EFFECTIVE DEVELOPMENT, UTILIZATION AND MANAGEMENT OF UNDERGROUND COMMERCIAL AREAS

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Effective Development, Utilization and Management of Underground Commercial Areas

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CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

Signed

Siyuan Liu

I would like to dedicate this thesis to my deceased loving grandmother Mrs. G.Q. Meng and respected PhD co-supervisor Dr. Andy Wong

Abstract

With development of the global economy and the improvement of people's living standards, commercial spaces have been expanding to cope with market demand. In most large cities in China, due to the limited space in central urban areas, effective development, utilization and management of underground commercial areas is a topic worthy of further research. The development of underground commercial areas has to go through a project lifecycle starting with a feasibility study including site selection, financial viability, environmental assessment, government involvement and stakeholders. Once a particular project is decided upon, designing, financing, and construction have to be smoothly executed in order to finish the project by the agreed completion date. To achieve this, there needs to be an effective strategic management system for the duration of the project's lifecycle.

The development and utilization of underground commercial areas has the characteristics of high investment, high risk, high profit, and irreversibility. China's underground commercial areas have transformed from one with a very high degree of government intervention into a more market-driven system, which has become a popular investment opportunity. The ultimate purpose of modern underground commercial projects is to operate at a profit and are therefore mainly developed by state-owned and private enterprises. Although some progress has been made, there is a lack of strategic guidance, ideology, and scientific management for project decision-making of underground commercial areas, especially for developers.

This thesis establishes an effective strategic management model to help developers

improve the quality of decision-making for project lifecycle development of underground commercial areas using strategy as its guiding ideology. The research objectives at the outset were to:

1. Identify and analyse the strategic decision factors covering the project lifecycle development of underground commercial areas.
2. Establish a strategic management model to improve the quality of decision-making for project lifecycle development of underground commercial areas.
3. Evaluate the strategic management model by a case study.

Qualitative analysis and quantitative analysis were combined in the process of achieving the research objectives. First, document analysis and interviews with experts were adopted as the main research methods to achieve objective 1. Second, document analysis and Delphi method were adopted as the main research methods to achieve objective 2. Third, case study, the AHP method and the Delphi method were adopted as the main research methods to achieve objective 3. The AHP method was applied to evaluate the strategic management model through a real-life case study. By developing the strategic management model to achieve optimal economic benefits for a real-life project, the model was empirically validated by using the Delphi method and Yaahp software. Three university scholars were interviewed in order to identify the strategic decision factors, and nine experts, including university scholars, industry experts, and enterprise executives were invited to assess the established strategic management model.

Determination of the model’s effective development, utilization and management of

underground commercial areas and the measurement of such effectiveness is based on the established strategic management model. The research results show that the model is applicable to decision-making for project lifecycle development of underground commercial areas by developers. It serves as a scientific management model contributing to the effective development, utilization and management of underground commercial areas.

The thesis contributes to the relevant body of knowledge in two respects. First, it is the first study to investigate the comprehensive strategic decision factors covering the different stages of project lifecycle development of underground commercial areas for decision-making by developers. Second, it is the first study to establish a strategic management model consisting of different layers, including strategic objective layer, primary decision-making layer, secondary decision-making layer, and tactical execution layer to improve the quality of project decision-making for underground commercial areas by developers.

Acknowledgements

This time around, I am filled with emotion in retrospect. When I walked into The Hong Kong Polytechnic University on day one, I never expected so much for today. As the saying goes, the most beautiful thing is not keeping time but retaining memories. Besides the knowledge gained, those ineffable sceneries and stories I have experienced over these years will benefit me for life.

Above all, I feel fortunate and privileged to have had the opportunity to study in the supervision of my PhD supervisors: Prof. Geoffrey Shen and Dr. Andy Wong. Without their guidance and support in continuous patience and understanding, this thesis would not have become a reality. And I must say the greatest preciousness I cognised from both of my supervisors was having a very passionate and loving heart besides a high level of knowledge, which should be engraved and cherished for me. To quote the motto of Dr. Andy Wong, "Charity begins at home, and unity comes from patriotism." I believe nothing beats that.

Most of all, I am grateful to my families for their care and company along the way, especially to my grandmother and parents who have encouraged me to stick with this study and be positive while facing any difficulties. My grandmother has lived alone in hometown for over fifteen years until she heard my study and determined to move close for accompanying me. The unparalleled time spent with my grandmother over these years has become an exceptionally precious memory which will forever remain in my heart, and each flush will be my life-time serendipity. I still clearly remember her smile when I reached home on every past Friday afternoon. At this particular moment, I feel deeply sorry and disappointed that my grandmother could not make it to today, which will be my eternal regret. Besides, special thanks go to my father for his thoughtful advice for my study. His valuable expertise and remarkable achievement in the industry has been efficient and helpful, from which I have greatly benefited.

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Chapter 1 Introduction

1.1 Overview

With development of the global economy and the improvement of people's living standards, land is becoming increasingly scarce, and how best to maximize the use of space has become an urgent issue for major cities around the world. When land is horizontally expanded, the vertical development of space gradually becomes a new direction subject to the progress of science, technology and social productivity (Chen, 2018; Wang, 2015). Rapid urban expansion has resulted in a lot of issues such as dense population, traffic congestion, environmental pollution, and exorbitant downtown prices (Chen, 2016; Qian, 2015). As a result, it is increasingly difficult to develop and utilize aboveground areas to achieve sustainable urban development. Hence, many developed countries have begun to develop and utilize underground areas. This approach has played a considerable role in promoting urban development, reflected in not only expanding urban capacity but also improving urban functions and urban efficiency (Chen, 2015a; Ni, 2016). As a non-renewable natural resource, the function of underground areas gradually developed to cover habitation, storage, leisure, transportation, entertainment, disaster preparedness, business, etc. Among them, there has been a relatively recent rise in the demand for and development of underground areas for commercial use.

Underground commercial areas are the product of urban economic development to a particular stage (Qian, 2002; Yu, 2012). While promoting urban economic development, underground commercial areas are also influenced by overall urban development. The rise of underground commercial areas does not only expand urban space, but also brings new opportunities for achieving multiple benefits to cities and developers, which has become popular with investors. Along with this, in-depth investigation and exploration of management systems for underground commercial areas has become a key subject. In light of this, research into underground areas from any perspective should not ignore the development of cities and the effective development, utilization and management of underground commercial areas, which has become a symbol of urban commercial maturity.

This chapter introduces the research background, states the research problems, determines the research aim and objectives, discusses the research gap, highlights the significance of the research, and outlines the thesis structure.

1.2 Research Background

1.2.1 Underground Areas

According to Zhang et al. (2017), the 21st century was the century of exploitation and utilization of underground areas: The 6th International Conference on underground areas was held in Montreal, Canada, in 1997 on the theme “Tomorrow’s Indoor Cities”; An international conference on underground areas with the theme of “Underground City” was held in Moscow in 1998, which demonstrated the role and position of underground areas in the sustainable development of cities.

Urban development can be traced back to the middle of the 18th century when the British Industrial Revolution led the development of cities, industrial technology, and urbanization. With economic development and the continually increasing demand for construction land, the need to make full and effective use of underground urban areas has become increasingly urgent.

The development and utilization of underground areas is not only a requirement of urban economic growth but also critical for urban functional improvement, resilience, and sustainable development (Shi et al., 2013; Sterling et al., 2012). Underground areas have been closely integrated with urban development since its emergence. Through the integration of its form, it not only connects underground areas with aboveground areas but also integrates large areas of isolated underground public areas and provides contact in ways that no longer exist on urban roads aboveground. Meanwhile, it provides essential space for people’s daily life, such as transportation, shopping, dining, rest, etc. Use of urban underground areas has been growing significantly in the world’s biggest and wealthiest cities (Bobylev, 2016).

1.2.2 Underground Commercial Areas

Commerce is the typical form of urban economic development and the critical content of urban function, and commercial activity is an essential direction of urban economic growth as well as a sign of urban economic activity and prosperity (Yu, 2012). Underground commercial areas were initially named because it is similar to the use of aboveground commercial areas. Most commercial activities are located in central urban areas with a massive flow of people or densely populated areas with traffic hubs. Underground commercial areas can effectively disperse the flow of people above-ground as shown in Figure 1.1.

With the increasingly mature development of urban business, commercial economies above-ground tend to be saturated, and commercial spaces have been expanding to cope with the market demand (Xiao et al., 2016). The price of land above-ground is growingly high, and aboveground commercial resources are scarce and costly, especially the cost of land resources in the core business districts are continuously rising. As a result, the competitive environment for newly built commercial buildings is getting worse, and so it becomes increasingly risky to develop commercial projects. Consequently, cities desiring sustainable growth and expansion needs one or more forms of business to relieve stress arising from accelerated urbanization. In this context, it is particularly important to extend commercial activities to underground areas (Li et al., 2011). Therefore, the development of underground commercial areas can not only expand and enrich the connotation of commercial areas, but also enhance the commercial function of cities, as shown in Figure 1.2. The development and utilization of modern underground commercial areas have become typical underground projects in such places as Europe, USA, and Japan, with some underground projects and urban subways connecting seamlessly, greatly improving the convenience of urban transportation and shopping (Yu, 2012).

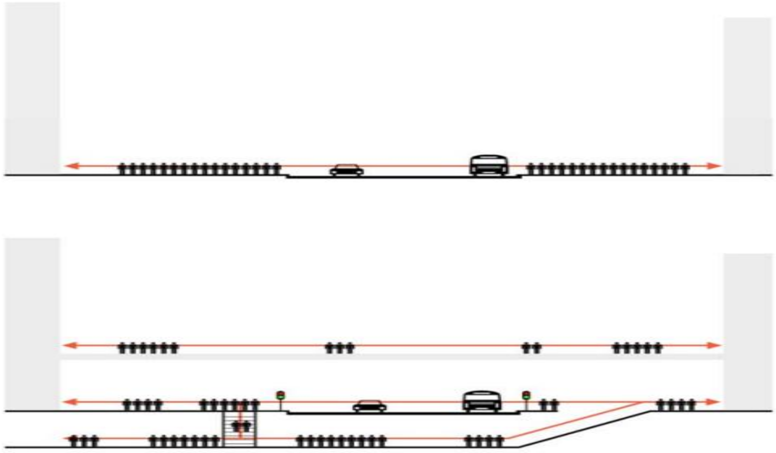

Figure 1.1 Flow of People Above-ground Dispersion[1]

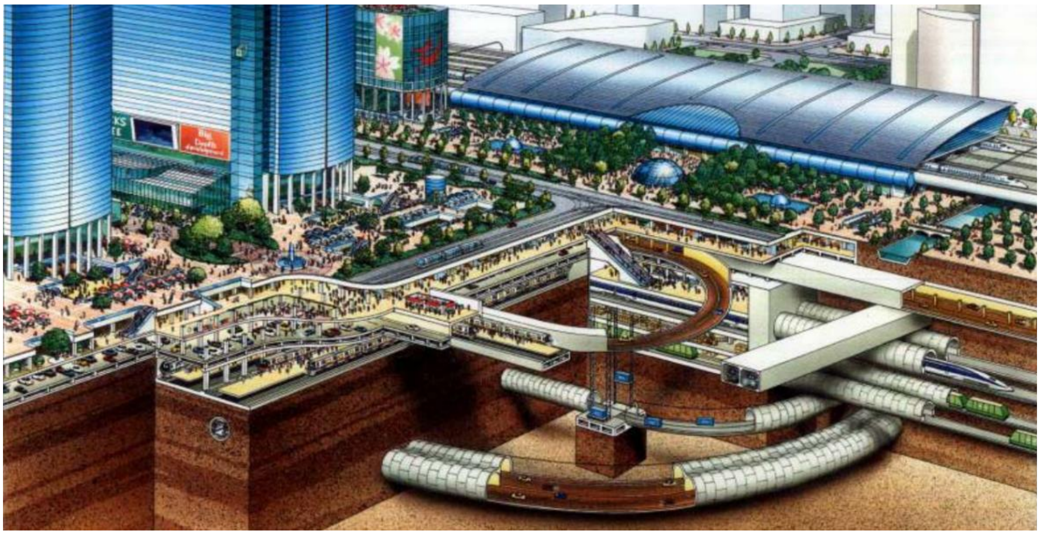

Figure 1.2 Underground Multifunctional Development[2]

1. Underground Commercial Areas in the World

As an essential function of underground areas, underground commercial areas in Europe and the United States have experienced a long history on the world stage (Chen, 2018; Yu, 2012). In the 1950s, with the popularization of automobiles, traffic jams in urban centres of Europe, America and Japan became so severe that many normal urban functions were gradually affected. To relieve the tremendous pressure of motor vehicles

[1] Primary data from Shenzhen WorldUnion Properties

[2] Primary data from Shenzhen WorldUnion Properties

on urban road traffic and share the ground flow, a kind of three-dimensional traffic facility for pedestrian crossings, which functions similar to the pedestrian bridge, was created. Initially, the underground passage was simply a new alternative route for pedestrians to cross the road with no shops or facilities inside (Wu, 2004). Subsequently, people gradually found its commercial benefits, so they began to hang advertisements, windows and advertising light boxes on both sides of the passage. At this stage, the underground passage has the functions of exchanging business, but there is no actual commercial transaction. Nevertheless, the emergence of underground passages laid a foundation for the formation of underground commercial areas (Bobylev, 2010).

With the expansion of underground passage sizes and increasing numbers of users, commercial facilities such as booths and shops were set up in the underground passage, which has made the development and utilization of the underground areas a key step toward functional recombination (Henry, 2006). Initially, commercial facilities were small in size and relatively single in function, mainly for shopping. With the emergence of the commercial value and associated economic benefits, people continued to expand underground areas into an underground passage and commerce composite combination development mode, which gradually developed into underground commercial streets. However, due to the lack of related development experience, while successfully creating the commercial value of the underground passage, it led to a poor image and lack of sufficient attractions. At this stage, underground commercial areas functioned as pedestrian systems, areas to display advertisements, and a place to conduct some commercial activities. It presented a functional combination that connected with the urban pedestrian system on the surface, which became a prototype for the underground city.

The large-scale modernization of underground commercial areas in Europe, America and other countries began with the construction and development of underground railways (Evans et al., 2009). In London, the world's first subway was built in 1863, pioneering the development of urban subway systems worldwide; in New York, the first subway was built in 1867; the first subway in Paris was built in 1900; Berlin built its first subway in 1902; in Madrid, the first subway was built in 1919; and Tokyo built its first subway in 1927. These subways have significantly improved urban transportation services and thus promoted the prosperity of commerce. At present, the development and utilization of underground commercial areas in the world has achieved a high degree in many developed countries. Figure 1.3 shows the layout of the underground development of New York City, USA.

Japan's first subway was a prelude to Asian underground development (Yu et al., 2013). Although the integrated development and utilization of underground areas in Japan started later than in Europe, underground development in Japan now leads the world. The most prominent characteristics of Japan's underground commercial areas are the large underground construction scale and strong resilience to disasters (Wang, 2012). Since the 1980s, Japan's single underground streets have become increasingly large, with higher design indicators and stronger resilience. Meanwhile, the country has formed a set of mature underground development and utilization systems regarding legislation, planning, design, etc. Unquestionably, the development, utilization and management of underground commercial areas in Japan are in the forefront of the world.

Figure 1.4 shows the layout of underground development of Shinjuku, Japan.

Figure 1.3 Layout of Underground Development of New York City, USA[3]

Figure 1.4 Layout of Underground Development of Shinjuku, Japan[4]

2. Underground Commercial Areas in China

China's underground commercial areas have transformed from one with a very high

[3] Primary data from Shenzhen WorldUnion Properties

[4] Primary data from Shenzhen WorldUnion Properties

degree of government intervention into a more market-oriented system. Before the 1980s, the utilization of the underground areas in China mainly focused on civil air defense (He et al., 2012). During this period, civil air defense construction was mostly for combat readiness purposes, and commercial use was not encouraged. Especially in the 1960s and 1970s, the development of civil air defense engineering reached a peak due to tensions in international relations. Since the reform and opening-up, China's economy has been built on the principle of construction for peace, and the civil air defense projects have focused on combat readiness along with social and economic benefits, hence underground areas began to develop rapidly (Xi et al., 2005). Some original civil air defense project developments have been changed to commercial use, while some large underground commercial streets constructed as civil air defense projects have been adapted to combine peacetime and wartime use. At that time, the underground commercial layout in China was single purpose, the areas closed, and the environment quality poor as the country has not realized the importance of the development and utilization of underground commercial areas. Due to various reasons, this produced many uncontrolled and unreasonable phenomena.

In 2001, China's Ministry of Construction stipulated that underground projects should be based on the principle of "who invests, who owns, who benefits and who maintains", allowing construction units to self-operate underground projects in which they either invest and develop, or transfer and lease underground property under the law (Liu & Chen, 2015). At this stage, the government encouraged social capital to invest in underground development, and developers began to develop underground areas under the framework of civil air defense. The Renhe Group, as one of the most representative developers, began to invest and develop civil air defense projects and use them as underground shopping areas for business returns through leasing or transferring the right to operate shops and develop underground areas as garages to match residence (Lin, 2009). It should be noted that the basis of the property rights system at this stage had not been established and so the rights of underground areas were uncertain. Despite this, underground areas were being developed and utilized for the purpose of making a profit and formed as an operational asset.

With the further growth of urban space and commercial demand, commercial estates have become the focus of urban development. As an important part of commercial property, the development cost of underground commercial areas is relatively low (50% of the land transfer fee charged by aboveground commerce), and the space rights have become clear (the development and utilization of underground commercial areas should obtain the use rights of underground construction land, and the use rights of underground construction land should be paid for a specified term following the allocation conditions). During this period, the business operation prospects for underground commercial areas are favorable, and the value of the related development, utilization and operation is increasingly apparent. Unquestionably, the rise of underground commercial areas in China has given a new charm to city life and brought diversity and convenience to people's social activities, especially in combination with urban transportation. It preserves the historical value of cities and buildings above-ground and can use its unique safety and privacy features as an earthquake relief command centre when disasters occur, which significantly improve a city's comprehensive protection capabilities (Qian, 2012).

The evolution of underground commercial development in China is the result of reform of the national urban construction system and adjustment of urban underground development strategy. There is however a lack of strategic guiding ideology and scientific management for underground commercial development in China when compared with international standards (Chen, 2017; Liu & Chen, 2015; Wang et al., 2014; Wu, 2017). Figure 1.5 depicts the evolution of the underground development in China. It shows that the commercial value becomes apparent at stage 3 when the property rights of underground area use and facilities use are gradually clarified, with the market mechanism standardized and developed at stage 4.

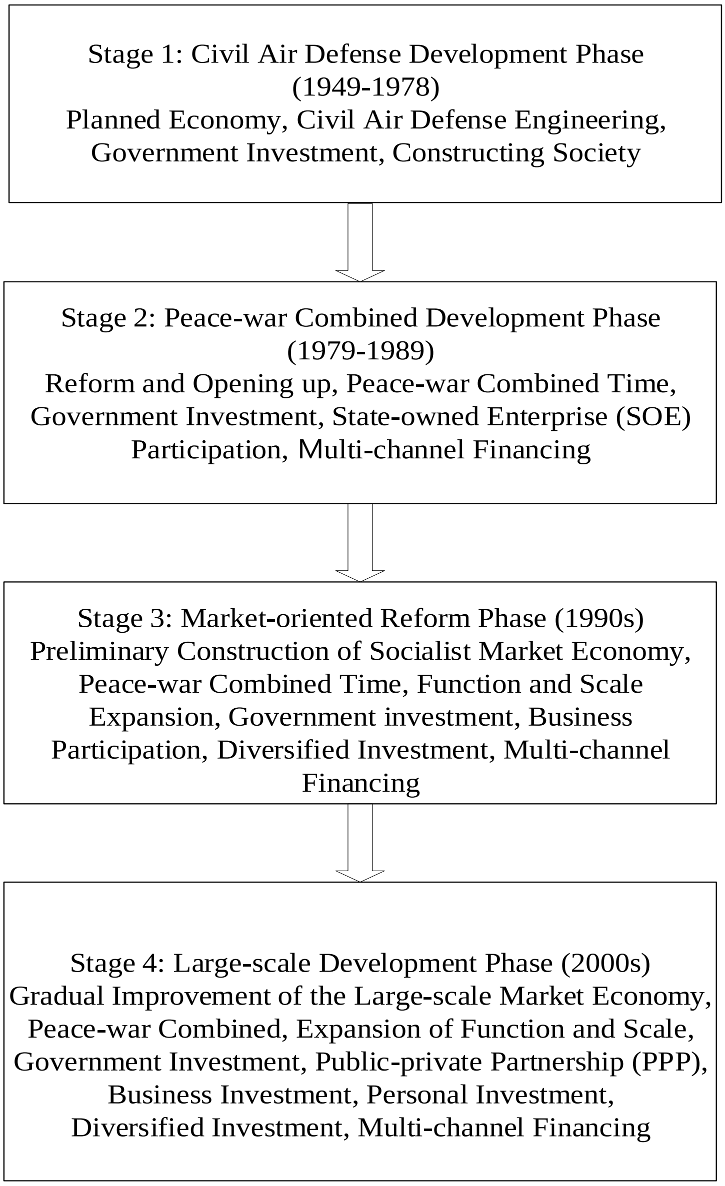

Figure 1.5 China Underground Development Evolution

1.3 Research Problems Statement

The development and utilization of underground commercial areas is characterized by high investment, high risk, high return, and irreversibility. Although most cities have developed and utilized underground commercial areas with varying degrees of success in China, there is still a lack of strategic guiding thought and effective management systems for underground commercial areas, especially from project developers.

The development and utilization of modern underground commercial areas is mainly for the purpose of operational profit. Therefore, market-oriented operations are required for most underground commercial projects, which are mostly developed by state-owned and private enterprises. In the process of project development, many stakeholders are involved, including local government, developers, operators, managers and users of underground commercial areas. To give full play to the role of the participants, mobilize their enthusiasm and promote the orderly development of underground commercial areas, modern underground commercial projects need to be developed taking strategy as the guiding ideology, and an effective strategic management system pertaining to project decision-making is required from developers. However, there has been little if any research into how this may be achieved.

Therefore, the core research questions that this thesis answers in order to ensure smooth project completion from the viewpoint of developers, are: What is the status of project development of underground commercial areas in China? How to explore and achieve the project objectives and aspirations of underground commercial areas? What are the strategic decision factors that need to be considered for developers of underground commercial areas? How to establish a strategic management model applicable to the project decision-making of underground commercial areas? What are the elements that make up the model, and how to identify and manage them? How to evaluate the established model and apply it to an actual project?

1.4 Research Aim and Objectives

The aim of the study was to develop a strategic management model to help developers improve the quality of decision-making for project lifecycle development of underground commercial areas.

The specific research objectives were:

1. To identify and analyse the strategic decision factors covering the project lifecycle development of underground commercial areas.
2. To establish a strategic management model to improve the quality of decision-making for project lifecycle development of underground commercial areas.
3. To evaluate the strategic management model by a case study.

1.5 Research Design

The research framework, illustrated in Figure 1.6, is designed to help manage the progress of the research. The three specific objectives are shown along with the corresponding methodologies and expected outcomes.

