}}
    ShowMsg("Login successfully！ ","index.php",0,2000);
    exit();
    }
}
```

Homepage:

```
<head>

<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />

<title>CASAMIAHELP</title>

<meta name="keywords" content="CASAMIAHELP" />

<meta name="description" content="CASAMIAHELP" />

<meta name="baidu-tc-verification" content="75e113393e7b65ff7d43595dcba9feaf" />


<!-- 360 USES extreme speed mode -->
```

```html
<meta name="renderer" content="webkit">

<meta content="IE=7" http-equiv="X-UA-Compatible"/>

<script type="text/javascript">

var CMS_ABS = '/'

, hostname    = 'CASAMIA'

, tplurl        = '/'

, vcodes        =
',register,login,admin,freesms,commu1,commu3,commu4,commu5,commu8,commu32,commu33,
commu35,commu40,commu45,commu46,commu49,archive,archive8,archive106,archive101,archi
ve_fy,archive_xq,payonline,pm';

var originDomain = originDomain || document.domain;

document.domain = '' || document.domain;

</script>

<link rel="stylesheet" type="text/css" href="/skin/css/global.css"/>

<!-- type index | newhouse | money | business | oldhouse | rent | news | special | mobile | tools -->


<!--<link href="/favicon.ico" type="image/x-icon" rel=icon>-->

<link href="/favicon.ico" type="image/x-icon" rel="shortcut icon">

<link rel="stylesheet" href="/skin/css/common.css">

<link rel="stylesheet" href="/skin/css/common-0.css">

<link rel="stylesheet" type="text/css" href="/skin/css/main.css">

<script src="/skin/css/jquery.js"></script>


<script src="/skin/css/fe.js"></script>

<script src="/skin/css/common.js"></script>


<base target="_blank">

<link rel="stylesheet" type="text/css" href="/skin/css/index.css"/>

</head>

<body>
```

```
<style>

.top-navmenu ul li.selected>a,.top-navmenu ul li:hover>a{color:#fff;}

ul.marquee {display: block;line-height: 1;position: relative;overflow: hidden;width: 400px;
height: 22px; }

ul.marquee li {position: absolute; top: -999em;left: 0;display: block;    white-space: nowrap;
padding: 3px 0px; }

</style>

<script>

((function(){

$("#scroll_info").marquee({yScroll: "top"});

});

</script>

<script>

//Search bar prompts

function ss_tip(eleObj){

var v_dataparam = $(eleObj).attr("data-param");

json_dataparam = $.parseJSON(v_dataparam);

$("#keyword-box1").attr("placeholder",json_dataparam.searchword);

$("#caid").val(json_dataparam.caid);

$("#addno").val(json_dataparam.addno);

var position = $(eleObj).position();

$(eleObj).parent("ul").siblings("i").css("left",position.left);//Position bar to move positioning

$(eleObj).siblings("li").removeClass("check");

$(eleObj).addClass("check");

//Search parameter assignment

var v_dataParam =$(eleObj).attr("data-param");

var json_dataParam=$.parseJSON(v_dataParam);

var v_caid = json_dataParam.caid;

$("#caid").val(v_caid);

}
```

```
//Looking for a room

function findHouse(){

//var v_caid = $("#caid").val();

$("#form_findHouse").submit();

}

$(function(){

//Search to submit

$("#act_submit").click(function(){

$("#form_search").submit();

});

});

</script>

<script language="javascript" type="text/javascript"
src="{dede:global.cfg_cmsurl/}/include/dedeajax2.js"></script>

<script language="javascript" type="text/javascript">

function CheckLogin(){

var taget_obj = document.getElementById('_userlogin');

myajax = new DedeAjax(taget_obj,false,false,'','','');

myajax.SendGet2("{dede:global.cfg_cmspath/}/member/ajax_loginsta.php");

DedeXHTTP = null;

}

</script>

<div class="header" data-stellar-background-ratio="0.07" >

<div id="div_headerWrapper" class="wrapper">

<div class="w270 l">

<h2 class="l" style="margin-top: 14px;"><a title="CASAMIA" href="/"
target="_self"><img src="/skin/images/logo.png"/></a></h2>


</div>

<div class="fr">
```

```html
<div class="nav typeUserInfo" style="border-bottom:none;">

    <div class="ti-hover">

        <div class="typeShowUser ">

            <i></i><!--<span class="welcome">-->

            <span id="_userlogin">

                <a   href="/member/login.php"><span
class="reg">Login</span></a> |

                <a href="/member/reg_new.php"><span
class="log">Register</span></a>

            </span>

            <script language="javascript"
type="text/javascript">CheckLogin();</script>

        </div>

    </div>

    <ul>


    </ul>

</div>

</div>

<div class="clear"></div>

<!--Head search bar-->

<div class="header-wrap">

<div class="wrap-ico"></div>

<div class="search-box-wrap" log-mod="search">

    <div class="search-box-con">

        <div class="menu">

            <ul>

                <li class="tab "><span><a
href="/plus/search.php?q=Roma">Roma</a></span></li>

                <li class="tab "><span><a
href="/plus/search.php?q=Milano">Milano</a></span></li>
```

```
                    <li class="tab "><span><a
href="/plus/search.php?q=Torino">Torino</a></span></li>

                    <li class="tab "><span><a
href="/plus/search.php?q=Genova">Genova</a></span></li>

                    <li class="tab "><span><a
href="/plus/search.php?q=Venezia">Venezia</a></span></li>


                  </ul>

                  <i></i>

                </div>

                <div class="search clear">

                  <div class="box">

                    <form
action="{dede:global.cfg_cmsurl/}/plus/search.php" target="_blank" class="clearfix" >

                        <input class="text left txt" name="q"
autocomplete="off" placeholder="Roma" id="keyword-box1" >

                        <input type="hidden" id="caid" value="2"/>

                        <input type="hidden" id="addno" />

                        <input class="btn home-ico ico-search left"
type="submit" value="Start Search" >

                    </form>

                  </div>

                </div>

              </div>

            </div>

          </div>

        <!--end div_headSearch-->

        </div>

      </div>
```

References

- Slides on classes

- http://help.dedecms.com

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- http://www.anjuke.com

- http://en.wikipedia.org/wiki/Main_Page

- http://www.google.com

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