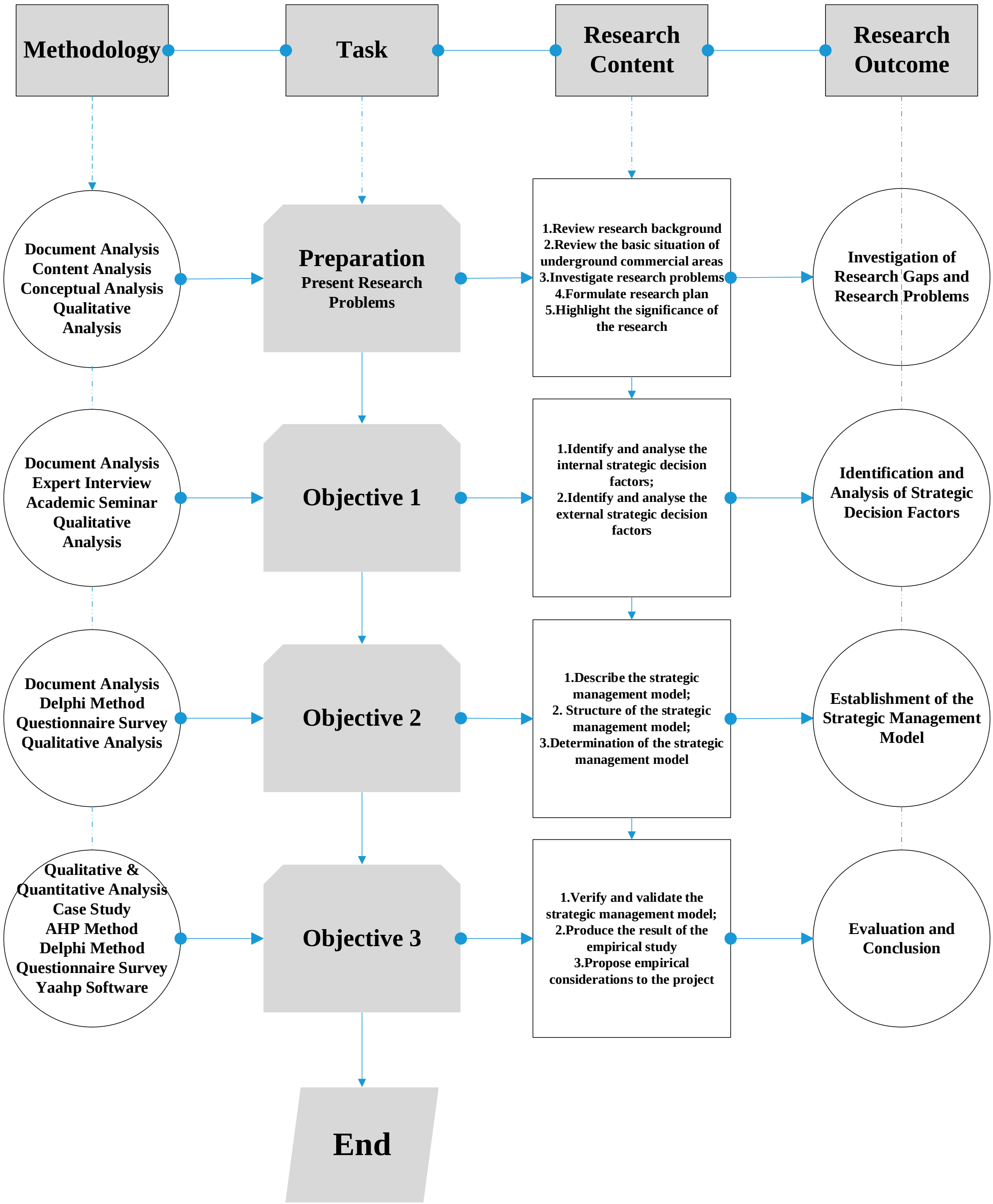

Figure 1.6 Research Flow

Preparation: Status review and research problems discovery.

Research content: (1) review the research background; (2) review the basic industry situation; (3) discover research problems; (4) formulate research plan; (5) ensure the significance of the research.

Methodology: Document analysis; Content analysis; Conceptual analysis; Qualitative analysis

This phase is mainly to provide an overview of the research topic, discover the research problems and ensure the significance of the research to future project development in underground commercial areas. Learning background knowledge from various documents, contents and concepts in the general research area lays a solid foundation for each step of the study.

Objective 1: To identify and analyse the strategic decision factors covering the project lifecycle development of underground commercial areas.

Research content: (1) identify and analyse the internal strategic decision factors; (2) identify and analyse the external strategic decision factors.

Methodology: Document analysis; Expert interview; Academic seminar; Qualitative analysis

This phase is mainly to identify and analyse the strategic decision factors covering the project lifecycle development of underground commercial areas based on the theoretical review results, including a special focus on influential factors, motivating factors and success factors, document analysis, and practical experience. The identification method of the strategic decision factors is confirmed through interviews with experts in the field.

Objective 2: To establish a strategic management model to improve the quality of decision-making for project lifecycle development of underground commercial areas.

Research content: (1) Composition of the strategic management model; (2) Structure of the strategic management model; (3) Determination of the strategic management model.

Methodology: Document analysis; Delphi method; Questionnaire survey; Qualitative analysis

This phase is mainly to establish a strategic management model underlying the strategic decision factors and consists of different layers. First, it describes the structure and boundary of the strategic management model. Second, it discusses the establishment of the strategic management model. Last, it presents the determination of the strategic management model. The strategic management model is assessed by Delphi method via a questionnaire survey.

Objective 3: To evaluate the strategic management model by a case study.

Research content: (1) Verify and validate the strategic management model; (2) Produce the result of empirical study; (3) Propose empirical considerations to project.

Methodology: Qualitative and quantitative analysis; Case study; AHP method; Delphi method; Questionnaire survey; Yaahp software

This phase is mainly to verify and validate the strategic management model by applying Yaahp software based on the AHP method for proposing weight analysis to a real-life project. The strategic management model is scored based on weight evaluation criteria for the strategic decision factors using the Delphi method via a questionnaire survey.

1.6 Significance of the Research

The outcomes of this research derived guidelines and methodologies for investing in the project development of underground commercial areas, such as undertakings for underground transportation and commercial complexes, which is significant for developers' project management strategies. The urban public at large has concerns on the project overrun and over budget of underground transportation and government construction projects of a complex nature. Therefore, the application of the strategic management model covering the project lifecycle development of underground commercial areas is the main contribution of this research.

Although research on underground commercial areas is not uncommon, there is a lack of in-depth study specifically on project decision-making related to underground commercial areas for developers. The outcomes of this study will improve the quality of decision-making for developers, which will facilitate project lifecycle development aimed at achieving project objectives and aspirations, and provide sustainable strategic advantage for effective development, utilization and management of underground commercial areas. The thesis will also make a significant contribution to research, teaching and learning in the Department of Building and Real Estate of The Hong Kong Polytechnic University, where this thesis is registered.

1.7 Structure of the Thesis

This thesis comprises seven chapters.

Chapter 1 presents an overall introduction highlighting the essential information of the research, including the research background, research problems statement, research aim and objectives, research significance, research design and thesis structure.

Chapter 2 presents a critical review of the literature related to the three special focuses of the thesis: the influential factors, motivational factors and success factors the project development of underground commercial areas. The knowledge gaps and research trends in this field of study are identified in order to justify the importance and significance of the research topic.

Chapter 3 presents the research methodologies adopted for the study. First, it discusses the research methods, followed by an explanation of the data collection methods employed in this study. The study's main analytical tool, the Yaahp software based on the AHP method, is also described in detail.

Chapter 4 presents the identification and analysis of the strategic decision factors covering the different stages of project lifecycle development of underground commercial areas. The strategic decision factors are the basis on which the strategic management model is established.

Chapter 5 presents the establishment of the strategic management model, which consists of the strategic objective layer, the primary decision-making layer, the secondary decision-making layer, and the tactical execution layer. The model is assessed through the Delphi method.

Chapter 6 presents the empirical study to evaluate the established strategic management model and a demonstration of its application. Yaahp software based on the AHP method as the main analytical tool is applied for model verification and validation by a case study. The strategic management model is scored based on the weight evaluation criteria for the strategic decision factors through the Delphi method.

Chapter 7 presents a conclusion to the thesis, including the main research findings and achievement of the research objectives. The research contribution to knowledge and industry are reviewed and highlighted, and the research limitation and future research direction are discussed.

1.8 Chapter Summary

This chapter provided an introduction to the research, which included the research background, research problems statement, research aim and objectives, research design, significance of the research, and thesis structure.

Chapter 2 Literature Review

2.1 Introduction

The study of underground areas of modern cities in China has gradually developed since 1949, during which time underground civil defense projects have been turned into functional complexes for use in peacetime and wartime. The development and utilization of China's urban underground areas were mostly simple civil air defense facilities before the 1980s. During this period, the underground layout of civil defense facilities were not incorporated into urban planning system and it was not closely connected with other activities, so the related theoretical research was scarcely studied, and there is little about underground commercial areas (Yu, 2012).

In the late 1980s, large-scale and diversified underground development began to emerge in some cities. Since the 1990s, China's large-scale urban construction has developed rapidly, creating ideal conditions and providing a golden opportunity for the development and utilization of underground areas, which laid a material and technical foundation for the development and utilization of underground commercial areas (Chen, 2016). However, due to government restriction, the academic research results and concrete data of underground development are often kept confidential and rarely entered into public databases (Li et al., 2016b).

The existing research methods for underground commercial areas include the Analytic Hierarchy Process (AHP) method and the Super-efficient Data Envelopment Analysis (SDEA) method, with most of them from the perspectives of cities (Wang, 2014; Yu, 2012). As China's underground commercial areas have transformed from one with a very high degree of government intervention into a more market-driven system, which is closely combined with civil air defense projects both in peacetime and wartime, the results and data of theoretical research and exploration on underground planning and architectural design are often kept confidential and rarely recorded into public data bases since it is highly classified information. Under these circumstances, the literature review research needs of this study were achieved in the following three ways: by studying the basic information of underground commercial areas; by studying underground projects; and by studying the project development of underground commercial areas.

This chapter first reviews the definition, classification, and value characteristics of underground commercial areas, including the development advantages and particularity of underground projects. It then summarises and analyses three special focuses in the literature on project development of underground commercial areas: influential factors, motivational factors, and success factors. Finally, the research gaps are identified.

2.2 Definition of Underground Commercial Areas

At present, there are no literary definitions of underground commercial areas. To define the topic of this study, the following definition combines document analysis, the results of interviews with experts in the field, and practical experience.

Underground commercial areas refer to areas below the surface developed and constructed according to commercial and market needs. It is an important part of urban underground areas and becomes a typical underground project, which should take into account economic benefits, social benefits, environmental benefits and combat readiness benefits. The scope of modern underground commercial areas has evolved from purely commercial to comprehensive underground complexes that include multiple urban functions and is interdependent with urban transportation, business, civil air defense and other facilities.

2.3 Classification of Underground Commercial Areas

2.3.1 Classification by Shape

By shape, underground commercial areas can be classified into dotted mode, linear mode, planar mode, mesh mode and complex mode (Gong, 2017; Wu, 2017).

Dotted mode: such as the single underground stores.

Linear mode: such as the single street developed along with underground commercial development.

Planar mode: such as the underground commercial areas developed in park square.

Mesh mode: such as the underground commercial areas developed in conditions of multiple street connections.

Complex mode: such as the underground commercial areas developed in the conditions of surface and aboveground buildings, streets, transportation hubs, intersections, etc.

2.3.2 Classification by Scale

By scale, underground commercial areas can be classified into small size mode, medium size mode, and large size mode (Yu, 2012).

Small size mode: under 3000 square meters, less than 50 shops.

Medium size mode: 3000-10000 square meters, 50-100 shops.

Large size mode: above 10000 square meters, more than 100 shops.

2.3.3 Classification by Structure

By structure, underground commercial areas can be classified into independently-built mode and dependently-built mode (Wu, 2017).

Independently built mode: the cost of developing independently built underground commercial areas dominated by large-scale or deep depth is the highest. According to relevant studies, the one-lump investment cost for developing and utilizing independently built underground commercial areas is typically 2 to 4 times or even 8 to 10 times that for aboveground with the same construction area (excluding land charge). Meanwhile, the energy consumed for running underground buildings is generally more than three times than aboveground when the internal environmental standard for underground buildings is at the same standard as aboveground buildings. Additionally, the cost of developing independently built underground commercial areas is extremely uncertain due to the complicated and diversified geological conditions of underground rocks and soil. It is also restricted by space such as whether appropriate entrances and relevant supporting facilities are available to meet the required conditions, so it is difficult to estimate and control construction cost, which leads to relatively high investment risk.

Dependently built mode: the cost of developing dependently built underground commercial areas is relatively lower than aboveground (no need for facade decoration), which is 25% lower than that of residential aboveground buildings. Furthermore, facility operation and maintenance cost can be significantly reduced by taking full advantage of traditional energy-saving designs. Especially, heating and cooling costs in underground buildings typically are 1/2 to 2/3 lower than those in traditional aboveground buildings of the same scale. The building maintenance cost can be greatly saved as the paint on underground buildings is confined to the inner surface without any rocks covering as there is no requirement of the roof and facade renovation every 10 to 15 years. Therefore, higher economic benefits can be achieved by developing operation-oriented underground commercial areas, in which transfer mode is advised to be adopted. Therefore, a majority of developers are only willing to invest and develop dependently built underground commercial areas connected with aboveground to follow the cost-benefit principle, aimed at reducing costs and gaining greater profits. In comparison, independently built underground complexes are rarely considered by developers as they are restricted by economic factors. Under the restriction conditions of economic factors, the development of underground commercial areas is restricted by local economic growth and the market price of real estate. The commercial development of underground commercial areas can be promoted only when the local economy reaches a certain level, and the price of real estate is higher than development costs.

2.3.4 Classification by Location

By location, underground commercial areas can be classified into central business district mode, sub-central business district mode, and streets mode (Gong, 2017; Yu, 2012).

Central business district mode: developed in the city's main business district, or the central business district, where the business density is relatively large and traffic is congested. This area usually has a strong demand for developing underground commercial areas. Many cities have developed underground commercial areas in central business district during construction or renovation, which both relieves traffic pressure and complements aboveground business.

Sub-central business district mode: in addition to the central business district in large cities, there are also underground commercial areas in sub-central business districts. Some cities develop underground commercial areas after development of the sub-central business district has matured.

Streets mode: developed in crowded streets or intersections along with underground passages and based on the commercial development of the underground passages.

Community category type: developed in order to make full use of community aboveground areas, such as residential or leisure areas.

2.3.5 Classification by Business Nature

By business nature, underground commercial areas can be classified into shop mode, commercial complex mode, and service integration mode (Gong, 2017).

Shop mode: this type of underground commercial area is usually directly related to the aboveground commercial areas, such as supplementing the aboveground commercial streets, the extension of aboveground commercial buildings, the commercial entity in the commercial needs of community residential buildings, etc.

Commercial complex mode: the underground commercial complex is the underground commercial entity which mainly meets the demand of shopping, combines dining, entertainment and other leisure activities, and is usually built in the leisure areas adjacent to the city's commercial centre. Most commercial complexes in modern cities are combined with transportation hubs and conduct business and accommodation activities.

Service integration mode: such an underground commercial entity is usually associated with service underground areas such as parking, catering, accommodation, etc.

2.3.6 Classification by Business Entity

By business entity, underground commercial areas can be classified into Government-oriented mode, market-oriented mode, and incomplete market-oriented mode (Yu et al., 2013; Yu, 2012).

Government-oriented mode: due to the needs of civil air defense construction, the basic system of underground commercial areas in China is initially government invested, constructed and operated. It was led by government in the early stage of transition to integrated commercial use, which led to single investment channels and low operating efficiency. Later, the government gradually realized the importance of its leading position in underground commercial areas by establishing relevant rules and regulations, which were established on two principles: to set up special management organization to regulate the planning and investment strategy of underground developments; to establish supporting policy systems for underground investment and financing, including the legal system, market regulations, and government management systems.

Market-oriented mode: in consideration of the further development of underground commercial areas, it is crucial to pursue market-oriented development and management mechanisms instead of relying on government investment alone. Therefore, reducing the input of government investment in a field where market mechanisms play a role, could help government separate itself from private developers of underground commercial areas and become instructor and coordinator of private capital investments. Incomplete market-oriented mode: the market mechanism of underground development and utilization includes developing underground commercial areas to meet market needs and optimize the mode of the wholly government-oriented approach. At present, cities in developed countries around the world have realized the marketization and industrialization of urban underground commercial development and utilization. Such cities have established strong municipal government agencies to regulate and manage underground commercial areas and implement management systems as joint venture cooperation between government and private capital, so as to form a stable source of funding for underground commercial developments.

2.4 Value Characteristics of Underground Projects

2.4.1 Development Advantages

As a supplement to the function of aboveground development, underground projects are the continuation of urban space, and also one of the most frequently used public areas in urban space (Chen, 2017; Wu, 2017). The advantages of developing underground projects are as follows:

1. Underground projects have the advantages of warm in winter and cool in summer, which can save energy for air conditioning systems compared with the aboveground buildings, especially in long-term use (Shao, 2016).
2. Historical and cultural cities have received many restrictions on the development of

urban commercial development due to a large number of historical and cultural protection orders. Developing underground projects can effectively use land resources and ease the contradiction between urban development and cultural protection (Zhang & Chen, 2012).

3. As underground projects are close to aboveground developments, it has excellent commercial development potential as long as the areas are properly designed and people can be effectively imported through a flow of passengers and a combination of the urban overground and underground traffic system (Shao, 2016).
4. It is a strategic consideration for China's national security that underground areas are safe, stable and meet the requirement of combining peacetime and wartime use (Chen, 2017; Wang, 1995; Wang et al., 1995).

2.4.2 Development Particularity

Underground projects are not disturbed by the outside climate or environment, it is not subject to stringent natural environmental controls, and benefits the natural environment by improving the flow of surface traffic (Shao, 2016). Compared to aboveground projects, underground projects have the following peculiarities:

1. Unlike aboveground developments where large spaces are available, a variety of urban facilities and transport are required to be organically integrated for extensively developing underground projects, thus imposing varying effects on surrounding commercial, civil, public and industrial buildings. Underground projects will facilitate people's daily life and especially make it possible for the sustainable development of urban environments with geographic advantages. For

example, underground rails and passages will significantly improve the economic value of land and buildings in surrounding areas or along rail lines (Guo et al., 2011).

2. The construction of underground projects is more limited than those aboveground. Many factors such as geological features and groundwater have to be considered before construction. Underground projects cannot be simply disassembled, changed or expanded without limit. The scope available for underground areas is continuously decreasing with urban construction and development. Therefore, it is extremely important to make a reasonable and farsighted construction plan for underground projects, which should be coordinated with the sustainable development of the city (Wu et al., 2010).
3. As the construction cost of underground projects is much higher than that of aboveground buildings under the same conditions, to meet the requirements on function and safety, the overall scope of underground projects is less than that for aboveground projects due to its architectural features. Additionally, people's inherent concept and requirements on accessibility is the main reason why the commercial investment risk for underground projects is far higher than that for aboveground projects, so investors are advised to be adequately prepared (Shao, 2016).
4. It is almost impossible to transform underground projects that have been completed into a different form of architecture for meeting new development requirements by changing its structure and function (Cai et al., 2006). Hence, scientific and comprehensive positioning and full consideration of future developments is crucial

to the operation and future development of underground projects (Chen, 2017).

2.5 Special Focuses of Project Development

The project development of underground commercial areas is an organic part of modern urban construction (Chen, 2015b). As a particular social practice, it features special focuses just as anything else does. By correctly understanding and capturing the special focuses of the project development of underground commercial areas following the influential factors, motivational factors and success factors, such particular practices can become more rational and achieve sustainable and effective development, utilization and management of underground commercial areas appropriate for project decision-making of underground commercial areas (Chen, 2017; Wang, 2017; Wu, 2017) (See Appendix I).

The special focuses on the influential factors, motivational factors and success factors of the project development of underground commercial areas are reviewed and summarised in this chapter. This is achieved by analysing the current research findings of underground commercial areas, comprehensively studying the literature and analysing the essential relations among them in the view of the development practice of underground commercial areas.

2.5.1 Influential Factors

The project development of underground commercial areas is jointly affected by various factors. These factors are not isolated but are mutually interactive and restrictive, forming a complex integrated system (Chen, 2018; Yu, 2012; Zhang, 2009). The analysis of the influential factors of the project development of underground commercial areas can make the development and utilization of underground commercial areas more scientific, reasonable and effective.

1. Economic Level

Cost and benefits are primary factors for developers to consider when developing underground commercial areas. Only when benefits and income exceed costs and expenditure will developers consider developing and utilizing underground commercial areas (He et al., 2012). Therefore, economic factors are the fundamental influential factor preventing developers from developing underground commercial areas and the ultimate purpose for developers to make an investment in developing underground commercial areas is to obtain maximum economic profit while minimizing the total expenditure anticipated during development (including all expenditures and the interests required for raising these funds during the entire development period) (Chen et al., 2005; Zhao & Jiang, 2013). Furthermore, as it is difficult and costly to develop underground commercial areas, and the capital value or expected sales price of the projected developed and owned by investors is a quota to some extent after the project is accomplished, the right-of-use price of underground commercial areas is much lower than that of aboveground areas (He et al., 2012).

As mentioned, the one-lump investment cost for underground projects is higher than that for aboveground projects under the same construction standards. Therefore, economic strength is a fundamental condition for developing underground commercial areas. However, underground commercial areas should be developed based on the special characteristics and conditions in China (Chen et al., 2005; Xiao et al., 2016).

For first-tier cities in China like Beijing, Shanghai, Guangzhou and Shenzhen where underground commercial areas of a certain scale have been developed and utilized, they comprehensively developed underground commercial areas when their GDP per capita was 800 US dollars to 1,000 US dollars, and rapidly developed and utilized underground commercial areas when their GDP per capita was around 5,000 US dollars. Massive underground complexes with multifunctional and technically complicated underground buildings are being constructed. However, influenced by urban size, second-tier and third-tier cities only start to develop underground commercial areas when their GDP per capita was 3,000 US dollars to 5,000 US dollars (Cadena et al., 2012; Chen, 2016; Xu & Shao, 2015; Yu, 2012).

2. Urban Size

Economic development is inevitably associated with the sustainable growth of urban size. The urban agglomeration capacity improves synchronously as urban economic aggregate increases (Chen, 2015a; Gu et al., 2017; Liu, 2009). A variety of issues gradually emerge as urban size continuously becomes larger. “Urban syndrome” starts to prevent cities from being further expanded (Chen et al., 2005; Ma, 2007; Monnikhof et al., 1998; Sun, 2013; Xi, 2006; Xu & Shao, 2015). Driven by agglomeration benefits, population and industries are increasingly concentrated in central urban areas, thus further intensifying the pressure on urban space capacity (Bobylev, 2009; Chen, 1997; Shi et al., 2013; Wang, 2006; Wang, 2015). And motivated by economic benefits, developers prefer to develop estate projects featuring high building density and large plot ratio in central urban areas where land charges are quite high, thus further stimulating population and traffic flow to be concentrated in central urban areas and causing infrastructure and space burdens to continuously increase (Gu et al., 2017; Yu, 2012). Meanwhile, continuously strong functions in central urban areas make it impossible for traditional traffic mode to bear the gathering and evacuation of a large number of people (Chen, 2018; Shen et al., 2008; Yang et al., 2010a). In addition, coupled with complicated and chaotic road traffic flow, urban traffic congestion becomes even more serious, and reconstructed old cities increase the number of modern high-rise buildings and elevated roads that replace traditional historic blocks and cultural relics. The urban context is thus destroyed by "modern civilization" (Chen et al., 2005; Ma, 2007; Wang & Chen, 2005; Wang, 2015; Xu & Shao, 2015). Developing underground commercial areas will become a major way of effectively alleviating the contradictions in urban development because underground commercial areas optimize urban space while further improving the agglomeration benefits and maintaining the sustainable development of cities (Jiang & Chen, 2006; Sun, 2013).

3. Underground Rail Transit

(1) The Interactive Relationship between Underground Rail Transit and Urban Construction Layout

Underground rail transit systems in China's cities gradually developed with urban expansion and the increase in demand for improved urban public transport (Li, 2008; Li et al., 2016a; Lu, 1998; Ren, 2014; Song, 2012; Zhang, 2009). The distribution of the functional construction of urban blocks should be considered when planning rail transit and selecting route directions (Chen et al., 2015; Guan & Qiao, 2013); urban construction is affected by rail transit routes and planned routes to varying extents. The mutual interaction and influences display a pattern in which urban construction is mainly concentrated in areas near rail transit systems (Chen et al., 2007; Jia et al., 2011; Sun, 2013). Urban construction is more highly concentrated along rail transit systems (the density of urban construction is also simultaneously affected by many factors, such as policy orientation and environment), indicating that the traffic benefits of underground rail transit and higher land charges along rail transit routes play an important role in guiding the distribution of urban construction and the intensity of land use (Hou, 2008; Jiang & Chen, 2006; Li, 2008; Liu & Qiu, 2014). By contrast, intensified land use will inevitably result in higher population density, which will need to be supported by underground rail transit systems to ensure accessibility and convenient traffic flow (Fei, 2011; Li et al., 2014; Tong, 2009). Figure 2.1 shows the integrated development of underground rail transit and urban development.

Figure 2.1 Integrated Development of Underground Rail Transit and Urban Development[5]

[5] Primary data from Shenzhen WorldUnion Properties

(2) The Relationship between Underground Rail Transit and the Functional Distribution of Urban Land

A large number of people are concentrated in large cities along with economic development, but the population in urban residential areas requires convenient transport for commuting (Ren, 2014; Xie, 2009). The underground rail transit can satisfy people's demands for punctual and convenient traffic as it is fast and free from being disturbed by other factors, and its traffic volume is high (Chen et al., 2005; Luo, 2008; Zhang & Chen, 2011). Therefore, a large number of high-rise residential buildings can be found near rail transit stations, and large residential properties can be seen near rail transit stations in urban sub-centres and the transfer to different traffic modes near the terminal stations of underground rail transit, thus forming satellite towns in large cities (Li, 2008; Li, 2011; Liu, 2009). People have high expectations of underground rail transit, such as convenience and punctuality during their daily commuting between residential areas and office areas (Gu et al., 2017; Jiang & Chen, 2006; Ren, 2014). Residential areas are likely to be established in urban sub-centres and fringe areas as the land charge in central urban areas continues to increase (Gu et al., 2017; Luo, 2008). Underground rail transit reduces the spatial and temporal distance between major functional areas of cities while effectively meeting people's demands for high-volume, punctual and convenient traffic with fixed stations at short intervals; this stimulating urban office areas to be concentrated near rail transit routes. Office areas are more concentrated in rail transit stations as the transfer of traffic modes is not required (Li et al., 2014; Su, 2012).

(3) The Relationship between Underground Rail Transit and Land Charge in Urban Areas

The land price depends on rent, which depends on land location, and land location depends on land accessibility (Ding, 2007; Huang, 2002). Underground rail transit can effectively increase the land value along with the rail transit systems due to its convenience and large traffic capacity (Jiang & Chen, 2006; Yang, 2011). This effect is more obvious in rail transit stations, especially in large transfer hubs (Li et al., 2016a). The main reasons are as follows:

First, underground rail transit provides easier accessibility to the land along the route, thus improving local traffic conditions and stimulating local development (Gu et al., 2017).

Second, underground rail transit shortens the spatial and temporal distance between the land along the route and central urban areas, effectively reducing time and cost for accessing central urban areas (Chen et al., 2005; Li et al., 2016a).

Third, underground rail transit makes it possible for planning, adjusting and changing the nature of using the land along the route and for the value appreciation of the land along the route (Jiang & Chen, 2006; Yang, 2011).

Fourth, underground rail transit enhances the mutual relations between the land along the route, improves the complementary effect of the land so that the land along the route becomes an organic whole for mutual relations and support, and the increased range of the value of adjacent land masses are expanded (Fei, 2011; Huang et al., 2013).

Fifth, underground rail transit stations and large transfer hubs are characterized by extremely high volumes of human traffic, where the excellent business atmosphere is likely to be formulated to further increase the rent and price of stations and those of the land in nearby areas (Su, 2012).

Therefore, the value of urban land along the subway rail transit may change in a pattern, as shown in the above schematic diagram if the effect of rail transit is only considered. The land value in the valid radiation scope of each station decreases inversely with the direction of increasing distance while that beyond the radiation scope basically keeps unchanged (Gu et al., 2017).

2.5.2 Motivational Factors

Motivation can be defined as what gets one to act (Schater et al., 2011). The project development of underground commercial areas is basically motivated by the multi-layer incremental effect and the needs of a market that can be produced on the premise of the coordinated development between underground and aboveground areas and the growth of market demand so that underground commercial areas can be developed more reasonably and generate multiple benefits (Yu, 2012; Zhao & Chen, 2004).

1. Incremental Effect

Incremental Effect is the effect of multiple factors acting together that is greater than the sum of the original single factors, and it is popularly known as “1+1>2”. The incremental effect of the coordinated development between aboveground and underground areas embodies the economically intensive development of the cities (Fei, 2011; Sun, 2013; Xi, 2006; Xu, 2014; Zhao, 2012). Only when the coordinated development between aboveground and underground areas is achieved can their functions be mutually supplemented, thus generating the effect increased by geometrical times and promoting the overall development of the cities (Lyu, 1992; Sun, 2013; Yang et al., 2014; Zhan, 2010).

By taking the interaction between subway transfer hubs and aboveground property development as an example, the coordinated development between underground transfer hubs and a variety of aboveground functions, among a large number of domestic and overseas success stories, can trigger the rapid growth of multiple benefits (Chen, 2018; Jiang & Chen, 2006). Figure 2.2 shows the internal mechanism of an underground commercial development. The development and utilization of subway and aboveground land can be mutually promoted by constructing subway hubs with efficient transfer capacity, and the economic and social benefits of subway rapidly increase, thus not only increasing regional accessibility but also attracting a large number of visitors (Cao & Shi, 2014; Wang et al., 2006). The concentrated population expands the scale of market demand, reduces the threshold of business development, and significantly increases the value of the land around stations and along the route so that considerable returns are achieved from land development (Fei, 2011; Xiao et al., 2008; Zhao & Jiang, 2013).

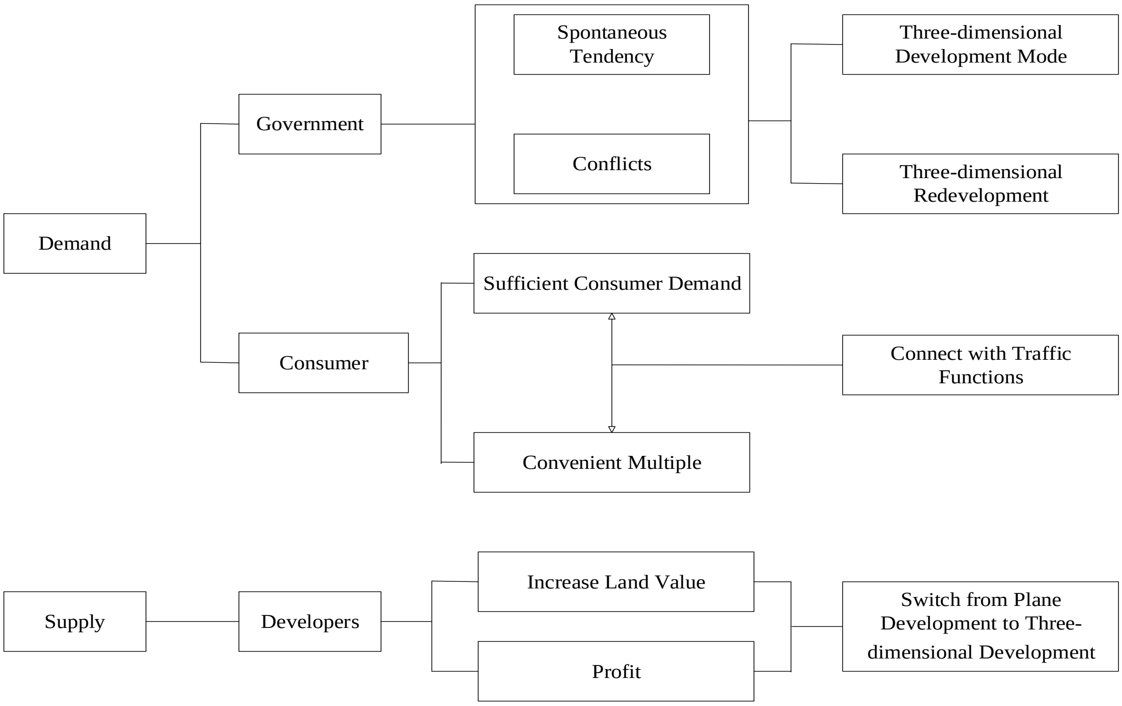

Figure 2.2 Internal Mechanism of Underground Commercial Development

Different underground commercial areas can be connected under subway hub stations, thus turning them into large underground commercial facilities and making it easier for citizens to go shopping and travel around (Li et al., 2016a; Su, 2012). For example, an underground floor in Hounslow, west London in the UK continuously expands to horizontally connect many business centres, thus forming a huge underground commercial complex.

The business facilities developed on one side or both sides of underground crossing roads increase the economic value of underground areas while expanding the social benefit of aboveground areas (Zhou et al., 2014). If urban road crossings and underground areas of subway hub stations are used for commercial development, some areas can provide a variety of commercial activities for pedestrians and relieve the tension of pedestrian traffic on the ground so that more aboveground public areas can be used for constructing urban landscapes (Zhu & Wang, 2013). While taking full advantage of underground commercial areas, it is important to consider commercial projects both underground and aboveground and make reasonable vertical traffic layout so that human traffic can be diverted both vertically and horizontally between underground commercial areas and aboveground commercial areas (Li et al., 2016a).

2. Market Motivation

The inherent market motivation of underground commercial projects can be analysed from the perspectives of demand and supply (Yu, 2012). From the perspective of demand, government sectors and departments are required to update and renovate cities or re-develop cities and formulate a three-dimensional re-development or a three-dimensional urban development mode so that a variety of inevitable and irreconcilable contradictions in the traditional urban development mode can be resolved (Chen, 2018; Shi et al., 2013). Plans for developing underground commercial projects in China have already been launched or are being made in some major cities (Yuan et al., 2013). With the continuously increasing urban income per capita and growing consumption capacity, underground areas of different types can provide diversified consumption environment and efficient consumption modes sufficient to meet consumer demands, and underground traffic connection is more easily accepted by people in modern society (Un, 2016; Zhou et al., 2014).

From the perspective of supply, as developers attempt to maximize the use and value of land with the aim of reaping greater profits, so underground commercial areas have become a new battlefield for developers to pursue extra profits. Take Guangzhou City as an example, a number of prosperous commercial areas are likely to be further developed underground. Guangzhou plans to develop about 90 million square meters of underground areas within the city, among which underground commercial districts will be about 8 million square meters. The target is 5 square meters per capita, just the same as Beijing and Shanghai, with a yearly growth rate of 28%.

2.5.3 Success Factors

The success of underground commercial areas is critically important for urban development and stakeholders cooperation, given that the role played by the underground commercial areas has no immediate or direct substitute (Chen, 2017). Like other industries, underground commercial areas are confronted with traditional and new challenges, which require developers to seek improvements through investigating the success factors associated with the performance standards of project development in order to stay competitive. Numerous studies have identified these success factors as being the following:

1. Combining with Urban Agglomeration and Expansion

Sustainable development is the aim of all city planning experts (Wang & Chen, 2005). The project development of underground commercial areas needs to consider the trend of the agglomeration effect as well as the three-dimensional and intensive development of modern cities. This reveals the inherent relation between urban development and underground commercial development and demonstrates that the dialectic relation of project development of underground commercial areas and urban development are interdependent (Chen, 2015b; Luo et al., 2007; Ren, 2014; Xu, 2010). Understanding and capturing the project development of underground commercial areas combined with urban agglomeration and expansion is of great significance to provide references for the development, utilization and management of underground commercial areas.

While bringing substantial advantages to cities, urban concentration causes a lot of issues for urban development (Jia, 2018; Qian, 2007; Shao, 2014a). In particular, highly concentrated urban populations result in spatial crisis since traditional areas in cities are developed mainly by horizontally extending urban land and expanding urban space capacity (Chen, 2018; Ren, 2014). However, such a mode of extensive development can no longer meet the requirements of urban development in a modern society faced with population, environment and resource crises, as well the accelerated pace of production and life. Especially, cities cannot be expanded without restrictions because the land for urban development is very limited and land resources are insufficient (Huang et al., 2013; Qiu, 2006; Yu & Lu, 1998). Urban functions are becoming more and more closely linked, the flow and exchange scale and speed for people, things, energy, and information are increasingly demanding. Meeting the functional demands for expanding urban space capacity and achieving high efficiency and low energy consumption caused by population growth and economic development, urban development needs to be intensive (Yang, 2010; Zhang et al., 2007). The development mode in which the demand for urban space capacity is satisfied by merely expanding the scale of urban land needs to be transformed into one in which upper and lower urban space is comprehensively and efficiently developed and the three-dimensional development of urban space is achieved by deeply exploiting limited urban land (Gu et al., 2017). Meanwhile, it is necessary to replace or introduce new urban functional space and adjust the organizational structure and pattern of urban space through the three-dimensional redevelopment of urban space and reasonable reallocation of urban space and functions to improve the operation efficiency of urban space, promote efficient development and utilization of urban space and give play to the advantages of urban concentration. Therefore, it is an inevitable trend to comprehensively improve the utilization efficiency of urban space to achieve three-dimensional and intensive development (Chen, 2018; Chen, 2015a; Wang, 1995).

Excessively concentrated high-rise buildings result in the rapid deterioration of urban environments, and densely allocated elevated roads have a negative impact on urban environments and the landscape (Gu et al., 2017). The space available for human life on the earth's land surface is limited (Chen et al., 2015). When the height and density of buildings in cities cannot be expanded upward due to a variety of factors, the advantages and potentials of underground areas in expanding urban space capacity are gradually realized (Chen, 2018). It is inevitable for humans to acquire land and space from underground to achieve urban development. Practice indicates that it is the most effective way to improve the efficiency of land utilization, save land resources, alleviate the high density of urban areas, divert people flow and traffic flow, control traffic, expand infrastructure capacity, increase urban land, protect historical and cultural landscapes, reduce environmental pollution, improve urban ecology, and enhance the overall ability of cities to combat natural disasters (Gou et al., 2012).

Developing underground commercial areas is a modern type of land resource use method for urban development and construction. Featuring huge and feasible development potentials, it meets some demands for space that cannot be met aboveground for intensive urban development (Chen, 2018; Yu, 2012). It is necessary to develop and utilize resources from underground areas rationally. The exact purpose of efficiently utilizing underground resources is to expand urban space capacity, strengthen urban functions and improve urban life quality, and to satisfy the demand for intensive urban development. Therefore, for effective development, utilization and management of underground resources, only by considering the global situation of urban development and construction, getting adjusted to the demand for the three-dimensional and intensive urban development and serving the overall interests of urban development and construction can its general objective be realized (Chen, 2018; Yu, 2012).

2. Coordinating with Aboveground Areas

The project development of underground commercial areas is an integral part of overall urban development and construction (Fei, 2011; Li et al., 2016b). Understanding and capturing the coordinated development of aboveground and underground is of great significance to expand urban aboveground areas and supplement surface areas capacity. However, not only spatial demands need to be satisfied, but overall urban functions should be strengthened during urban development. Urban environmental issues cannot be resolved by simply expanding space capacity. Instead, unified and coordinated development of aboveground and underground areas must be achieved (Cao & Feng, 2013; Wang, 1988).

Developing underground commercial areas should be an organic part of overall urban planning and development. It is incorrect to regard underground commercial areas as an isolated area from aboveground. The coordination between underground and aboveground means that underground commercial areas are developed to adapt to the spatial environment and aboveground architecture, in terms of regional location, spatial environment, functional category, construction scale (construction area, targeted depth and number of floors), development progress and architectural technology (including structure and construction), and achieving overall coordination and mutual benefits (Yu, 2012; Zhao & Chen, 2004).

To achieve a balanced and reasonable allocation of the aboveground and underground areas scales of cities and formulate a system and regional coordinated relations, it is important to make sure that the morphological distribution and functional settings of the points, lines and surfaces of the aboveground and underground areas correspond to and relate to each other. They should be perfectly connected so as to formulate an organic and integrated urban space network with reasonable structure and convenient transport. There should be overall efficiency of urban space with the goal of achieving the purpose of effectively enhancing overall urban functions and improving the overall urban environment, as well as enabling development projects for underground commercial areas to maximize social, environmental and economic benefits (Chen, 2018; Lan & Chen, 2016).

For instance, in terms of regional location, spatial layout and functional category of underground commercial areas, it is suggested to build and connect basements in central business districts by combing with a large number of high-rise buildings and develop a multi-functional underground building complex that integrates business, trade, shopping, entertainment and parking services, as well as transport and municipal infrastructure (Liu et al., 2017; Xiao et al., 2009; Zhang & Chen, 2011). The open aboveground areas can be reserved, green areas can be expanded, and land can be efficiently utilized if parking lots, walkways, shopping malls and recreational facilities are constructed under the central square and recreational areas in front of the station (Ma, 2007; Wang et al., 2016; Zhu & Hu, 2000). It is advised to develop underground commercial areas and build underground parking lots and supporting facilities such as commercial service buildings, heat exchange stations, gas stations and water pump houses just in case residential areas experience severe shortages (Liu et al., 2017). It is also advised to develop underground commercial areas, which play a unique role in protecting traditional landscape and nature by efficiently utilizing land and strengthening urban functions in case the number of floors, density and functional nature of aboveground buildings are restricted in order to preserve historic buildings, traditional features, cultural relics, historical sites, and natural resorts (Fei, 2011; Wang et al., 2016).

3. Adapting Multi-function and Environment

The environment is the sum of external conditions that include human beings and have various influences on their lives and activities (Encyclopadia Britannica, 2006). The environmental characteristics of underground commercial areas are objective, the functional areas of underground buildings are selective, and the environmental characteristics of underground areas need to be adapted (Chen et al., 2005; Zhao &

Zhang, 2018). Understanding and capturing the inherent relations between the environmental characteristics of underground commercial areas and the functions of underground buildings is of great significance for reasonably determining the functional categories of buildings and ensuring the efficient utilization of underground area resources during underground district developments. It should also ensure the applicability and economic efficiency of the functional environment of underground buildings to enhance the overall urban functions.

Underground commercial areas are developed in cities with the basic aim of giving play to certain underground business functions by taking advantage of underground commercial areas. Functional adaptability means that it is crucial to develop underground areas under the guidance of overall planning and based on its natural characteristics during project demonstration and design so that the functional categories of the underground buildings to be constructed adapt to the natural advantages of underground areas and avoid its disadvantages (such as insufficient natural light, lack of sunlight, limited natural ventilation and closed space); in other words, to make the best use of functions with minimum costs (Shao, 2014a).

The underground commercial areas are abundant in the functions of urban buildings, which, however, should be distinguished based on the principle of functional adaptability. It is always advised to specifically analyse what functions should be established aboveground and what functions should be established underground to better adapt to the underground environment (Chen, 2011; Shao, 2014a). In terms of building environment and functional characteristics, underground areas are characterized by stable temperature (heat preservation and insulation), isolation (anti-dust, anti-noise, shock absorption and shading), protective property, and excellent shock resistance (Wang & Xu, 2013). Underground buildings enjoy a preferential advantage in collecting heat and conserving energy, resisting earthquakes and hurricanes, offering protection during wartime, protecting natural landscape and historic views above-ground and expanding aboveground buildings and traffic, especially in areas suffering harsh natural climates such as freezing temperature, strong wind, heavy snow or scorching heat (Li et al., 2013; Xi et al., 2005).

Hence, it is necessary and reasonable (or adaptable) for many aboveground building functions to be relocated under-ground when aboveground areas are in severe shortage. The categories of such aboveground building functions mainly include: (1) where sunshine is not required or demanded; (2) where artificial lighting, mechanical ventilation and air conditioners are required in daytime even in aboveground areas; (3) where a few professional staff or no staff will have access; (4) where a large number of staff need to access but stay for a short time only; (5) where special protection measures are required; (6) the functions that need to be isolated from crowds or public environment; and (7) the functions finding it challenging to adapt to harsh natural climate aboveground (Shao, 2014b; Wang et al., 2014; Xu et al., 2016; Yu, 2012; Zheng & Luo, 2010).

In conclusion, functional adaptability is one of the basic conditions of establishing underground area development projects. Further quantitative research can be conducted by applying the analytic hierarchy process to compare the above mentioned functional area models with a variety of factors related to the adaptability of underground districts (such as physical factors, physiological factors, psychological factors, environmental factors, social factors, etc.) to determine its weight, system analysis, comprehensive quantitative evaluation, and adaptability order so as to provide references for the demonstration and optimization analysis of underground district development and construction (Chen, 2018; Xu et al., 2016).

4. Balancing Urban Ecosystems

As an organic part of urban development and construction, the project development of underground commercial areas needs to play a unique role in protecting the ecological environment and promoting the sustainable development of cities (Chen et al., 2005; Li, 2008; Zhao & Zhang, 2018). Understanding and capturing the necessary relation between developing underground commercial areas and maintaining the ecological balance of urban environments is of great significance to better give play to the role and advantage of underground commercial areas in improving urban ecological environments and promoting its own sound and sustainable development.

Ideally, a city is developed to be green and ecological in the future. The objective is to create a living environment for humans featuring harmonious coexistence between humans and nature, the coordinated development between society, economy and natural environment as well as favourable ecological circulation (Li, 2008; Ma, 2007; Xu et al., 1999; Zhuang et al., 2003). Therefore, it is particularly important to rationally develop and utilize underground resources and give full play to the role of underground commercial areas in improving ecological environments and promoting sustainable urban development, which is mainly demonstrated in the following aspects.

First, rationally develop and utilize underground resources to expand urban capacity, stimulate the three-dimensional and intensive development of underground areas, improve the utilization efficiency of urban land, save land resources, and reasonably restrict urban extension to further effectively protect farmlands and natural forests and maintain ecological environments (Li, 2008; Shen et al., 2009).

Second, make full use of the open aboveground areas for landscaping, highlight the integrated development of underground commercial areas and urban green areas, increase landscaping areas and green coverage ratios, enhance the cities' natural and ecological adjustment ability, and improve urban landscaping quality during the development and exploitation of underground commercial areas, striving to achieve a harmony between the artificial environment and natural environment (Tong et al., 2016).

Third, give full play to the role of underground commercial areas in preventing environmental pollution such as developing and using underground traffic areas and converting the vehicular circulation system aboveground that causes environmental pollution to underground areas (Wang & Xu, 2013).

Fourth, give full play to the advantages of underground commercial areas in conserving energy and utilizing renewable clean energy such as taking advantage of the thermal stability, large capacity and excellent ability to resist high temperatures, high pressure and low temperatures of deep underground areas (Zhou & Huang, 2013).

Fifth, project development and environmental protection are equally important. It is necessary to minimize the negative impact of large-scale development of underground commercial areas on the ecological environment. The project's environmental benefits should be strictly and scientifically evaluated from overall planning to specific plans and the demonstration of specific project items (Luo et al., 2007). The development scope, type and mode as well as development scale and capacity should be reasonably determined. Additionally, the policies, laws and regulations, as well as the technical standards of controlling the impact of underground areas development on the environment (such as stabilizing stratum, protecting underground water systems, neighboring architectural environments, natural plants and landscape, etc.), should be formulated and improved (Yu, 2012). It is important to minimize environmental disturbance and pollution and reduce energy consumption in the process of geological prospecting, engineering design and construction of underground projects, especially of large-scale development of underground projects. The efficient, energy saving, material saving and environmentally-friendly underground areas structure, building materials, construction equipment as well as construction technology and management mode should also be studied, developed and vigorously promoted (Zhou & Huang, 2013).

5. Achieving Multiple Benefits

The value of achieving multiple benefits needs to be followed for developing underground commercial areas (Hu & Liang, 2015; Zheng & Luo, 2010). Understanding and capturing the inherent relations between underground commercial development and economic benefits as well as between social benefits and environmental benefits is of great significance to the development and utilization of underground commercial areas as an objective demand for rapidly developing urban economies and expanding urban space capacity. Land is a carrier of urban space. Urban intensification makes it possible to continuously increase urban benefit and value while constantly exploring land potentials and improving the use-value of land. The market price of land mirrors its use-value, which is mainly governed by objective economic laws but also by other factors such as government's land policy and speculation in the land market, etc. (Luo et al., 2007; Xu et al., 2016). As mentioned, the construction price of public buildings underground is 2 to 4 times that of public buildings of the same type and the same size aboveground. If the environmental standards inside buildings underground are not lower than those aboveground, its energy consumption will be three times higher. Hence, the use-value of underground areas will be fully revealed when no excessive land is available for development and utilization aboveground or land price aboveground is excessively high, and no land charge needs to be paid for developing and utilizing a certain depth of underground areas (Xu et al., 2016). The total cost of developing and utilizing underground buildings may be lower than that of aboveground buildings (land charge included), so it will be more appealing with remarkable economic benefits (Luo et al., 2007). And it is of great significance to give full play to the use-value of underground areas, mobilize the enthusiasm of developing underground areas and promote underground commercial development. It is also important to realize from the law of development value of underground commercial areas that it will involve complicated construction technologies, difficult construction projects, high unit area building cost, great project investment and long construction cycle. It is therefore particularly important to conduct economic assessment and prediction targeting at optimal cost-effectiveness. A feasibility study and an evaluation before deciding to develop underground commercial areas should warrant careful investigation, rigorous demonstration and objective prediction and assessment of economic factors. This should include the input and output of the project to be developed by adopting modern investment economic analysis methods and means so as to identify the best solution and maximize the cost-effectiveness of the investment (Hu & Liang, 2015; Luo et al., 2007). Among them, the critical factors affecting investment and benefits including project site selection, nature of use, functional category, construction scale, architectural standards, structure and pattern, spatial layout, equipment and facilities, protection standards, construction technologies and post-construction operations should be cautiously demonstrated (Yu, 2012). While considering the benefits of underground commercial areas, particular importance should be attached to the land price in the place where the project is located, the investment environment of aboveground buildings and rate of return on investment as well as the long-term influence of aboveground environmental conditions on the value and benefits of developing underground areas, and special factors such as the benefits of underground areas for aboveground environmental and combat readiness benefits (Hu & Liang, 2015; Luo et al., 2007).

Therefore, understanding and capturing the law of developing and utilizing underground commercial areas is of great significance to scientifically and rationally formulating the policies and regulations concerning the technology and economy of underground commercial areas, guide investment orientation and standardize investment behaviours to ensure the efficient utilization of underground commercial areas resources and mobilize the enthusiasm of developing and utilizing underground commercial areas. It is also particularly important to enhance market competitiveness and promote the sound development of underground commercial areas under existing market and economic conditions.

6. Relying on Technological Advances

The level of construction technology determines the ability and efficiency of developing underground commercial areas. The development and utilization of underground commercial areas is driven by technological advances while its demands continuously promote the continuous progress of construction technology for underground commercial areas (Chen, 2018; Wang, 2015). Understanding and capturing the interactive relation between developing underground commercial areas and the scientific and technological level is of great significance to promoting the scientific and technological innovation for developing underground commercial areas. From the use of simple tools and technologies for underground caves in primitive society to the application of advanced technologies for developing large-scale, extensive, deep and multi-functional underground commercial areas with excellent environmental quality, the historical development indicates that humans must rely on physical and technological means to develop underground areas and that the construction technology level determines the ability and efficiency of developing underground commercial areas (Chen, 2018; Ji, 2015; Wang, 2015; Wang, 2011). The practice of humans is to develop underground commercial areas and continuously promote the development of underground construction technologies as well as emerging new materials, new structures and new processes. It is essential and necessary to develop underground commercial areas that rely on scientific and technological innovation and progress (Tanzer & Schweigler, 2016; Wang, 2010; Wong et al., 2006).

2.6 Research Gaps

Through this study's critical literature review of the project development of underground commercial areas, a wide range of research themes in the discipline of underground commercial areas have been investigated and summarised. Previous studies have contributed to the body of knowledge concerning the development and utilization of underground commercial areas providing valuable and constructive information for the project management of underground commercial areas. However, the existing academic research results of underground commercial areas are mainly related to urban function, planning and design from the perspectives of city and architect, rarely from the project management and developers' perspective. Under such circumstances, the following two major research gaps were identified:

1. Although academic achievements have been made concerning research into the development and utilization of underground commercial areas in China, there is a lack of strategic guiding ideology and strategic management system for project lifecycle development of underground commercial areas, which is far behind the actual demands of today's market.
2. Although there are studies on the evaluation factors for underground commercial

developments, a publicly recognised guidance model, especially for the project decision-making of underground commercial areas covering the whole project lifecycle development has not yet been formed, and there is a lack of a related quantification methods.

2.7 Chapter Summary

The chapter reviewed the current development, utilization and management of underground commercial areas in the literature. In addition to the introductory literature review, the special focuses on the influential factors, motivational factors and success factors of project development of underground commercial areas were critically reviewed and summarised for the purpose of identifying research gaps and future research directions. The research gaps identified form a solid justification for the significance of this study.

Chapter 3 Research Methodology

3.1 Introduction

Qualitative analysis and quantitative analysis are complementary research methods in scientific research (Seawright, 2016). Dominated by qualitative analysis and supplemented by quantitative analysis, this study summarises a large amount of data collected from observation, interviews and works of literature and verifies relevant statistical data through a representative case study so that demonstration is reasonable and convincing.

Theory is a beacon for guiding practice and development, while practice is the sole criterion for testing truth. On the one hand, this study collects data from different documents including monographs, books, journals, conference papers, academic papers, academic institutions and society seminars, and summarises the theoretical principles of relevant fields and applies these principles to the development, utilization and management of underground commercial areas; the empirical study in particular with its large amount of primary objective data supplements and updates design theory. On the other hand, the research method of identifying the strategic decision factors and the established strategic management model is confirmed and assessed through expert questionnaire method. And the established strategic management model is scored based on the weight evaluation criteria for the strategic decision factors through the Delphi method. By combining information from two such perspectives along with China's national conditions, this study formulates a virtuous cycle of theory and practice for the entire lifecycle of the development, utilization and management of underground commercial areas.

Following the research methods presented above, this chapter introduces the research methods, data collection methods and analytical tools employed in this study.

3.2 Data Collection Methods

3.2.1 Document Analysis

The Document analysis method refers to the method of studying a certain problem comprehensively and correctly by reading, analysing and sorting out relevant literature and materials (Choi et al., 2014).

To help identify knowledge gaps, this study conducted document analysis of relevant archival materials including related articles, journals, reference books, conference papers, and online information for the purpose of capturing a profile of the characteristics of underground commercial areas and the critical factors involved in their effective development, utilization and management.

3.2.2 Expert Interview

The expert interview method refers to research interviews with experts in the field, which is a way to collect objective and unbiased factual materials orally based on the opinions of the experts. It is especially important to get information from experts when studying complicated issues (Libakova & Sertakova, 2015).

The expert interview method is frequently used in this study. Three university scholars were consulted over appropriate research methods for identifying and analysing strategic decision factors. The interviews were then summarised to confirm the best way of identifying strategic decision factors. A large amount of primary data in a case study was also obtained from the internal office of the project developer.

3.2.3 Delphi Method

The Delphi method, also known as the expert survey method, is essentially a feedback anonymous inquiry method. The general process is to sort out and summarise information obtained from the experts' opinions and give anonymous feedback to each expert, and solicit opinions again until a consensus is reached (Ameyaw et al., 2016).

In this study, nine representative experts were invited to assess the strategic management model according to the experts' experience and knowledge, after feedback from the results and a score was allocated to the strategic management model based on the weight evaluation criteria. Data aggregation was then conducted for empirical study.

3.2.4 Questionnaire Survey

The Questionnaire survey method is a qualitative forecasting method for consulting the opinions of survey respondents according to a certain procedure. In recent years, China has also begun to use this method for economic forecasting and decision-making (Banda, 2019).

In this study, nine representative experts including university scholars, industry experts and enterprise executives were invited to assess and score the established strategic management model for empirically evaluating the strategic management model so as to further confirm that the model is objective, practical and effective. The questionnaires for the experts were designed and issued to construct an expert judgment matrix.

3.2.5 Case Study

Case study method is classified as field research. Researchers select specific cases as objects, systematically collect information and data, and conduct in-depth research to explore the condition of a phenomenon in real life (Wiley, 2011).

In this study, case study was applied to study a representative case of underground commercial areas to verify and validate the strategic management model. Through the case study, the strategic management model will be practically applied in a representative case for quantification.

3.3 Analytical Tools

3.3.1 AHP Method

1. Introduction

As a modern science, the Analytic Hierarchy Process (AHP) is a decision-making method for qualitative and quantitative analysis on the basis of decomposing decisions into relevant factors such as the objective, criterion, and scheme. This hierarchical weight decision analysis method is proposed by applying the theory of network system and multi-objective comprehensive evaluation method (Darko et al., 2019).

AHP provides a new, practical but straightforward decision-making method for studying the kind of complex system and helps to systematically analyse issues about society, economy and management when researchers face complex systems consisting of a large number of mutually correlated and restrictive factors. Under different conditions, underground commercial projects will choose different development goals. Based on different purposes, the project development of underground commercial areas is also different, and the multi-objective decision theory can provide theoretical support for this mechanism (Joykoc, 1987; Ma & Guan, 2003; Yang, 2008; Zhao et al., 2010).

Adopting AHP as an analytical tool can treat the complicated multi-objective decision making as a system, decompose objectives into multiple objectives or criteria, further decompose these objectives into multiple indexes (criteria or constraints) and calculate single hierarchical arrangements (weight) and total arrangement through qualitative index fuzzy quantization as a system and method for optimizing decisions on multiple objectives and multiple schemes. In addition, AHP decomposes decision making into different levels and structures based on general objectives, subunit objectives, evaluation criteria and the specific order of backup investment schemes. The prior weight of a certain element on each level to the previous level is obtained by solving the characteristics vector of judgment matrix and merging the weights of the selected scheme into the final weight of the general objective by reweighing the sum. The scheme whose final weight is the largest is the best. AHP is more suitable for decisions where the objectives system consists of multiple evaluation indexes, and the target value is challenging to be quantitatively described. AHP decomposes an issue into different constituents based on its nature and the general objective to be achieved, and aggregates such constituents based on different levels based on their mutual correlation and subordinated relations to formulate a multi-level analytic hierarchy model so that the issue is eventually summarised as the determination of the relative importance weight of low level (the scheme and measures for making decisions) to the highest level (general objective) or the arrangement of relative advantages and disadvantages.

2. Advantages

(1) Systematic Analysis Method

The AHP method involves treating a research object as a system and making decisions based on decomposition, comparative judgment and comprehensive ways of thinking, thus developing into an important tool for systematic analysis, followed by mechanism analysis and statistical analysis. The idea of the system is not to cut off the effect of factors on the result while the weight settings of each layer in the AHP will eventually directly or indirectly affect the result. This method is particularly useful for evaluating the system without structure and the system of multiple objectives, multiple criteria and multiple phases.

(2) Simple and Practical Decision-making Method

The AHP method organically integrates qualitative method and quantitative method and decomposes complicated systems instead of merely seeking advanced mathematics or unilaterally highlighting behaviour, logic and inference so that human thinking processes can be mathematically, systematically and easily accepted. In addition, the decision problem with multiple objectives and multiple criteria which is difficult to be quantified can be turned into a multi-level single-objective problem, and after the quantitative relationship of the elements of the same level relative to the elements of the previous level is determined by pairwise comparison, a simple mathematical calculation is eventually carried out. The calculation is simple, and the result is simple, clear and easy to be understood and captured by decision-makers.

(3) Less Quantitative Data and Information Required

The AHP method is more specific to analysis and judgment than general quantitative methods, as it is based on evaluators' understanding of the essence and factors of the problem to be evaluated. An analytic hierarchy process is a way of simulating humans' thinking mode of decision making, it leaves the judgment of the relative importance of factors to the human brain while only reserving human brain's impression on the factors and turning it into a simple weight for further calculation. This kind of thinking can be used to solve a lot of practical problems that cannot be solved by traditional optimized techniques.

3. Application Process

The application of the AHP method in this study was processed as below:

(1) Establish a Hierarchical Structure Model

The correlation between the objective factors (decision-making criteria) and objects of decision is divided into the highest layer, the middle layer and the lowest layer based on the attributes. The elements on the same layer are taken as a criterion, and they play a dominant role in some elements on the next layer, thus forming a hierarchical level (Saaty, 2003).

The highest layer, also known as the objective layer, usually contains only one element, and it indicates the purpose of solving a problem. The middle layer, also known as the criterion layer, contains elements such as measures, schemes and policies for achieving the overall objective. Generally, it can be divided into a strategic layer, constraint layer and sub-criterion layer. The lowest layer, also known as the scheme layer, is used for means and methods for solving a problem. Their relations are shown in Figure 3.1.

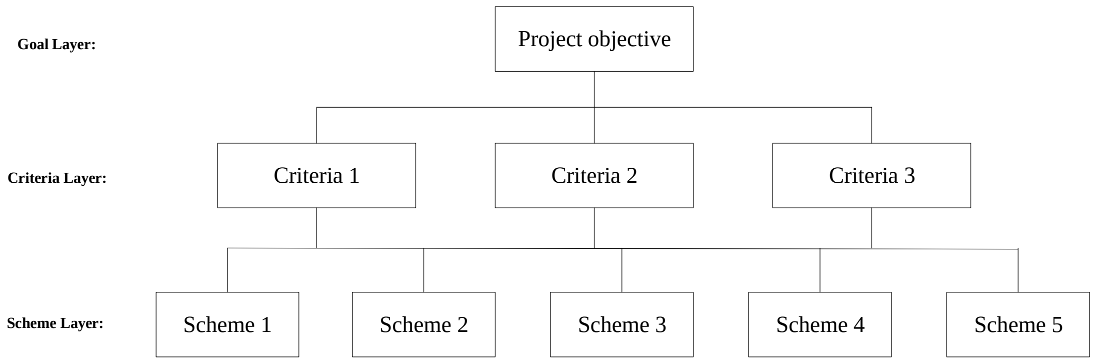

Figure 3.1 Structure of the AHP Model

The line between items represents that items interact. If the same layers are not connected with a line, these layers are mutually independent, which is known as internal independence. The upper factors have distributive relations with the lower ones while lower factors do not dominate upper ones, known as a hierarchical structure.

(2) Construct Judgment (Pairwise Comparison) Matrix

When the weight of different factors in each layer is determined, the qualitative results are usually not readily accepted, so consistency matrix method is proposed, which is to make pairwise comparison through relative size instead of comparing all factors in one basket to make it less challenging but more accurate to compare the factors of different nature (Saaty, 2003). For example, schemes of a certain criterion are compared by pairs, and their rankings are evaluated based on their importance.

When the AHPs method is used, unreasonable factors, ambiguous meanings or incorrect relations among factors will reduce the quality of the AHP method, or even fail decision making through the AHP method. To ensure that hierarchical structure is reasonable, the following principles should be followed:

First, it should accurately master major factors when decomposing and simplifying issues.

Second, it should pay attention to the relationship strength between factors and never place substantially different factors on the same layer for comparison.

Table 3.1 introduces the “1～9 scale method” which is used to make a pairwise comparison between elements on the same layer concerning the importance of a certain criterion on the previous layer. The method adopted 1～9 and their reciprocal as scale method to divide people's non-quantifiable resolving power of pairwise comparisons into nine levels (Saaty, 2003).

Table 3.1 "1-9" Scale Method

Scale	Description (comparative factors i and j)
1	Factor i is as important as j
3	Factor i is slightly more important than j
5	Factor i is medially more important than j
7	Factor i is heavily more important than j
9	Factor i is definitely more important than j
2, 4, 6, 8	The intermediate value of two adjacent judgments
Count Backwards	When comparing the degree of insignificance between factor i with factor j

Construct a judgment matrix B= (b_{ij}). The form of the judgment matrix B is shown in Table 3.3. If A_i on the A layer is related with a total of n elements on the lower layer of B_1, B_2… B_n , it meets $b_{ij}=1(i=j)$, as shown in Table 3.2.

Table 3.2 Judgment Matrix of AHP

A_i	B_1	B_1 B_2 … B_n	Weight Value
B_1	B_{11}	B_{11} B_{12} … B_{1n}	…

B_2	B_{21}	B_{21} B_{22} … B_{2n}	…
...	…	...	…
B_n	B_{n1}	B_{n1} B_{n2} … B_{nn}	…

(3) Single Hierarchical Ranking and Consistency Check

The eigenvalue of maximum λmax of the judgment matrix B is firstly obtained, and then the feature vector W is obtained by the formula: $BW=\lambda_{max}$. After W is standardized or the weighted value of the relative importance of corresponding elements in the same level to a factor in the previous level is ranked, its consistency index CI has to be calculated so as to check the consistency of the judgment matrix B, defined as:

$$CI = \frac{\lambda_{max} - n}{n - 1}$$

In the formula, n is the number of orders in the judgment matrix B.

Obviously, CI=0 when B exhibits complete consistency. The greater the CI is, the less consistency the judgment matrix will exhibit.

In order to determine whether B exhibits satisfactory consistency, CI needs to be further compared with the average random consistency index RI. The value of the average random consistency index RI is shown in Table 3.3.

Table 3.3 The Value of Average Random Consistency Index RI

Order	1	2	3	4	5	6	7	8	9
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45

Set up $CR = \frac{CI}{RI}$

CR is the random consistency ratio.

The judgment matrix B exhibits satisfactory consistency when CR <0.10. Otherwise, B needs to be adjusted again till it exhibits satisfactory consistency.

(4) Overall Ranking and Consistency Check

The ranking that calculates the relative importance of all factors at the same layer to the highest layer is called overall ranking, which is conducted from the highest layer to the lowest layer. The consistency check of the overall ranking is also conducted from the highest layer to the lowest layer. If the consistency index of a certain factor on the B layer to A_j the single hierarchical ranking is CI_j, and corresponding average random consistency index is RI_j, then the random consistency ratio of the overall ranking on the layer B can be expressed as the following formula:

$$CR = \frac{\sum_{j-1}^{m} a_j CI_j}{\sum_{j-1}^{m} a_j RI_j}$$

When CR<0.10, it is generally believed that overall ranking exhibits satisfactory consistency. Otherwise, the value of the elements in the judgment matrix needs to be re-evaluated.

3.3.2 Yaahp Software

According to the official introduction of Shanxi Yuan Decision Software Technology[6], which is the founder of Yaahp software, Yaahp is the auxiliary comprehensive evaluation software based on the AHP method, and it provides the tools of model construction, calculation and analysis during decision making by AHP evaluation. In

[6] http://www.metadecsn.com/

this study, Yaahp software is applicable and the advantages of using it are as shown by the following:

(1) The hierarchy model drawn by Yaahp is quite intuitive and accessible, thus enabling users to concentrate their attention on decision making. Users can be allowed to easily modify hierarchy mode with simple edition functions and provide support in sorting out ideas. If documents or reports need to be written, the hierarchy model can be directly exported instead of being repeatedly drawn using other software.

(2) After the hierarchy model is identified, the software will conduct analysis and generate a judgment matrix. A variety of ways can be selected to enter data into the judgment matrix. It is effortless to enter data into the judgment matrix by both format and textual description. The data entry can be completed by either dragging a slider or directly inputting self-determined data.

(3) As human thoughts are subjective and the objective world is complicated, we can hardly construct a judgment matrix meeting the requirement of consistency for one time in resolving practical decision problems. The judgment matrix often needs to be adjusted multiple times before being consistent. Yaahp can display the ratio of consistency of the judgment matrix in a real-time manner based on the changes of data if it is used to enter the data of the judgment matrix. Yaahp can also display the factors that currently have the most significant impact on the consistency in a real-time manner when the judgment matrix is inconsistent, so that users can make adjustments accordingly.

(4) Users are allowed to manually adjust inconsistent judgment matrix by the function of Yaahp to provide the ratio of consistency in a real-time manner. However, it is somewhat blind to manually adjust an inconsistent judgment matrix. Instead, it requires experience and skills, so it is not sufficiently scientific. Besides, if the data of the expert questionnaire survey to be collected is involved, it is likely to be unreasonable to adjust these data or modify experts' original judgments directly. Given such issues, Yaahp can automatically modify the inconsistent judgment matrix, during which psychological factors in making decisions are taken into accountant and experts' decision data are retained to the maximum extent when judgment matrix is adjusted to be consistent. The judgment matrix that needs to be modified will be automatically marked and modified.

(5) The questionnaires collected from a large number of experts might be required for practical decision making. The data given by experts from questionnaires may be incomplete. For example, certain experts may not present some data as they are not certain about data, or they are not interested or even want to avoid arousing suspicion, thus making the data in the judgment matrix incomplete. In other words, there are incomplete matrixes. If the elements absent from the judgment matrix can be indirectly obtained by other elements to be filled, then this incomplete judgment matrix is acceptable. Yaahp software provides an incomplete but acceptable calculation function of judgment matrix, which means that a judgment matrix can be calculated with at least n-1 inputs (instead of $n(n-1)/2$ of all inputs).

(6) If an incomplete matrix is not acceptable, then the ranking weight cannot be

calculated. In this case, the data of incomplete judgment matrix should be completed. If the data of incomplete judgment matrix is manually completed, it will have an impact on experts' decision data that are already known. And if a lot of items are absent from the judgment matrix, it will be blind to complete such data manually. Yaahp software automatically completes the incomplete judgment matrix. The judgment matrix can be completed by software on the basis of reflecting experts' decision data to the maximum extent as long as relevant conditions are satisfied. The incomplete judgment matrix that needs to be completed will be automatically marked and completed.

(7) Either the ranking weight of selective schemes to general objective or that of selective schemes to the elements not existing in the scheme layer of hierarchical structure can be easily calculated. And detailed data of judgment matrix, intermediate calculation data and final calculation results can be viewed.

(8) After the ranking weight of general objective or sub-objective is calculated, the weighted score can be further calculated. In other words, the final weighted score is calculated based on the weight of selective schemes and their actual scores.

(9) Sensitivity analysis can be used to determine what impact each selective scheme causes when the weight of a certain element changes to further have users make decisions on a higher level. The function of sensitivity analysis provided by Yaahp can be used to view how the weight of selective scheme changes with different elements and how the ranking of the weight of selective scheme changes, dynamically observe the impact of the changes in the weight of elements on the

weight of selective scheme and generate the sensitivity analysis report.

(10) Group decision making is used to give full play to collective wisdom. It is a process where a number of experts jointly get involved in decision analysis and make decisions. All experts who are involved in completing questionnaires are participants, and the final result is determined based on the data provided by all experts. Yaahp software provides support for group decision making and manages the information about the experts who are involved in decision making and the decision-making data provided by these experts. Yaahp software also provides a variety of methods of aggregating experts' data for users.

(11) Questionnaires are often required to be distributed to experts for the decision-making process by AHP, and then these questionnaires need to be collected for obtaining experts' data. Yaahp software provides the function of generating questionnaires, which means that a questionnaire survey can be automatically generated based on the hierarchical model and set texts and this questionnaire survey can be distributed to experts without modification or with slight modification. Yaahp software can also generate an importable format of a questionnaire survey in Excel format. The questionnaire survey in such format can be used to easily import experts' decision data after collection to reduce the workload of data entry significantly.

(12) It is time-consuming and effort-consuming to enter experts' data into every judgment matrix based on questionnaires. To resolve this issue, Yaahp software provides a kind of software of inputting the data of experts who are involved in

group decision making. The software enables experts to quickly enter their decision data and send back these data via email. The investigators can use Yaahp to directly import these experts' data and save a large amount of time and work.

(13) The examination of experts' data can be used to view any abnormal circumstances occurring to experts' data for group decision making and list out the circumstances where the judgment data given by experts are quite different, opposite and incomplete. This function makes it possible to examine experts' data and make targeted manual corrections quickly.

(14) The inconsistent or incomplete judgment matrix (which often occurs to experts' data) needs to be processed for calculation for group decision making. This function is used for making statistics and setting the processing mode in one step.

3.4 Chapter Summary

This chapter first introduced the research methodologies adopted in this study combining qualitative and quantitative methodologies. Second, the main data collection methods adopted, including document analysis, expert interview, Delphi method, questionnaire survey, and case study were introduced. Last, the main analytical tools, including the AHP method and Yaahp software, were presented for further evaluating the strategic management model.

Chapter 4 Strategic Decision Factors

4.1 Introduction

The strategy is a plan for achieving an overall objective based on comprehensive and careful consideration, and decision making is to decide on an action for achieving a specific objective based on the objective possibility, information and experience by analysing and determining the factors affecting the achievement of the objective (Rainey, 2010). Strategic decision-making is to make decisions about major issues related to an enterprise's overall situation and long-term development. Top decision-makers generally cause the decision in an enterprise, and strategic decision-making is the core of modern management (Mazzarol & Reboud, 2011).

This chapter identifies and analyses the strategic decision factors covering the different stages of project development of underground commercial areas from internal and external aspects based on the comprehensive review results, document analysis and practical experience. The strategic decision factors identified and analysed in this chapter are based on findings from the literature review.

4.2 External Strategic Decision Factors

4.2.1 Macro Environment

1. National Economy

National economy refers to the macroeconomic conditions affecting the economic market activities of a country. It mainly includes GDP and total export volume (Ashimov, 2013). Only when national economy grows to a certain level will it be necessary to develop underground commercial projects as the national economy can lay a foundation and create conditions and opportunities for such projects. Otherwise, it is of no significance to develop such projects. In terms of GDP and total import/export volume, China has been playing an important role in the global economy.

According to the data and official information released by China's National Bureau of Statistics[7], China's GDP (Chinese mainland) during the whole year of 2019 actually increased by 6.1% compared with the previous year if the price rise is excluded, and was in line with expectations. The year-on-year economic growth rates for the 1st, 2nd, 3rd and 4th quarter were 6.4%, 6.2%, 6.0% and 6.0%, respectively. Meanwhile, China's import/export volume was 31.54 trillion Yuan in 2019, with a year-on-year growth rate of 3.4%. Among them, total export volume was 17.23 trillion Yuan, with a growth rate of 5%; the total import volume was 14.31 trillion Yuan, with a growth rate of 1.6%. The trade surplus was 2.91 trillion Yuan, with an increase of 25.4%.

2. Regional Economy

Regional economy refers to the macroeconomic conditions affecting the economic market activities of a region (Ashimov, 2013). As mentioned, underground commercial areas are the product of a certain degree of urban construction development, and it is also an effective way for achieving the sustainable development of a city in the context of a series of inherent contradictions arising from urban development. From the dialectical point of view, only when the economy of a region develops to a certain level will it be necessary to develop underground commercial projects in this region. Otherwise, it is of no significance to develop such projects.

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[7] http://www.stats.gov.cn/

According to the data and official information released by local statistics bureaus[8], the economic growth rate of Guangdong Province in China was about 6.35% in 2019 with a total GDP of more than 10.5 trillion Yuan, thus making it the first and the only province with a total GDP exceeding 10 trillion Yuan. The GDP of Jiangsu Province was nearly 10 trillion Yuan in 2019 and is expected to exceed 10 trillion Yuan this year (in 2020). The GDP of Zhejiang Province exceeded 6 trillion Yuan, with a growth rate of 6.8% from the previous year. The GDP of Henan Province reached 5 trillion Yuan for the first time in 2019, with a growth rate of more than 7%. The GDP of Hebei Province exceeded 4 trillion Yuan in 2019, with a growth rate of around 7.8%. In terms of GDP, China's top ten cities were Shanghai, Beijing, Shenzhen, Guangzhou, Chongqing, Suzhou, Wuhan, Chengdu, Hangzhou and Tianjin in 2019, among which Shanghai, Beijing, Chongqing and Tianjin are municipalities directly under the central government, Shenzhen, Guangzhou, Wuhan, Chengdu and Hangzhou are sub-provincial cities, and only Jiangsu ranking the 6th is a prefecture-level city.

In terms of regional distribution, seven out of top ten cities are coastal cities in Eastern China including three cities in the Yangtze River Delta, two cities in the Pearl River Delta and two cities in the Beijing-Tianjin-Hebei region. Specifically, four first-tier cities of Beijing, Shanghai, Shenzhen and Guangzhou are the top four cities. Especially the two major first-tier cities of Shanghai and Beijing are far ahead of all the other cities in China.

3. Industry Economy

8 http://www.stats.gov.cn/tjgz/wzlj/dfzfwz/

Industrial economy is an applied discipline. The concept of industry came into being to meet the needs of industrial analysis (Ashimov, 2013). Business is an important expression of urban industry and an important part of social and economic system. All factors determining and affecting business growth, such as business aggregation will affect business to a certain extent, directly or indirectly. Business aggregation mainly depends on developers' investment scale. Developers' investment can not only illustrate how well a city's business development potential is recognised by commercial real estate but also demonstrate a city's business development status. Only when business aggregation reaches a certain degree will it be necessary to develop underground commercial projects as business aggregation lays a foundation and creates conditions and opportunities for such projects. Otherwise, it is of no significance to develop such projects.

According to the data and official information released by National Bureau of Statistics[9], China's nominal GDP reached nearly 100 trillion Yuan in 2019, among which the added value of the tertiary industry was 5.34233 trillion Yuan, an increase of 6.9% over the previous year and about 53.92% of China's total GDP in the same period, indicating that the tertiary industry has become the most important of China's national economy and demonstrating that China's economy has transformed from "being production-oriented" to "meeting the consumer demands of residents by production".

4. Demographic Structure

Demographic structure refers to the result obtained by dividing population based on

[9] http://www.stats.gov.cn/

different criteria, which mainly consists of factors such as age, gender, race, ethnicity, religion, educational background, profession, income and family size (Laurent, 2013). Different types of people may accept underground commercial areas to a varying extend, thus directly affecting the market promotion and development of underground commercial projects.

5. Policy Support

Industrial policy varies greatly in different countries because their economic development, cultural and historical conditions, political environment and economic trends are different (Chen, 2015a). And it even varies significantly in a country due to different stages of economic development. It is hugely to consider the historical conditions where industrial policy is formulated comprehensively, and these conditions include the perfection of industrial policy, the roles and objectives of industrial policy, the right of formulating industrial policy, and the implementation of industrial policy. It is also necessary to focus on and analyse the release and guidance of relevant policies, the perfection of these policies and the favourable conditions for business development before developing underground commercial projects. These conditions include land policy, tax policy, industrial policy, monetary policy, loan policy, mandatory policies and emergency policies.

The laws and regulations about developing and utilizing existing urban underground areas in China include “City Planning Law of the People’s Republic of China”, “Civil Air Defense Law of the People’s Republic of China”, “Regulations on the Development and Utilization of Urban Underground Space”, “Decision of the Ministry of

Construction on Amending the Regulations on the Development and Utilization of Urban Underground Space", etc. (Shao, 2016; Yu, 2012).

Currently, underground commercial projects in China are developed mainly in two ways. The first is to develop underground commercial areas in the form of urban underground civil air defense projects (civil air-based underground commerce). In accordance with the Civil Air Defense Law of the People's Republic of China, private and foreign companies are encouraged to make an investment in developing civil air defense projects in China (Yang et al., 2002; Yu, 2012). The investment income is owned by investors in peacetime, while Chinese governments may take back the right to utilize the project in wartime. In accordance with China's existing laws and regulations, underground civil air defense projects that are developed for commercial purposes are not classified into real estate development, so it is not subject to a lot of laws, regulations, taxation and policies applicable to China's real estate industry. Land transfer fee and value-added land tax are not required for such projects. The other is to develop underground commercial areas in the form of real estate development (real estate commerce). Same as other regular commercial projects, investment developers are required to obtain the right of developing projects by tender, auction and listing, and they are also required to pay land use and transfer fees as well as other fees to China's government.

4.2.2 Market Development

1. Market Size

Market size, also known as market capacity, refers to the number of units that a market can absorb a certain product or service in a certain period without considering product prices or suppliers. If market capacity is available, naturally it can promote enterprise investment and economic development. Otherwise, economic growth can only be stimulated by enterprise efficiency, thereby causing a huge risk of economic imbalance (Zhu, 2013).

In terms of the project development of underground commercial areas, market size indicates how large the market of developing underground commercial projects is or how well it is accepted by market in a specific region, and it is crucial to determine whether a specific underground commercial project is potentially profitable or promising in the market. If a number of enterprises have developed mature underground shopping malls in a region, then why do consumers need a new shopping mall under the same conditions? The market size should be dynamically evaluated. With the continuous development of the follow-up market research and the constant changes in the external environment, an enterprise's decision-makers are advised to regularly adjust and revise their market size to ensure its accuracy with a certain period.

2. Business Distribution

Business distribution refers to the distribution scope of the consumers who consume preferably in the places along a direction and within a distance based on the location of a project (Zhang et al., 2013). In other words, a business area is the geographic scope where consumers locate. For the convenience of analysis, the area demarcated by the project location as the centre of the circle and a certain distance as the radius is usually taken as the range of a business district. The formation and distribution of a business district is affected by many factors: population size, demographic features, regional public construction, local construction planning, and business development potential. Among them, business development potential includes purchasing potential and the operation status of existing shopping malls.

The scope of consumers' activities for underground commercial projects depends on the nature of business. As mentioned earlier, in the underground commercial complex with integrated services and the underground commercial complex connecting with rail transit, the temporary passers-by will consume based on their temporary needs, so their consumer scope is not fixed. However, the consumers for shops and commercial complex are usually geographically restricted or have relatively stable business district. Therefore, there is a difference in the scale and form of business district as their products, traffic, geographic locations and operation scale are different.

Even in the same underground commercial project, business district may change as it is affected by different factors in different periods. For example, competitors in the original business district arise and attract some consumers, thereby directly changing the scale and form of the business district. To analyse the distribution of the business district of an underground commercial project, decision-makers are required to conduct a field investigation and analyse the components, features and scope of the business district where a project is located and the factors affecting the scale of the business district so as to provide a basis for selecting location, formulating and adjusting development orientation and strategy. When a location is chosen for a new underground commercial project, it is important to focus on long-term market objective and attract more consumers. Therefore, decision-makers should first determine the scope of business district and get to know its demographic distribution and data about other markets and non-market factors, based on which the development value is measured, and operation benefits are evaluated to achieve coordinated relations between project settings, business distribution, geographic location and operating condition, thus further creating market advantages and timely seize the opportunities.

3. Market Demand

In economics, market is the sum of goods exchanged. Both buyers and sellers have to be present in a market, and they have to exchange goods or services. The core of the market is an exchange relationship (Zhu, 2013). The three basic laws of market economy is the law of demand, the law of supply, and the law of supply and demand. The factors affecting market demand include competitors' development, regional macro-business maturity, consumers' income level, consumers' preference, consumer scale and governments' commercial industries.

The market demand for underground commercial areas refers to consumers' needs and preferences to underground commercial areas in a certain period of time when other conditions remain fixed and unchanged. The traditional business structure has been greatly impacted by the rapid development of e-commerce platform and online shopping. Some traditional shopping malls have been transformed, and some even shut down. The development potential of traditional retail industry, once a leading industry, seems to be severely restricted.

Online shopping is a huge threat to underground commercial areas. The Internet provides a platform of instant communication and eliminates space and geographic restrictions. As the post-80s and post-90s gradually become a major force of contemporary society and market, the application and users of the Internet rapidly grows, and relevant laws and financial security systems are continuously improving. Undoubtedly, online shopping has become an important and inevitable mode of consumption. While making people's life more convenient, the online platform also significantly threatens physical retail stores, including underground shopping malls, which are characterized by fixed locations, fixed areas and relatively stable brands and product categories.

4. Development Trend

Market development trend refers to the development status of real estate in a region, and it is determined by the region's history and current situation as well as its position in future's urban structure including its functional positioning, cultural background, economic conditions and infrastructure (Zhu, 2013). This is demonstrated by supply, sales volume, price, product quality, purchasing characteristics, promotions and sales. Macro-economic factors are the major factors affecting long-term market trends. Factors such as industrial development, enterprises' economic benefits and internal economic trends will also have an impact on short-term and long-term market development trends.

In terms of the future development trend for underground commercial areas, a three-dimensional business pattern from top to bottom, from point to line, from line to plane, from plane to net, and from net to complex will be a trend of business development for cities in China. Underground commerce in China's market is an important factor for making urban business more mature and is an important link for forming a "three-dimensional business". There is also a need for commercial real estate to integrate with urban landscape and spatial resources, so it will surely be an inevitable trend to develop urban underground commercial areas in China.

5. Consumer Demand

Consumer demand refers to the demands and desires for consumer goods in the form of goods and services which includes consumers' disposable income, economic development prospects, social insurance system and demographic characteristics (Ni, 2015). When the economy of an industry is underdeveloped, consumers will be not accessible to massive consumption options and rich consumption contents, and their demands thus cannot be fully satisfied or even suppressed.

With the continuous development of social productivity, developers are capable of providing more and better underground commercial projects for market, thereby better satisfying consumers' demands. As people's materialistic and cultural living standards increasingly improve, consumer demands are becoming more diversified and multi-level and gradually developing from low level to high level. The consumption options are continuously expanded, consumption contents are becoming increasingly rich, and consumption quality has been sustainably improved. Hence, a more favourable environment is available for developing underground commercial projects.

4.2.3 Land Condition

1. Transport System

An urban public transport system is organically composed of a variety of urban public transport modes. The system can be divided into two subsystems, one is public transport tools and facilities, and the other is public transport planning and operation management, which is affected by many factors such as people (drivers, pedestrians and passengers), vehicles (including motor and non-motor vehicles), roads (highway, urban roads, access roads and relevant facilities) and environment (off-road landscape, management facilities and meteorological conditions) (Zhao & Wang, 2018). The underground areas in the core business area of a city are no longer troubled by the separation between buildings and roads, and factors such as traffic flow do not need to be considered because transport systems are interconnected. However, an underdeveloped transport system in an entire area where underground commercial areas are located will result in insufficient customer flow. Therefore, whether the transport system is mature or not is a decision-making factor to determine whether it is necessary to develop an underground commercial project. It is important to consider not only whether the existing transport system of the area where an underground commercial project is located in is mature or not, but also the development prospect of its future transport system in the preliminary investment analysis so as to determine and estimate the incubation period of the project.

2. Surrounding Resources

Generally speaking, resources in economics refers to the things that can produce benefits for enterprises and society in a direct manner or by use. Different resource should be considered for different industries (Zhao & Wang, 2018). The surrounding resource for business generally includes transport, people, public facilities, environmental resources, and business support resources. The surrounding resources of the areas where an underground commercial project is located, such as business resources, tourism resources and cultural resources can play an important role in promoting the development of the project. Successful underground commercial projects should not only meet people's consumer demands but also integrate surrounding resources and create opportunities for its own development by taking advantage of existing surrounding resources, thereby mutually promoting development. As a whole, underground commercial areas are interconnected with surrounding resources to create a fashionable lifestyle and cultivate a positive attitude towards life.

3. Metro System

Metro system refers to the distribution and construction of stations along with the public transport system, especially subway and light rail. It is generally commercially supported by excellent customers from businesses above the metro system (Zhao & Wang, 2018).

As the core of underground rail transit, subway can transport a large number of passengers in a short period of time while aggregating a large number of passengers. If entrances and exits of rail transit are connected with underground commercial areas while translating passengers into business opportunities to the greatest extent, or subway commerce as is simply called, it will surely bring considerable economic benefits for underground commercial project developers and operators. Therefore, the vigorous development of subway commerce is also the most important subject of underground rail transit in major cities and a decision-making factor to promote underground commercial areas.

4. Geological Condition

Geological condition refers to the general term of various geological factors affecting engineering construction (Osipov et al., 2011). It mainly includes topographical features, stratigraphic lithology, geological structure, earthquake, hydrogeology, natural building materials, and undesirable physical and geological phenomena such as karst, landslide, caving, sand liquefaction and foundation deformation. The geological condition of the engineering construction sites should be investigated and studied prior to project planning, design and construction. The conditions include previous construction experience of the site, causes of engineering accidents that have occurred, prevention and control measures and consequences, building settlement, deformation and foundation seismic effect.

Underground construction is the most closely related to the geological condition of engineering construction. Different from aboveground construction projects, underground construction projects are located at a certain depth below the ground surface, and it is more obviously affected by surrounding rocks, soil masses and water conditions (water condition refers to the changes, movements and other phenomena of water in nature). Therefore, underground construction is more directly affected by the engineering geology of these rocks and soil masses. The geological engineering issues are more complicated if underground areas are constructed in the rocks and soil masses with different geological condition. A qualifying geological condition is indispensable for underground construction.

5. Surface Combination

Nowadays, a three-dimensional development mode integrating aboveground and underground has been formed for modern cities, which exhibits a comprehensive development trend of diversified and integrated business forms (Bobylev, 2016). As mentioned, the fundamental motivation for developing and utilizing urban underground commercial areas is that multi-level additive effect can be produced on the premise of the coordinated aboveground and underground development so that urban space can be more reasonably utilized to create more economic and social benefits. While taking full advantage of underground areas, it is also important to consider the close relations between public, commercial projects and supporting facilities between underground and aboveground areas, reasonably establish horizontal and vertical transport systems and ensure that people and materials can be reasonably transported and circulated between underground and aboveground areas.

4.3 Internal Strategic Decision Factors

4.3.1 Development Orientation

1. Overall Orientation

Orientation, which is similar to positioning, is the core strategy of a commercial project, which plays an important role in guiding and defining the planning and market promotion of a project. The overall positioning of a commercial real estate project in the preliminary stage should be comprehensive, rigorous and feasible (Khan, 2016). Commercial real estate is more complicated than residential real estate because it involves multiple aspects such as merchants, operators and house owners. And it is quite important to consider all factors during overall orientation, and these factors include function, main body, scale, level, style, form of business, type of business, target customers and consumption level. There in an ever-increasing number of underground commercial projects in China. However, a lot of projects are poorly operated, which are fundamentally caused by incomplete operation management system and inaccurate positioning. The overall positioning of an underground commercial project can affect not only the operation conditions of the project in the later stage but also how well the positioning in the early stage is recognised by stakeholders (such as government, developers, operators and consumers), thus directly affecting the expected revenue of the project.

2. Theme Orientation

In the increasingly saturated market of commercial real estate, theme orientation, also known as market image positioning, determines whether a commercial real estate project can be widely recognised and accepted by the market in a short period (Gao & Wang, 2014). The market image can be formed by the characteristic portfolio of a project in the views of customers. Generally speaking, it is the public's understanding and impression of a project. An innovative theme positioning can never be absent from an overall positioning in an underground commercial project. The competition is very fierce in the modern commercial market. The consumption viscosity can hardly be achieved if characteristic positioning or attractive type of business is not available, let alone second consumption or repeated consumption. Traditional business in the early days only required to consider how to best satisfy customers' physical needs in the shortest period of time. Modern business, however, has to create experience consumption opportunities for customers and promotion potentials for merchants. The distinctive features, prominent personality culture and rich sensory experience play an important role in enhancing consumers' intuitive impression of the project, thereby driving and accelerating market promotion. Therefore, decision-makers are advised to conduct detailed market research in the early stage, provide guidance for product planning through innovative theme positioning by capturing consumers' psychological characteristics, and master the combination and distribution of primary and secondary forms of business so as to ensure harmonious cooperation among merchants, investors and agents.

3. Business Orientation

The business orientation includes the studies on business portfolio and principal form of business (Chwolka & Raith, 2012). Commercial real estate projects in China are generally homogenized, which can be divided into four categories: retail shopping, catering, recreation and entertainment, and supporting services. However, the proportions of type of business are different for these four categories. It is necessary to position the proportion of type of business for a specific form of business according to customers, urban consumption capacity and competitors. Diversified business planning is recommended for underground commercial projects after an accurate overall positioning and theme positioning. The merchants to be settled need to be carefully selected during investment attraction so that they can better fit to the underground commercial atmosphere. In addition to geographic positioning, merchants that are in line with the temperament of the project site are needed to support, combine and highlight specific forms of business, which should be further combined with theme positioning by reasonable layout and design to intuitively and effectively communicate the development concept of the project to consumers, thus establishing a unique basis of underground commercial culture.

4. Market Orientation

Market orientation is to vigorously establish a unique, impressive and distinctive product personality or image based on the market shares of competitors' existing products and consumers' emphasis on certain features, attributes and core benefits of these products and rapidly, accurately and vividly convey such image to customers through a specific marketing portfolio, thereby influencing customers' overall perception about these products (Chwolka & Raith, 2012). Compared with competitive counterparts, underground commercial project developers are suggested to consider how to establish a unique project image for consumers so as to formulate long-term competitive advantages. The key to market positioning is for developers to find features that are more competitive than their competitors in their projects. Competitive advantage can be basically divided into two types. One is the competitive advantage in price, which refers to lower prices than competitors under same conditions. Hence, developers are required to take measures to reduce their costs and improve their advantages in investment attraction. And the other is the competitive advantage in preference, which is the ability to provide specific features to satisfy consumers' specific preferences, so developers need to develop project personalities such as theme positioning and business planning. Functional orientation is to highlight the unique functions of a product during market promotion so that it is easily distinguished from the same kind of products and is more competitive.

5. Functional Orientation

Based on the orientation of the same kind of product, functional orientation is to select superior features of the same kind of products as the key to development orientation (France-Mensah et al., 2019). Modern commercial real estate projects generally embody the following four major functions, which are shopping, recreation, entertainment and service. In the modern society with increasingly severe traffic pressure, underground commercial areas not only give full play to commercial functions but also improves traffic conditions aboveground and promote the development of industries such as tourism, entertainment and shopping. It owns unique abilities in traffic, shopping, landscaping and recreation. Additionally, China's underground commercial projects are built for the purpose of civil defense with particular construction standard so that they give full play to commercial functions in peacetime while having the benefit of combat readiness in wartime, which are not available for most aboveground buildings.

4.3.2 Planning & Design

1. Spatial Design

Architectural spatial design refers to an artistic creation that can meet the aesthetic standards of most people and be implemented under the designated use function (Silva et al., 2012). Spatial design includes commercial display design, home design and commercial store design. The commercial value of underground commercial areas surely cannot be neglected. But unfortunately, underground areas are inborn with airtight space and stagnant air, which could likely have a negative impact on people's psychology, thus making people feel depressed and have poor sensory experience. As a result, it is more difficult to design underground commercial projects. More attention should be paid to details, and methods such as perfect and reasonable design concept, science and technology and system tools are needed for eliminating people's negative psychological impact and increase human flow.

Meanwhile, large investment, long construction lead time, many participating units, high functional requirements and massive information in the entire cycle are required for modern commercial real estate projects, thus making the spatial design of underground commercial areas much more complicated. Traditional information communication and drawing methods are far from meeting current requirements. Backward technology also makes information be incorrectly or incompletely communicated or even leads to accidents and disasters. Therefore, software and tools that are based on scientific and technological innovation and integrated with computer technology and digital information technology are effective in solving complicated problems about underground spatial relations. Among them, Building Information Modeling (BIM) is particularly effective (Wang, 2017). During spatial design, BIM technology integrates professional models based on construction schemes into a building model for verification by combining the three-dimensional models of multiple professions such as architecture, structural and electrical engineering into a working BIM environment for producing a collaborative visual design and jointly modifying the three-dimensional model, thus automatically modifying and improving the design. Potential secondary problems can be eliminated in the simulated construction and the factors affecting the requirements of design specification and construction can be overcome in advance to ensure that the physical project can be smoothly carried out and effectively managed upon completion.

2. Supporting Service

Supporting service is a series of mutually complementary intangible activities that can bring benefits to people or satisfy people's demands. These activities are transferrable with compensations (He & Zhang, 2011).

In terms of internal supporting service, the service system of an underground commercial project is formulated based on supporting service. The employees in the shopping malls can better understand the characteristics of service flow and reasonably allocate their service items and manpower by analysing market demand, drawing service flow chart and conducting internal communication, thus reducing pressure from extra workloads and insufficient resources. In terms of external supporting service, the service concept of the external supporting services should be people oriented. In other words, all business activities are specifically screened and recombined based on the comprehensive consideration of consumers' differentiated demands to formulate an effective integrated service, which covers supporting services such as parking, recreation, safety system (such as alarm, spraying, civil defense and municipal facilities), public space as well as other aboveground and supporting facilities. In addition, system, lighting and audio system designs in the underground shopping malls are improved.

3. Energy Saving & Environmental Protection

Advocacy for energy saving and environmental protection can save energy resources and reduce energy wastes, which is the energy saving trend of the times (Zhou & Huang, 2013). Energy consumption, environmental protection and low carbon have to be considered for constructing underground commercial areas because underground areas are characterized by close space, insufficient lighting and stagnant air. To advocate environmental protection and energy saving, we should adopt integrated modular architectural design, natural ventilation, lighting and have reasonable connections between indoor and outdoor to reduce consumption and hazardous gas emission to create environmentally friendly underground commercial areas.

4. Internal Transport System

As modern commercial buildings increase, it becomes increasingly important to design an internal transport system (Zhao & Wang, 2018). The internal transport system of a commercial real estate project includes social flow channels, logistic channels and emergence exits. It is necessary to reasonably connect a variety of transport systems with plane and three-dimensional traffic systems and design convenient driveways where a variety of vehicles are available for developing underground commercial areas. It is impossible to operate an underground commercial area if it is not safe. The underground floor is often far away from the evacuation exit aboveground, and evacuation stairwell often is not accessible to outdoor during the planning and designing of underground internal transport system. Reasonable transport systems can ensure smooth human flow and play an important role in particular circumstances such as smoke evacuation, fire evacuation and earthquake evacuation.

5. Landscape Environment

Landscape environment refers to the spatial relations with ornamental, humanistic and ecological value that is composed of various natural landscape resources and cultural landscape resources. It is important to integrate indoor natural landscape with outdoor natural landscape such as excellent lighting and ventilation in a commercial real estate project. And it is also important to create a cultural environment such as local culture and theme culture (Yang et al., 2010b).

The landscape planning and design in underground commercial areas will directly affect consumers' using experience, thus eventually affecting the use-value and comprehensive benefits of the project. Therefore, decision-makers are advised to analyse the characteristics of target market and local consumers' demands for landscape in underground commercial areas in the early stage, reasonably plan and design the sequences and elements of landscape in underground commercial areas and summarise the characteristics of landscape in underground commercial areas. The landscape sequences should be analysed explicitly in different projects to further formulate the strategies and methods of improving landscape environment including the strategies for designing the landscape at entrances, the landscape in linear transport systems, the landscape in node space and the atrium of underground commercial space and landscape-oriented design of facilities and infrastructure.

4.3.3 Operation Management

1. Operation Strategy

Operation strategy refers to the methods of supporting and accomplishing an enterprise’s overall strategic objective by means of operation management within the overall frame of its operation strategy (Liao et al., 2012). The operation and management of underground commercial projects are difficult, the problems to be faced are quite complicated and customers have higher requirements. Decision-makers are advised to focus on formulating operation and management strategy to develop better operation management modes suitable for different underground commercial projects, improve commercial quality and achieve sustainable development. Specifically, they can launch business campaigns, create shopping atmospheres, manage investment environments and enhance management team construction to make underground commerce more valuable and dynamic during operation management. Property management refers to the activities in which owners engage property service enterprises to repair, maintain and manage buildings, supporting facilities and equipment and relevant sites and maintain the environmental sanitation and order in the property management area in accordance with property service agreement and contract.

The operation management of underground commerce involves a lot of aspects such as the strategy of attracting developers, enterprises’ management experience, the ownership of the project property rights, the ability of developers and operators to coordinate with government, property management companies, stores and other stakeholders, developers' financing ability and fund chain stability, the strategic decision-making and target execution ability of project development teams on business operation and the operation management mode of the project. Thus, decision-makers are required to intensively plan, organize, implement and control project operation in all stages, closely monitor management progress and attach significant importance to management such as merchant attraction, promotion and daily operation within the business scope including optimizing and adjusting business layout and allocation, introducing and adjusting brand, launching promotion campaigns and management on the guiding signs, environment, theme and style of underground commerce.

Currently, China's underground commercial areas can be generally divided into four operation modes: independently-owned, for rent, for sale, and for rent and sale (Yu, 2012). In term of long-term benefits, developers usually adopt independently owned business to ensure its level and quality. They can obtain sustainable and stable rental incomes by sound operation while increasing property value. In terms of short-term benefits, developers can recover their investment through quick sales based on their own needs and improve the projected liquidity on the premise of meeting market requirements. Developers can obtain stable sales and rental incomes by independently owning, renting and selling their property. Generally speaking, the main advantages of independently owned property lies in giving full play to the integrated effect of the project and improving its overall image and value. However, the costs and benefits arising from merchant attraction and operation are uncertain. The main advantages of commercial sales lie in rapidly recovering capital and avoiding paying fees after that.

Still, its overall image can be affected, and business development can be out of control. Therefore, an operation mode should be formulated based on developers' conditions and demands combined with their operation strategies. Concrete analysis should be made according to concrete circumstances.

2. Property Management

As stipulated in the Property Law of the People's Republic of China, developers of underground commercial areas can manage the property on their own or by entrusting it to property service agencies or managers (Chen, 2015b). Property managers of underground commercial areas have to consider a lot of factors such as compliance with fire prevention, disaster prevention and health management regulations, ensuring that qualified buildings are safe without potential dangers. They should ensure that equipment for daily use, the mechanical ventilation system and flood control and rainwater backflow facilities are in good condition and allocate mechanical smoke control and exhaust systems, automatic spray systems, emergency lighting systems, automated fire alarm systems and other fire facilities and equipment.

3. Facility Management

Facility management refers to scientific management over the entire moving process of physical equipment and their values (including planning, design, model selection, procurement, installation, inspection, utilization, maintenance, repair, renovation, update and scrap) by taking equipment as the research object, applying a series of theories and methods and taking a series of technical, economic and organizational measures (Kyle, 2016). It is essential for developers and operators to maintain and manage the equipment used for underground commercial areas, especially when it is used for civil defense so that it can be ready for use in both peacetime and wartime. Meanwhile, they should also enhance their management and daily maintenance of equipment and facilities to ensure the regular operation of underground commerce. While meeting governments' relevant requirements and standards, it should provide a safe and pleasant consumption and shopping environment for consumers.

4. Human Resource Management

Human resource management is the core content of establishment management in public organizations (Hari, 2018). The essence of personnel management is to assign the right personnel to right positions for right jobs so that "a right person is in a right position, and a right position is assigned to a right person". The operation of underground commercial areas needs to be transformed from management-based to service-based. It is important to enhance efficiency construction and management, actively optimize service mechanism, establish sound rules and regulations that meet the needs of managers' development and market competition, standardize execution, unify the executive abilities of employees and teams and implement awards and punishment system by means of regulations, strengthen implementation inspection and standardize all work processes so that all work can be carried out in a steady, planned, methodical, evidence-based and purposeful manner and economic benefits can be further improved. It is important to clearly define the function, role and work scope of each position in each department to ensure high-quality service and enhance the quality and efficiency of work. Meanwhile, to meet the requirement of sustainable development in the new context, it is also advised to improve serviceability, establish customer service centres, ensure that the job responsibilities of each department are clearly and precisely defined, and enhance work efficiency and optimize management. The key performance indicators analysis can be used to highlight the critical jobs of each department and improve their efficiency to continuously improve management teams' overall performance and ensure the steady progress of all tasks and objectives.

5. Safety Management

Safety management refers to the management of the people, materials and environmental factors. Effective control over the unsafe behaviours or unsafe states of people and materials helps avoid accidents, thus making people safe and healthy (Yu, 2017). Safety management is the premise of any industrial development, especially in China who attaches significant importance to safety. Safety first and People-oriented is an important national policy and purpose, which applies to all real estate industries, especially underground commercial areas where the social flow is relatively large and dense, and building structure is complex. It is challenging to evacuate and rescue people in case of any danger. Therefore, developers and operators are suggested to attach great importance to the safety design and safety management of underground commercial projects to eliminate potential hazards and avoid all safety accidents.

4.4 Chapter Summary

This chapter identified and analysed the strategic decision factors covering the different stages of project lifecycle development of underground commercial areas from internal and external perspectives by combining document analysis and practical experience. In summary, there are three external primary strategic decision factors including macro environment, market development, and land condition; and three internal strategic decision factors including development orientation, planning & design, and operation management. Each primary strategic decision factor derives five secondary strategic decision factors. For the macro environment it derives factors including national economy, regional economy, industry economy, demographic structure, and policy support; for market development, it derives factors including market size, business distribution, market demand, development trend, and consumer demand; for land condition, it derives factors including transport system, surrounding resource, metro system, geological condition, and surface combination; for development orientation, it derives factors including overall orientation, theme orientation, business orientation, market orientation, and functional orientation; for planning & design, it derives factors including spatial design, supporting service, energy saving & environmental protection, internal transport system, and landscape environment; for operation management, it derives factors including operation strategy, property management, facility management, human resource management, and safety management.

Chapter 5 Establishment of a Strategic Management Model

5.1 Introduction

Strategic management refers to the decision and management art on the overall, long-term development direction, goals, tasks and policies of an enterprise or organization in a certain period as well as resource allocation. And strategic management model refers to the full model that reveals the relationship between main factors during strategic management (Rainey, 2010).

The three phases of developing a strategic management model are as follows:

1. Defining an enterprise's vision, mission, and strategic objective is the starting point of strategic management and the programmatic document for guiding its actions. Hence, its business scope, customer and products or services need to be further defined.
2. Analysing strategic situation is to integrate and analyse an enterprise's internal and external environmental factors. It provides a basis for formulating a corporate strategy in line with objective conditions.
3. Strategic objective of a project is the expected outcome to be achieved by implementing a project or the results or services to be delivered by a project. The project implementation is actually a process of seeking a predetermined objective. Therefore, in a certain sense, the objective of a project should be clearly defined and can be ultimately achieved.

Following the general introduction of strategic management as above, this chapter presents the establishment of a strategic management model. To better understand the established procedures of the strategic management model, it begins with an overview model description, including general model structure and model boundary, and then each layer of the strategic management model is presented. Last, determination of the strategic management model is presented.

5.2 Model Description

5.2.1 Structure of the Model

The strategic management model pertaining to the project decision-making process of underground commercial areas established in this study includes three layers:

1. Strategic Goal Layer

Project objectives refer to the expected results to be achieved by the implementation of the project, such as the project deliverables or services (Rainey, 2010). The implementation process of the project is a process of pursuing the predetermined goals. Therefore, in a sense, project objectives should be clearly defined and ultimately realized.

2. Strategic Decision Layer

Generally made by high-level decision-makers, strategic decision is an important decision concerning the overall situation and long-term development of an enterprise. It is the key to the success of an organization, and it is closely related to the survival and development of an organization (Rainey, 2010). A strategic decision is a non-programmed and risky decision, which involves major issues concerning the survival of an enterprise such as development orientation, business policy, business objectives, product development, technical transformation, market development, enterprise orientation and human resources development. Hence, collective wisdom is needed to conduct a strict feasibility study during decision making. The following factors have to be carefully analysed and studied before making a strategic decision: (1) by fully considering operation environmental factors (including economic factors, political factors, scientific and technological factors, legal factors, social factors, etc.); (2) by combining with enterprises' internal conditions (including human resources, material resources, financial resources, natural conditions, technical patents, trademark reputation and other operating resources, production capacity, technical capacity, sales capacity, competitiveness, adaptability and management level, etc.).

3. Tactic Decision Layer

Tactic decision refers to the executive decision made by an organization or some specific departments on the mode of activities under the given direction and content in a short period in the future (Rainey, 2010). The implementation of tactic decision illustrates the application of the ability that an organization has owned. The implementation results will mainly affect an organization's efficiency and survival. To achieve strategic decision-making, tactical decision-making is aiming to make an executive decision about how events are launched based on a given direction and content. Generally speaking, tactics serve strategy and are the schemes of how actions are specifically implemented.

5.2.2 Boundary of the Model

The strategic management model established in this study is pertaining to the decision-making process for project lifecycle development of underground commercial areas. Decision making is an activation process in which a decision-maker selects a reasonable plan from many alternatives based on a specific goal by applying scientific theories and methods (Saravirta, 2001). Decision making is the basis for managers to engage in management. Managers have to face a variety of problems during management, and these problems need to be solved by managers. A decision can be divided into strategic decision, tactic decision and business decision based on its scope and importance.

5.3 Establishment of the Strategic Management Model

5.3.1 Goal Layer

Social benefits, environmental benefits and combat readiness benefits are advised to be comprehensively considered for developing underground commercial projects in addition to economic benefits to enhance the sustainable strategic advantages for project development.

5.3.2 Decision Layer

There are three external primary strategic decision factors including macro environment, market development, and land condition; three internal strategic decision factors including development orientation, planning & design, and operation management. For each primary strategic decision factor, it derives five secondary strategic decision factors, particularly, for macro environment, it derives factors including national economy, regional economy, industry economy, demographic structure, and policy support; for market development, it derives factors including market size, business distribution, market demand, development trend, and consumer demand; for land condition, it derives factors including transport system, surrounding resource, metro system, geological condition, and surface combination; for development orientation, it derives factors including overall orientation, theme orientation, business orientation, market orientation, and functional orientation; for planning & design, it derives factors including spatial design, supporting service, energy saving & environmental protection, internal transport system, and landscape environment; for operation management, it derives factors including operation strategy, property management, facility management, human resource management, and safety management. Based on the above analysis, the strategic decision factors framework is shown in Figure 5.1.

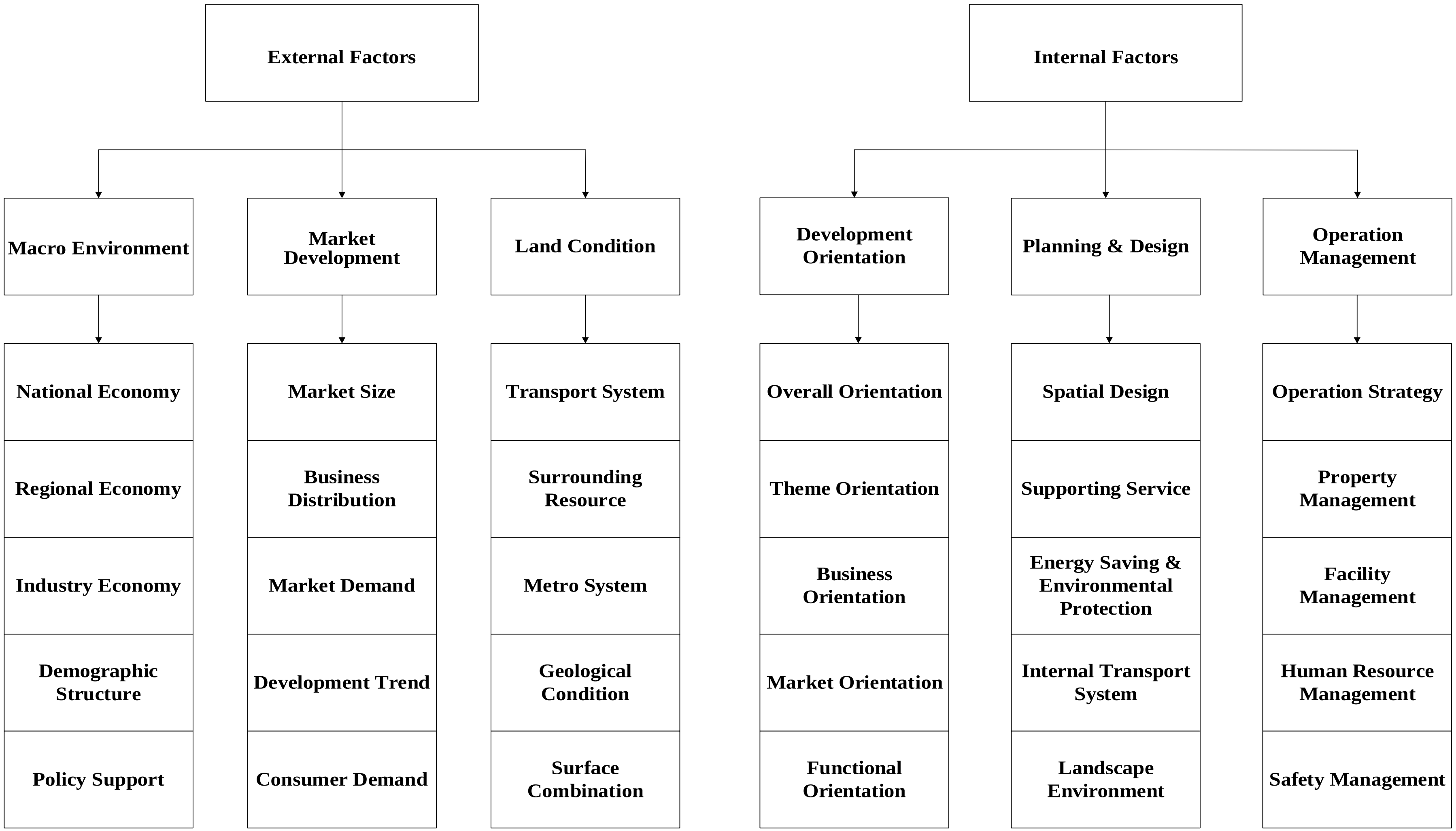

Figure 5.1 Strategic Decision Factors Framework

5.3.3 Execution Layer

1. Traffic System Scheme

Underground traffic system includes underground railway system, underground road system and underground static traffic system. The underground road system includes underground vehicle system, underground pedestrian system and underground logistics system. The underground static traffic system includes underground parking facilities and underground transfer facilities. As summarised earlier, a lot of underground commercial areas are connected with traffic systems, especially subway systems. Before developing subway commerce, a quantitative analysis should be established between the development scale of business mode, subway routes and human flow, thus stimulating the human flow in underground commercial areas and diverting human flow from the subway. Hence, the scheme of developing underground commercial projects that integrate the railway traffic system and facilities is helpful for making underground commerce more attractive and achieving integrated benefits. Figure 5.2 introduces the framework of underground traffic systems.

Figure 5.2 Underground Traffic System Framework

2. Commercial Supporting Scheme

The value of underground commercial areas can be affected by the prosperity of its district. The more prosperous the district is, the more value that its underground commercial areas will have. The central business of a city is usually located in the most prosperous district of the city. It can be accessible to every corner in the city, and its consumers' purchasing power is relatively strong; supporting business centres are also available in residential areas. They can only be accessible to the district where it is located, but their fixed consumer groups are conducive to market positioning. Meanwhile, the value of underground is also affected by developed and convenient traffic. From the customers' perspective, the accessibility of public transport can be measured by indicators such as the number of nearby bus routes, the interval of buses and the population of resident areas along bus routes; parking space also needs to be considered. From the merchants' perspective, it is important to consider whether it is convenient for shipment loading and discharge. The improvement of road traffic conditions can result in colossal human flow for businesses along the road. The concentrated human flow is undoubtedly important for commercial value, but it is also necessary to determine whether these people are genuinely potential consumers. Therefore, the underground commercial areas highlighting commercial supporting facilities can take advantage of surrounding resources to improve economic benefits and get twice the results with half the effort. Table 5.1 introduces the development modes of most underground commercial projects in the current industry based on the specific classification of underground commercial areas analysed in the literature review chapter.

Table 5.1 Development Modes of Underground Commercial Projects

Project Category		Characteristics
Commercial Property	Shops & Stores	A Single Centre, Line and Form and Business; Poor Physical Conditions, on Low Floors, Poor Directive Property and Inadequate Environmental Conditions
	Shopping Centres	Multiple Centres, Complete Lines and Diversified Forms of Business; Wide Passages; On High Floors and Excellent Ventilation
Commercial Development	Traffic Hub	A Traffic Hub Which Integrates Multiple Transport Modes such as Subway, Bus Station and Train Station
	Business Supporting Project	Abundant Business Demands; Crowded with Office Buildings
	Thematic Project	Highlight a Specific Theme instead of Relying on Mature Aboveground Commerce to Attract Specific Target Consumers

	Road Service Project	Rely on Aboveground Complete Functional Facilities and Connect with Aboveground Functional Modules and Transport Stations to Formulate Singly Linear Commercial Shops and Rely on Aboveground Business for Attracting Consumers, Called as Transport Channel or Supporting Commerce

3. Environmental Landscaping Scheme

The environmental quality of underground commercial areas is generally manifested in two aspects: physiological environment and psychological environment. The physiological environment, also known as physical environment, includes air environment (temperature, humidity, and air quality), auditory environment (sound clarity, noise intensity, etc.) and visual environment (illumination, colour). The psychological environment mainly refers to how comfortable and convenient an underground business district is, the formal beauty of the internal space and the spatial atmosphere on the person's psychological pleasure, as well as the sense of security. Underground commercial areas are always oppressive and directionless, with a poor human experience. To enhance the relations between underground areas of financial city and natural environment, improve the environmental quality of underground commercial areas and make people more comfortable, it is suggested to actively use green hall, sinking square, lighting zenith and glass arcade as well as advanced technologies to introduce sunshine and natural wind to underground commercial areas and ensure that its internal environment is safe and comfortable while making underground areas more three-dimensional so that activities in underground commercial areas become a joyful behavioral experience.

The underground commercial areas that integrate traffic hubs are recommended to introduce sunshine and natural wind through a large lighting zenith because their space is huge, and human flow is very complicated. Meanwhile, a symbolic space formed by characteristic landscape not only effectively organizes human flow but also provides excellent traffic environment for passengers. And for open underground areas in squares, square and underground areas in green belts can be more flexibly designed. Abundant sunken squares and various forms of lighting zeniths can enable underground areas to be directly connected with natural environment. Therefore, the underground commercial areas that highlight environmental landscaping facilities can make underground commerce more attractive while achieving integrated benefits.

4. Disaster Prevention System Scheme

Due to China's unique historical background, underground commercial areas include civil defense systems with supporting functions and reasonable layout integrated with disaster prevention systems to maximize the protective advantages of all projects and improve the overall protection efficiency of a city during wartime. These areas can improve the emergency response and disaster prevention capacity of a city during disasters and enhance the commercial value of underground areas in peacetime. Therefore, the underground commercial areas that highlight disaster prevention systems and facilities can make underground commerce more attractive while achieving integrated benefits.

The development principles of civil air defense projects include the following:

(1) The civil defense projects must be closely combined with the development and utilization of urban underground areas and developed in a coordinated manner.

(2) The principle of combining peacetime and wartime must be followed for civil defense projects. The underground must be developed and utilized strictly according to the requirements of civil defense.

(3) The site for key civil defense projects should be selected in areas with concentrated human traffic and disaster prevention. Civil defense projects combining peacetime and wartime should be constructed in the underground areas of parks, squares, green land and roads by combining with central or key construction centres.

(4) The timing sequence of key civil air defense projects is consistent with that of surface construction.

(5) The civil defense basement must be built for civil buildings according to national and local regulations.

5.4 Determination of the Model

Based on the comprehensive study of the underground commercial areas, the strategic management model is determined, which consists of the strategic objective layer, the primary decision-making layer, the secondary decision-making layer, and the tactical execution layer, as shown in Figure 5.3. The strategic management model is objective, practical and effective according to the expert questionnaires results (see Appendix II).

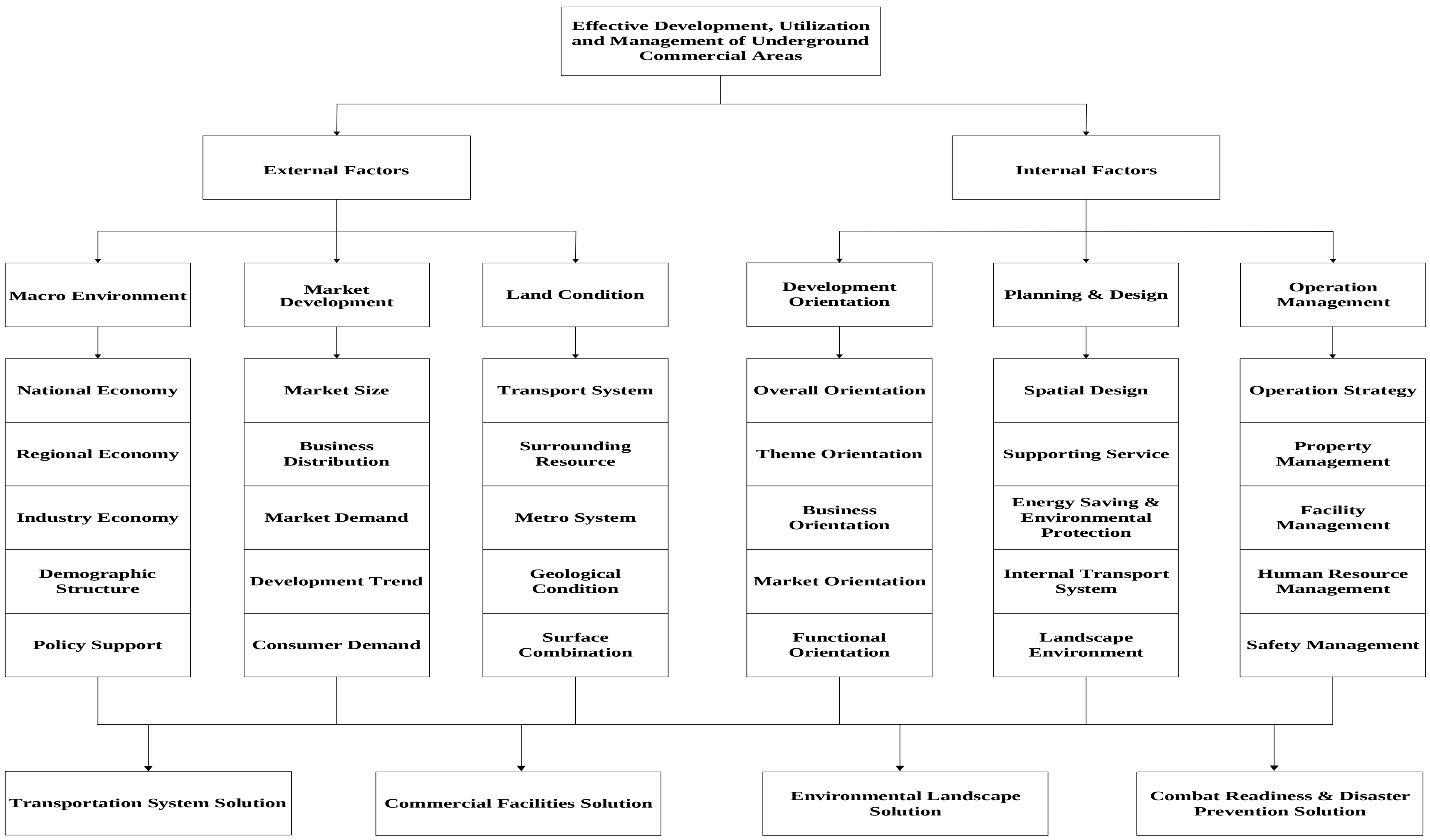

Figure 5.3 Strategic Management Model

5.5 Chapter Summary

This chapter presented the establishment of the strategic management model regarding the purpose, boundary, structure and determination. The strategic management model underlying the various strategic decision factors consists of the strategic objective layer, the primary decision-making layer, the secondary decision-making layer, and the tactical execution layer.

Chapter 6 Empirical Study

6.1 Introduction

This chapter undertakes an empirical study of the established strategic management model through the Analytic Hierarchy Process (AHP). It does so by taking the strategic objective of achieving optimal economic benefits for Guangzhou International Financial City as a case study to ensure that the model is objective, practical and effective.

6.2 Background of the Project

6.2.1 Overview

The strategy of "promoting urban development by financial power" was proposed in Guangzhou City, China, in 2011. The overall planning of Guangzhou International Financial City was thus put on the agenda. Extending to Huangpu Avenue and Zhongshan Avenue in the north, the Pearl River in the south, the boundary of Tianhe District in the east and Hua Nan Expressway in the west, Guangzhou International Financial City covers a total area of 7.5 square kilometres, which is expected to be the first financial CBD in Guangzhou. Guangzhou International Financial City starts from the central area of the overall planning scope for an international financial city. Extending to Keyun Road in the west, Chepo Road in the east, Huangpu Avenue in the north and the Pearl River in the south, the planning area covers a total land area of about 1.3 square kilometres.

According to the subject plan for underground areas in the starting area of Guangzhou

International Financial City issued by a renowned planning agency named Shanghai Tongji Urban Planning & Design Institute Co., Ltd in January 2014, Guangzhou International Financial City will develop China's largest underground city. The underground areas are expected to cover around 2.13 million square meters with a depth of around 26 meters. The primary data of technical parameters are shown in Table 6.1 and Table 6.2.

Table 6.1 Planning Indicators of the Project

Layer	Reasonable Amount for Development (10,000 square meters)	Effective Amount for Development (10,000 square meters)
Superficial Layer	240	160
Middle Layer	360	200
Deep Layer	528	210
Total	1,128	530

Table 6.2 Development Indicators of the Project

Types of Underground Facility		Contents	Underground Areas for Development (10,000 square meters)
Underground Traffic Facility		/	135.96
Among it	Subway (including new	Metro No.5,	5.67

	transport modes)		Guangzhou-Foshan Loop Line including Subway Stations	
	Reserved Rail		Linjiang Line and Two Stations	2.18
	Underground Garage		The Underground Construction Area of Each Parking Lot of 40 Square Meters & Areas of Bicycle and Motorcycle Parking Space, Underground Truck Loading and Unloading Sites, Storage and Management Facilities	109.4
	Among	Underground	/	5.9

	it	Public Garage		
	Underground Road		/	16
	Underground Pedestrian System		/	0.66
	Underground Bus Stations		/	0.9
	Sunken Square		/	1.15
	Among it	Public Square	/	0.5
Municipal Facilities			Underground Areas Can be Used for Construction of Municipal Trunk Pipe Network, Transformer and Distribution Power Station, Water Pump Room, Air Conditioning	10.8

		Room, Tool Room and Other Municipal Engineering Construction and Supporting Storage Facilities	
Underground Commercial Service Facilities		Commercial Facilities Generally Account for 10% to 20% of the Development Volume, with Some Overlap	47.4
Among it	Public Commerce	Commercial Pedestrian Streets Under Roads and Public Commercial Under Part of	20

		Land Mass	
Other Underground Public Facilities		Culture, Finance and Entertainment	5.6
Underground Facilities		/	13.8
Among it	Underground Public Facilities	/	1.7

The underground areas of Guangzhou International Financial City consist of five basements in total, where multiple facilities such as railway stations, new traffic means, parking lots and civil air defense are integrated, shown in Figure 6.1.

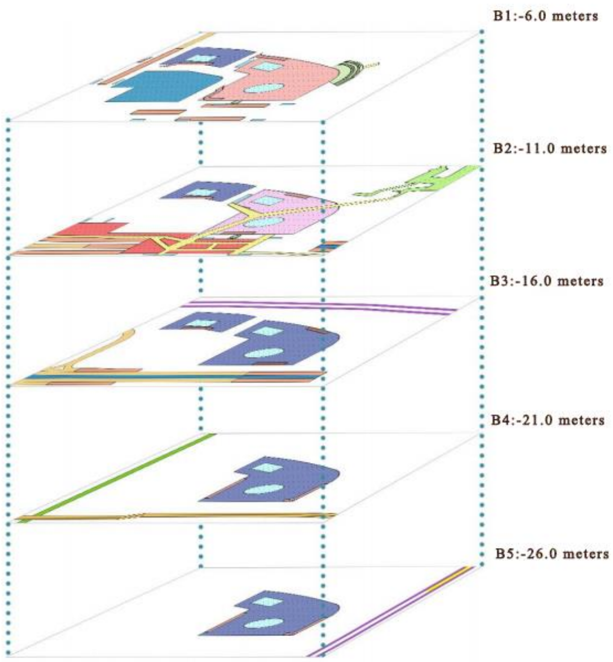

Figure 6.1 Schematic Diagram of the Hierarchical Planning of the Project[10]

10 Primary data from Shanghai Tongji Urban Planning & Design Institute

The underground commercial project cited in this study is in the starting area of Guangzhou International Financial City, shown in Figure 6.2. The main project is located in the 1st and 2nd floors underground, with an area of about 470,000 square meters. The environmental assessment for the underground commercial areas in this project was completed in 2015.

Figure 6.2 Starting Area of the Project

Currently, the project (Guangzhou International Financial City, including its underground city) is still under construction. At least 14 financial institutions had settled in Guangzhou International Financial City (starting area), and nearly 100 enterprises and public institutions had opened their headquarter offices in International Financial City (starting area) by August 2019.

6.2.2 Conditions of the Project Development

1. Economic Condition

The experience of urban development in China and abroad indicates that urban underground areas begin to be massively developed when GDP per capita is 3,000 US dollars, which provides a profound economic foundation for utilizing and developing underground resources in a massive and orderly manner.

According to the data and official information released by local statistics bureaus[11], when the project of International Financial City was launched by Guangzhou Municipal Government in 2011, Guangzhou achieved a Gross Domestic Product (GDP) of 1230.312 billion Yuan, with a permanent population of 12.7019 million and GDP per capita of 96,860 Yuan, far more than 3,000 US dollars. Up to now, Guangzhou achieved a GDP of 2.285935 trillion Yuan in 2018, doubling what it was in 2011. And Guangzhou has been a foreign trade city since ancient times, and now is still the largest international city of trade and business in Southern China. The wholesale and retail industry (single item) accounts for the largest proportion of the tertiary industry, reaching 21% in 2012. Additionally, financial sector, real estate and leasing business services also achieved a sound and healthy development, together accounting for 35.8%.

Economic conditions for planning and developing a replica project: as one of the most important cities in Southern China, Guangzhou exhibits a tremendous potential for economic development and indeed is economically capable of massively developing underground areas.

2. Planning Condition

[11] http://www.stats.gov.cn/

Located in the “urban axis” of Guangzhou’s strategic layout of “One Axis, Two Cities and Three Centres”, Guangzhou International Financial City mainly strives to establish business and trade centres, administrative offices and tour and sightseeing destinations. The business district in Guangzhou extends from west to east, and International Financial City is located in the commercial development axis of Guangzhou from west to east. In terms of development trend, International Financial City-Pazhou Business District will become the representative of a new generation of business districts in Guangzhou, striving to be a landmark model in Guangzhou; even China.

The underground areas of Guangzhou International Financial City are expected to be connected with 2.5 million square meters’ high-end office buildings, aiming to provide services for 164,000 employees and 24,000 residents. Traffic and visitor flow will produce colossal business opportunities. The commercial development along the underground railway can not only make up for the shortage in the economic benefits of underground traffic facilities but also complement aboveground commercial activities, thus making economic activities more active and dynamic.

Planning conditions for replica projects: With the overall development of Guangzhou International Financial City, social and economic activities such as commerce, business, conference, business tours and training are rapidly growing, which will provide a solid planning foundation and customer base for developing underground commercial projects in Guangzhou Financial City.

3. Social Condition

The aboveground areas of Guangzhou International Financial City are expected to cover an area of 4.4 million square meters where human and traffic flow will be massive. Only expanding road network and broadening streets aboveground is undoubtedly the best option for a new type of urban development.

Only by creating underground urban areas and building sufficient railways, roads, sidewalks, parking lots underground and other underground transfer facilities can we solve urban traffic issues, divert local human flow and traffic flow, protect the ecological environment and promote the sound development of Financial City.

Social conditions for replica projects: The underground commercial areas of Guangzhou International Financial City is developed by relying on the overall development of the underground areas of Guangzhou International Financial City, being in line with the overall interests of developing underground areas in Guangzhou International Financial City and meeting the essential life demands for shopping, catering, entertainment and recreation for permanent residents living aboveground and migrant populations on railways.

6.2.3 Objective of the Project Development

The primary objective of developing underground commercial project in Guangzhou International Financial City is economic benefits.

Profit is essential for an enterprise to survive, and economic benefit is what developers mainly expect from their investment. Guangzhou International Financial City can produce a significantly dynamic flow of human, information, capital and energy. The underground commercial project of Guangzhou International Financial City is certainly very profitable.

A variety of factors such as traffic, environment and disaster prevention would have been considered when developing the underground commercial project in Guangzhou International Financial City, as follows:

1. Traffic: The underground commercial project of Guangzhou Financial City is the major business section for the entire project of Financial City, but underground traffic facilities need to be integrated, and essential traffic facilities such as underground parking lots and entrances and exits of rail transit need to be provided so as to create favourable entrances for attracting and facilitating human flow.
2. Environment: It is hot and usually rainy in Guangzhou, thus seriously affecting outdoor activities. However, underground areas provide comfortable underground place for tourists when it is windy, rainy, freezing or hot. It is advised to implant the concept of environmental protection and energy saving by designing energy saving and environmentally friendly buildings and public areas and user-friendly facilities for the underground commercial project of Guangzhou Financial City to establish an environmentally friendly commercial image full of energy, vitality and cultural spirit.
3. Disaster Prevention: With naturally endowed protection ability, underground areas are a major part of the disaster prevention system. It can effectively prevent and reduce disasters when cities are threatened by wars, natural or man-made disasters.

In addition to flood, underground areas can better protect a city from multiple disasters than aboveground areas. Though a part of the overall development project of Guangzhou International Financial City, underground commercial projects still need to be disaster preventive. In addition, special attention should be paid to safety facilities such as underground firefighting facilities and emergency access to ensure people's safety.

6.2.4 Challenges of the Project Development

Guangzhou International Financial City involves an investment amount of billions of Yuan. Despite considerable potential profits, development lead time is long, so it is an investment recovery cycle. Any minor accident or mistake during project development will result in capital chain rupture or even project failure.

The retail business is developing steadily in Guangzhou. Traditional commercial areas are crowded with customers and visitors. And emerging underground commercial areas are also flourishing. Therefore, the project has to undertake pressure from external competition. Project operation such as functional planning, market positioning and business layout has to be carefully considered.

Lastly, other benefits and objectives of business supporting projects such as underground parking lots, landscaping and disaster prevention also cannot be neglected while developing Guangzhou International Financial City as it is crucial to achieve win-win results for enterprises, government and society.

The investment prospects and risks indicate that a lot of factors are involved in developing the underground commercial project of Guangzhou International Financial City with varying importance. All strategic decision-making factors for project development should be screened and analysed. And it is necessary to build a strategic management model for effectively developing, utilizing and managing projects to provide guidance for decision-makers and ultimately achieve optimal economic benefits.

6.3 Development of the Strategic Management Model in AHP

6.3.1 Development of AHP Model

Based on the above research, the strategic decision factors are divided into external factor and internal factor. The external factors include macro environment, market development, and land conditions, while the internal factors include development positioning, planning & design, and operation management. Therefore, a strategic management model underlying various strategic decision factors can be developed based on taking optimal economic benefits for the project.

For simplicity and convenience, C label series is defined as strategic decision factors, hereinafter referred to as C factors, respectively marked from C1 to C6. Among them, each C factor has five subdivision factors, in a total of 30 subdivision factors, hereinafter referred to as S factors, respectively marked from S1 to S30, as shown in Figure 6.3.

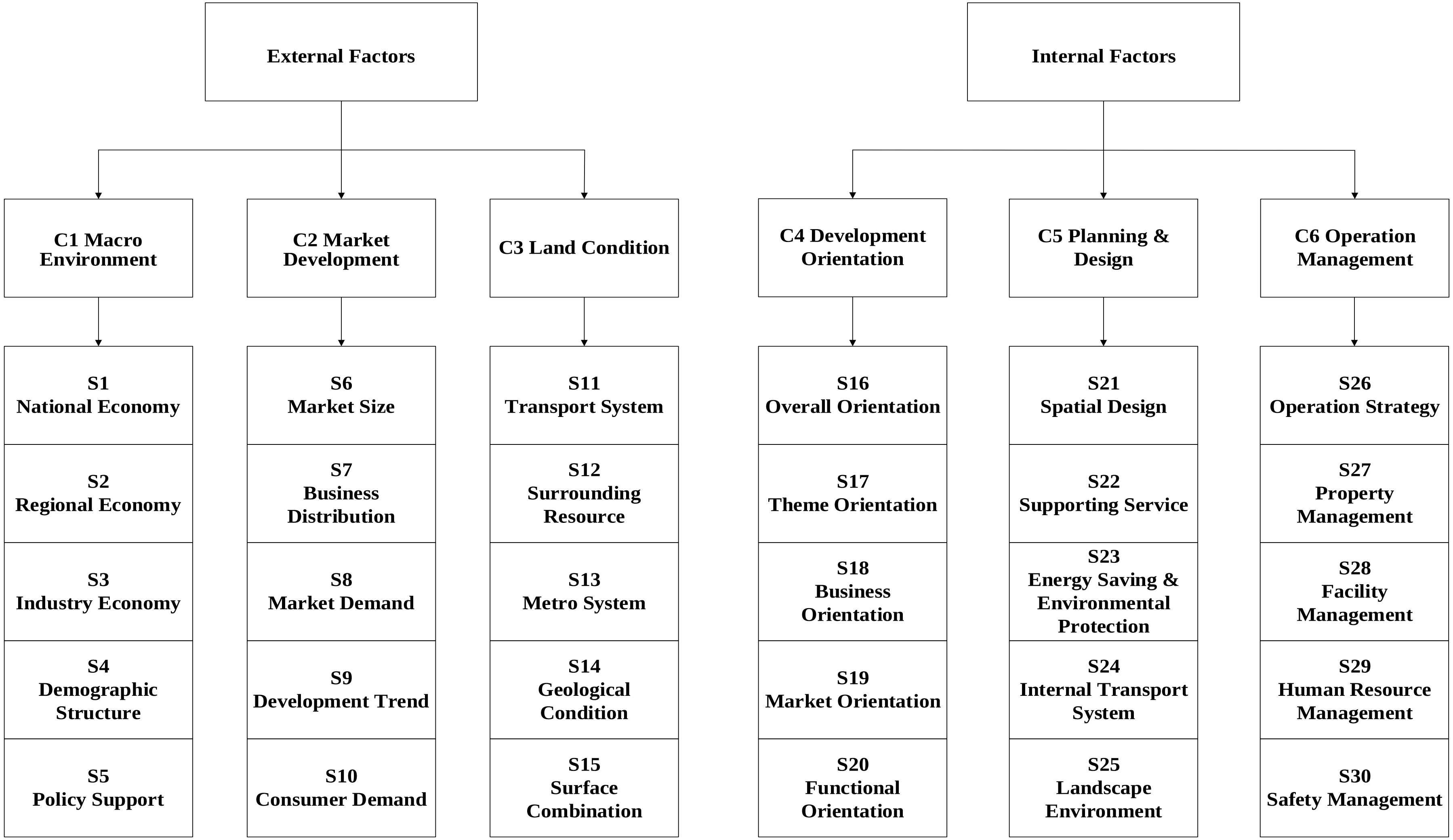

Figure 6.3 AHP Strategic Decision Factors Framework

In terms of the specific decisions for the underground commercial project in Guangzhou International Financial City, what strategic decision factors (C factors) and segmentation factors (S factors) are the most important should be highlighted and prioritized. AHP method is applied in this study to screen and sort strategic decision factors for effective project development, utilization and management.

As mentioned, the basic idea of AHP is to decompose a complicated problem into multiple components by dividing and sorting interconnected orderly hierarchies or establishing an internally dependent hierarchical sub-structure that describes the function or characteristics of a system. During system analysis, the relative scale is presented by pairwise comparison of relative importance between factors (or objectives, rules or schemes). And during system integration, the judgment matrix of upper factors to lower relevant factors is constructed to present the order of the relative importance of relative elements to a certain upper element. The core of AHP is ranking, including the principles of hierarchical structure, scaling and ranking. Moreover, in addition to the traditional use of AHP, absolute evaluation quantity method is also needed to obtain the optimal scheme. However, as computer technology is becoming increasingly mature, it will be more effective to obtain calculation results employing modern software. This study employs Yaahp hierarchical analysis software, which strictly complies with the basic operation formula and operation rules of AHP. The multi-code decisions analysis tasks where AHP or fuzzy comprehensive evaluation is required or where the AHP method and fuzzy comprehensive evaluation need to be integrated by the hierarchical analysis software that is highly consistent with the international mainstream hierarchical analysis software. The whole calculation process is constrained by the consistency ratio of 0.1. To facilitate calculation, the consistency check of single hierarchical ranking and overall ranking can be automatically conducted until relevant results are obtained.

6.3.2 Development of AHP Strategic Management Model

The economic benefit is undoubtedly a primary objective for a commercial project. After analysis and integration, the AHP model of the underground commercial project in Guangzhou International Financial City can be divided into four layers, as shown in Figure 6.4.

1. The highest layer (overall objective layer): This is the overall objective mentioned earlier, which is the optimal economic benefit of the underground commercial project in Guangzhou International Financial City or M1.
2. The primary middle layer (evaluation criterion layer): This includes six categories of strategic decision-making factors. The indexes of C factors: C1 macro environment, C2 market development, C3 land condition conditions, C4 development orientation, C5 planning & design, and C6 operation management.
3. The secondary middle layer (evaluation criterion sub-layer): This is the segmentation index of six categories of strategic decision factors mentioned earlier. The index of S factors contains a total of 30 sub-indexes, which are from S1 to S30.
4. The lowest layer (scheme execution layer): This is four kinds of facilities in the

form of areas utilization adopted by the underground commercial project in Guangzhou International Financial City, and is index P: P1 transport system facilities, P2 commercial supporting facilities, P3 environmental landscape facilities, and P4 disaster prevention system facilities.

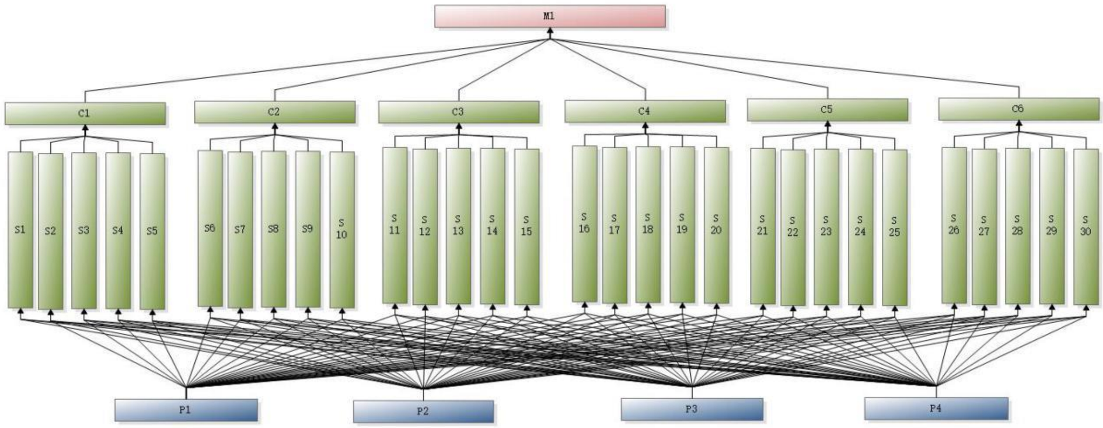

Figure 6.4 AHP Strategic Management Model

In addition, this study interviewed and consulted a group of planning experts, university scholars, industry experts and enterprise executives in the field of underground commercial areas. And a group of expert questionnaires were designed and issued to construct an expert judgment matrix (see Appendix III).

6.4 Model Verification and Validation

6.4.1 Model Operation

The judgment matrix was constructed by consulting experts based on the relationship between layers and the important relationship between the factors of the same category on the same layer. The expert judgment matrix, the geometric normalized value of each factor, the root value of eigenvalue of maximum, the weight to the superior layer and the calculation results of consistency check were all directly listed above the table due to the difference in calculation software.

1. Firstly, the consistency check of Factor 6C on the overall objective M1 was conducted, with results shown in Table 6.3.

Table 6.3 The Consistency Check of Factor 6C on the Overall Objective M1

M1	C1	C2	C3	C4	C5	C6	Wi
C1	1.0000	0.5000	2.0000	3.0000	3.0000	4.0000	0.2503
C2	2.0000	1.0000	3.0000	3.0000	3.0000	3.0000	0.3237
C3	0.5000	0.3333	1.0000	0.3333	2.0000	4.0000	0.1236
C4	0.3333	0.3333	3.0000	1.0000	3.0000	2.0000	0.1661
C5	0.3333	0.3333	0.5000	0.3333	1.0000	2.0000	0.0776
C6	0.2500	0.3333	0.2500	0.5000	0.5000	1.0000	0.0588

M1 The consistency ratio: 0.0784; The weight to M1:1.0000; λmax: 6.4941

According to the formula of consistency check, the following can be obtained:

$$CR=\frac{CI}{RI}=\frac{\frac{\lambda_{max}-n}{n-1}}{RI}=\frac{\frac{6.4941-6}{6-1}}{1.24}=0.07842857143<0.1$$

The results indicate that the judgment matrix exhibits excellent consistency.

2. Secondly, the consistency check of Factor 6C on the internal 30S was conducted, with results shown in Table 6.4 to Table 6.9.

Table 6.4 The Consistency Check of C1 on S1-S5

C1	S1	S2	S3	S4	S5	Wi
S1	1.0000	0.5000	2.0000	0.3333	2.0000	0.1572

S2	2.0000	1.0000	3.0000	0.5000	3.0000	0.2639
S3	0.5000	0.3333	1.0000	0.3333	2.0000	0.1117
S4	3.0000	2.0000	3.0000	1.0000	3.0000	0.3829
S5	0.5000	0.3333	0.5000	0.3333	1.0000	0.0844

C1 The consistency ratio: 0.0326; The weight to M1:0.2503; λmax: 5.1463

The result: CR=0.0326<0.1, pass the consistency test.

Table 6.5 The Consistency Check of C2 on S6-S10

C2	S6	S7	S8	S9	S10	Wi
S6	1.0000	3.0000	0.3333	0.5000	0.3333	0.1241
S7	0.3333	1.0000	0.5000	0.3333	0.3333	0.0835
S8	3.0000	2.0000	1.0000	3.0000	2.0000	0.3599
S9	2.0000	3.0000	0.3333	1.0000	0.5000	0.1711
S10	3.0000	3.0000	0.5000	2.0000	1.0000	0.2615

C2 The consistency ratio: 0.0844; The weight to M1:0.3237; λmax: 5.3781

The result: CR=0.0844<0.1, pass the consistency test.

Table 6.6 The Consistency Check of C3 on S11-S15

C3	S11	S12	S13	S14	S15	Wi
S11	1.0000	0.5000	0.3333	2.0000	0.5000	0.1304
S12	2.0000	1.0000	0.5000	0.5000	0.3333	0.1337
S13	3.0000	2.0000	1.0000	3.0000	2.0000	0.3539
S14	0.5000	2.0000	0.3333	1.0000	0.5000	0.1312

S15	2.0000	3.0000	0.5000	2.0000	1.0000	0.2508

C3 The consistency ratio: 0.0872; The weight to M1:0.1236; λmax: 5.3905

The result: CR=0.0872<0.1, pass the consistency test.

Table 6.7 The Consistency Check of C4 on S16-S20

C4	S16	S17	S18	S19	S20	Wi
S16	1.0000	0.3333	0.3333	0.3333	0.5000	0.0757
S17	3.0000	1.0000	3.0000	2.0000	3.0000	0.3848
S18	3.0000	0.3333	1.0000	2.0000	3.0000	0.2440
S19	3.0000	0.5000	0.5000	1.0000	3.0000	0.1960
S20	2.0000	0.3333	0.3333	0.3333	1.0000	0.0995

C4 The consistency ratio: 0.0640; The weight to M1:0.1661; λmax: 5.2866

The result: CR=0.064<0.1, pass the consistency test.

Table 6.8 The Consistency Check of C5 on S21-S20

C5	S21	S22	S23	S24	S25	Wi
S21	1.0000	3.0000	0.5000	0.3333	0.5000	0.1328
S22	0.3333	1.0000	0.5000	0.3333	0.3333	0.0806
S23	2.0000	2.0000	1.0000	0.5000	3.0000	0.2607
S24	3.0000	3.0000	2.0000	1.0000	2.0000	0.3489
S25	2.0000	3.0000	0.3333	0.5000	1.0000	0.1770

C5 The consistency ratio: 0.0766; The weight to M1:0.0776; λmax: 5.3432

The result: CR=0.0766<0.1, pass the consistency test.

Table 6.9 The Consistency Check of C6 on S26-S30

C6	S26	S27	S28	S29	S30	Wi
S26	1.0000	2.0000	3.0000	0.5000	2.0000	0.2517
S27	0.5000	1.0000	3.0000	0.5000	3.0000	0.2049
S28	0.3333	0.3333	1.0000	0.3333	3.0000	0.1169
S29	2.0000	2.0000	3.0000	1.0000	3.0000	0.3462
S30	0.5000	0.3333	0.3333	0.3333	1.0000	0.0802

C6 The consistency ratio: 0.0772; The weight to M1:0.0588; λmax: 5.3460

The result: CR=0.0772<0.1, pass the consistency test.

3. Thirdly, the consistency check of Factor 6C on the Execution Layer 4P was conducted, with results shown in Table 6.10 to Table 6.15.

Table 6.10 The Consistency Check of C1 on P1-P4

C1	P1	P2	P3	P4	Wi
P1	1.0000	2.0000	4.0000	3.0000	0.4532
P2	0.5000	1.0000	4.0000	3.0000	0.3220
P3	0.2500	0.2500	1.0000	2.0000	0.1241
P4	0.3333	0.3333	0.5000	1.0000	0.1007

C1 The consistency ratio: 0.0687; The weight to M1:0.2503; λmax: 4.1833

CR=0.0687<0.1, pass the consistency test.

Table 6.11 The Consistency Check of C2 on P1-P4

C2	P1	P2	P3	P4	Wi

P1	1.0000	0.5000	4.0000	3.0000	0.3128
P2	2.0000	1.0000	5.0000	3.0000	0.4710
P3	0.2500	0.2000	1.0000	2.0000	0.1163
P4	0.3333	0.3333	0.5000	1.0000	0.0999

C2 The consistency ratio: 0.0744; The weight to M1:0.3237; λmax: 4.1988

CR=0.0744<0.1, pass the consistency test.

Table 6.12 The Consistency Check of C3 on P1-P4

C3	P1	P2	P3	P4	Wi
P1	1.0000	4.0000	6.0000	4.0000	0.5892
P2	0.2500	1.0000	2.0000	2.0000	0.1842
P3	0.1667	0.5000	1.0000	3.0000	0.1390
P4	0.2500	0.5000	0.3333	1.0000	0.0876

C3 The consistency ratio: 0.0976; The weight to M1: 0.1236; λmax: 4.2606

CR=0.0976<0.1, pass the consistency test.

Table 6.13 The Consistency Check of C4 on P1-P4

C4	P1	P2	P3	P4	Wi
P1	1.0000	0.5000	3.0000	3.0000	0.3085
P2	2.0000	1.0000	3.0000	3.0000	0.4330
P3	0.3333	0.3333	1.0000	3.0000	0.1645
P4	0.3333	0.3333	0.3333	1.0000	0.0939

C4 The consistency ratio: 0.0806; The weight to M1: 0.1661; λmax: 4.2153

CR=0.0806<0.1, pass the consistency test.

Table 6.14 The Consistency Check of C5 on P1-P4

C5	P1	P2	P3	P4	Wi
P1	1.0000	0.5000	3.0000	3.0000	0.3219
P2	2.0000	1.0000	2.0000	3.0000	0.4091
P3	0.3333	0.5000	1.0000	2.0000	0.1653
P4	0.3333	0.3333	0.5000	1.0000	0.1038

C5 The consistency ratio: 0.0536; The weight to M1: 0.0776; λmax: 4.1431

CR=0.0536<0.1, pass the consistency test.

Table 6.15 The Consistency Check of C6 on P1-P4

C6	P1	P2	P3	P4	Wi
P1	1.0000	0.2500	4.0000	2.0000	0.2432
P2	4.0000	1.0000	3.0000	4.0000	0.5367
P3	0.2500	0.3333	1.0000	1.0000	0.1082
P4	0.5000	0.2500	1.0000	1.0000	0.1119

C6 The consistency ratio: 0.0941; The weight to M1: 0.0588; λmax: 4.2512

CR=0.0941<0.1, pass the consistency test.

6.4.2 Result Analysis

The weights of factors in the models can be obtained based on the calculation results.

1. The first is the total weight of the P-C-M model, as shown in Figure 6.5.

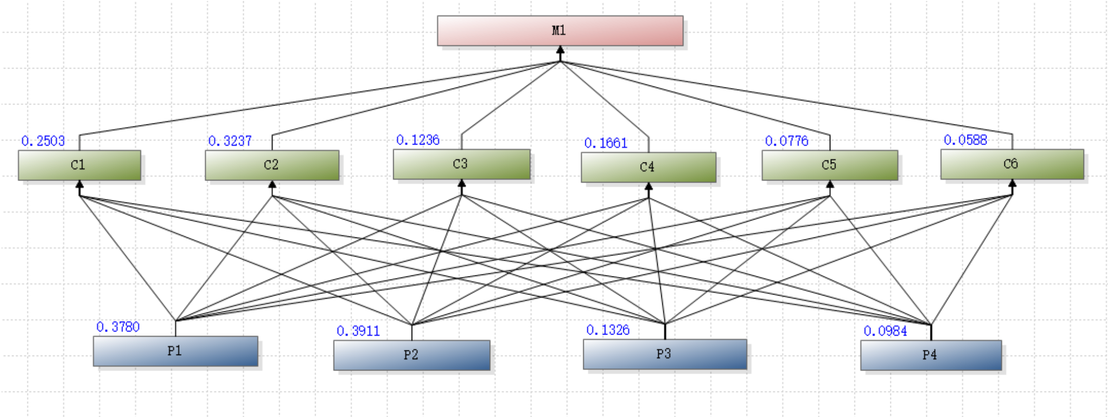

Figure 6.5 “P-C-M” Weight Distribution

According to the calculation results in Figure 5.1, transport system facilities (P2) accounts for the largest weight of the scheme execution layer. The underground commercial areas in this project should be developed and utilized mainly by transport system facilities (P2), followed by commercial supporting facilities (P1), then environment landscape facilities (P3) and then disaster prevention system facilities (P4).

2. The second is the weight of S-C-M model, as shown in Figure 6.6.

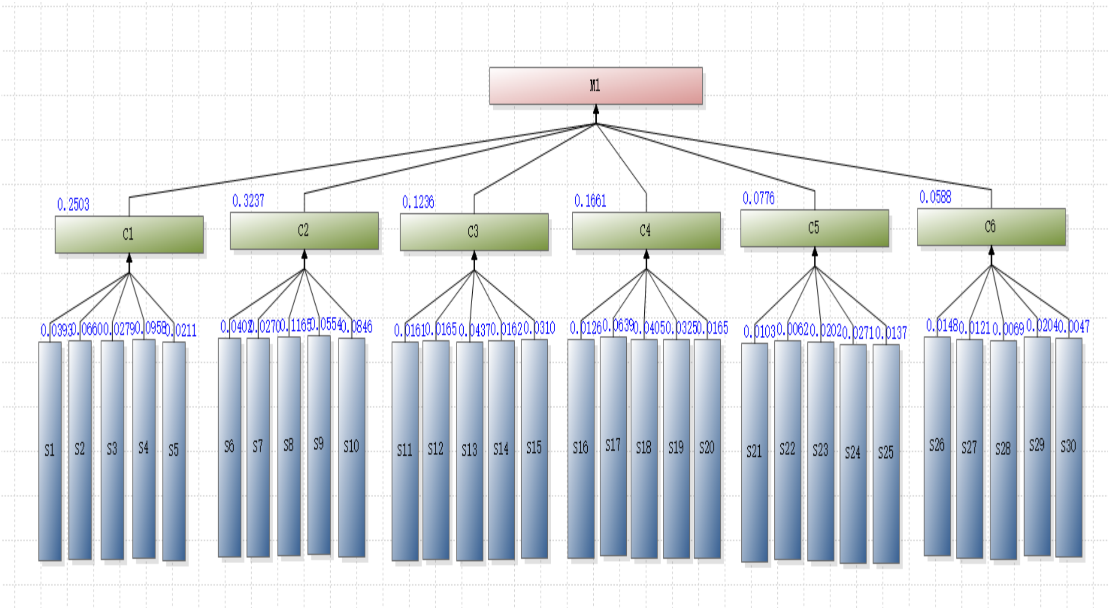

Figure 6.6 “S-C-M” Weight Results

The third is the secondary middle layer (evaluation criterion sub-layer), or the ranking of the weights of 30S factors, as shown in Table 6.16.

Table 6.16 The Weights or Ratios of the Factors on the Secondary Middle Layer

Middle layer	Ranking of Weight
S8	0.1165
S4	0.0958
S10	0.0846
S2	0.066
S17	0.0639
S9	0.0554
S13	0.0437
S18	0.0405
S6	0.0402
S1	0.0393
S19	0.0325
S15	0.031
S3	0.0279
S24	0.0271
S7	0.027
S5	0.0211
S29	0.0204

S23	0.0202
S20	0.0165
S12	0.0165
S14	0.0162
S11	0.0161
S26	0.0148
S25	0.0137
S16	0.0126
S27	0.0121
S21	0.0103
S28	0.0069
S22	0.0062
S30	0.0047

The calculation result is obtained by calculating the S-C-M model of the same data.

According to the calculation results in Table 6.16, the factor of commercial demand (S8) accounts for the largest weight of the scheme execution layer, followed by demographic structure (S4) and then consumption demand (S10). The factors ranking in the forefront need to be highlighted and utilized to achieve optimal economic benefits.

The last is the primary middle level (evaluation criterion layer) or the ranking of the weights of 6C factors, as shown in Table 6.17.

Table 6.17 The Weight Distribution of Primary Middle Layer

Middle Level	Ranking of Weight
C2	0.3237
C1	0.2503
C4	0.1661
C3	0.1236
C5	0.0776
C6	0.0588

It’s observed that the calculation results shown in Table 6.17 are entirely consistent with those in Figure 6.5 and Figure 6.6.

According to the calculation results in Table 6.17, the factor of market development (C2) is the most important factor among strategic decision factors. It is necessary to focus on market development, in which business demand and development trend need to be carefully considered. The underground commercial areas are developed and utilized still based on “market demand, consumption demand and competitive situation”.

The factor of macro environment factor (C1) accounts for the second-largest weight. The favourable macro environment to real estate projects is like a fish in the water. The favourable macro environment is conducive to the effective development, utilization and management of the project.

The factor of development orientation (C4) accounts for the third-largest weight. The successful project positioning helps identify target customers, establishing commercial image and creating economic benefits.

6.4.3 Empirical Analysis

By applying the strategic management model with optimal economic benefits updated based on AHP, it can empirically analyse the indicators and data such as site selection, positioning, planning and operation for developing underground commercial project in Guangzhou International Financial City, as shown in Table 6.18. And it is found that the model is applicable to the development and utilization of underground commercial projects in International Financial City, and it is prospective, guiding, accurate and practical.

Table 6.18 Empirical Analysis of the Project

Ranking of Weight	Primary Factor	Secondary Factor	Empirical Factors and Data
Weight 1	Market Development (C2)	Market Size (S6)	The annual average growth rate of the total retail volume is 30% The growth rate of underground commercial areas is larger than that of traditional aboveground commercial areas
		Business Distribution	Tianhe business district is still the largest business district in Guangzhou

		(S7)	There is no others in same around the project
		Business Demand (S8)	Financial City is large in planning volume and huge in commercial demands.
		Development Trend (S9)	The supply is large, and it is faced with huge market competition and pressure
		Consumer Demand (S10)	It is dominated by young fashion and household consumption, the annual income is generally between 20,000 and 80,000, and the consumption is mainly middle grade
Weight 2	Macro Environment (C1)	National Economy (S1)	China's GDP is the second largest in the world, and its total import/export volume is also the second largest in the world
		Regional Economy (S2)	Guangzhou's GDP was 1.35 trillion Yuan in 2012, with a growth rate of 10.5%
		Industry Economy	Commerce and retail industries are pillar industries, accounting for the

		(S3)	largest proportion of the tertiary industry
		Demographic Structure (S4)	The permanent population was around 13 million in Guangzhou in 2012, with an annual increase of about 500,000 people The population aged between 15 and 64 accounted for 81.91%
		Policy Support (S5)	The strategy of “promoting urban development by financial power” Guangzhou International Financial City located in the “urban axis” of with a strategic layout of “One Axis, Two Cities and Three Centres”, which has great potentials in customers and market.
Weight 3	Development Positioning (C4)	Overall Positioning (S16)	International commerce tourism and cultural centre
		Theme Positioning	The most “tasteful” place in Guangzhou

		(S17)	
		Industry Positioning (S18)	Dominated by underground commercial stores, it promotes other stores by experience stores
		Market Positioning (S19)	Achieve displaced achievement with other business districts, and it is dominated by medium- and high-end consumption
		Function Positioning (S20)	Entertainment experience centre, food experience centre, technology experience centre, business experience centre, and cultural experience centre
Weight 4	Land Condition (C3)	Traffic Positioning (S11)	It is surrounded by main avenues, but the traffic to the south of the project is not active
		Surrounding Resources (S12)	It is dominated by residential and professional markets, so the surrounding commercial atmosphere is not strong
		Track (S13)	There are seven bus stations and two subway stations, but they are distributed

			along main avenues. The railway and bus stations are not incorporated into the project
		(S14)	The underground commercial areas of the project are located in the plain terrain
		Surface Combination (S15)	Large-scale commercial facilities are not available aboveground, and they are still under construction
Weight 5	Planning Design (C5)	Spatial Design (S21)	For commercial purposes -1/F & -2/F (transport & commerce), for other purposes -3/F & -4/F (transport & parking space), -5/F (civil defense in peacetime and wartime, reserved projects)
		Supporting Service (S22)	Supporting service for headquarter office and historical and cultural exhibitions, etc.
		Energy Saving (S23)	Green plants are used for landscaping, and it is equipped with recyclable and energy-saving devices

		Internal traffic system (S24)	It is divided into three parts: underground rail system (Metro 4 and Metro 5), underground road system (Guangzhou-Foshan Loop Line) and underground static transport system (underground intelligent parking lots)
		Landscape Environment (S25)	Guide system, landscaping system, lighting beautification system, and audio system
Weight 6	Operation Management (C6)	S26	It is divided into three phases and integrates rental with sales services
		Facility Management (S27)	It is expected to introduce internationally renowned property management companies
		Human Resource Management (S28)	It is expected to be dominated by senior Chinese management teams
		Safety Management (S29)	Introduce intelligent systems

		Property Management (S30)	Improve mechanical and electrical equipment (central air-conditioning, power supply, firefighting, communication system, Internet system, etc.)

(Some data of the year 2012 is used to ensure the reducibility and validity of the project decision-making)

6.5 Empirical Considerations

1. Market Development

Concerning the factor of market development (C1) which ranks first in weighting, we DTZ / Cushman & Wakefield, an internationally renowned real estate consulting agency, conducted detailed research and analysis on the factor of market development such as the business model, distribution of business circles and market development trend.

Figure 6.7 presents the research result of consumer demand for the project. According to the result, the ratio of consumer demand is the largest for young people aged from 26 to 35. The ratio of population aged between 18 and 45 is up to 76.8%. The consumer demand is mainly dominated by young fashion and family consumption. The annual income is mainly between 20,000 Chinese Yuan to 80,000 Chinese Yuan, and consumption grade is given priority.

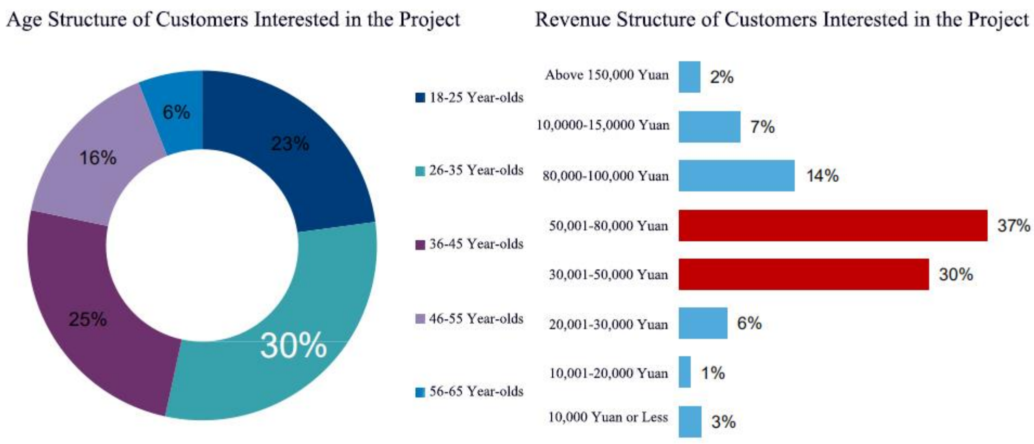

Figure 6.7 Research Result of Consumer Demand

Consumer demand may vary as time moves on, and a new round of survey on consumer demand is required. However, previous market surveys still have certain reference significance.

2. Development Positioning

The factor of development orientation (C4) accounts for the third-largest weight in this project. Originally, the project is generally positioned to be international commerce, tourism and cultural centre to illustrate its international insight, integrate Guangzhou's cultural elements, and keep up with the functional and industrial positioning of International Financial City while satisfying the comprehensive supporting services of Guangzhou Financial City.

The form of business is originally positioned to be dominated by experience stores while promoting other stores by experience stores, thus becoming a "must-visit place" for domestic and global commercial tourists, including:

(1) Entertainment experience centre: add leisure and entertainment elements, such as

theme museum, Tussauds wax museum, etc.

(2) Food experience centre: gather Chinese and western cuisines, such as local specialities.

(3) Scientific and technological experience centre: promote brands such as Huawei, Apple and Samsung and attract more customers.

(4) Business experience centre: provide distinguished business experience and high-end private business club.

(5) Cultural experience centre: gather Guangzhou's special culture such as Guangzhou and Chaoshan cultural collection, shown in Figure 6.8.

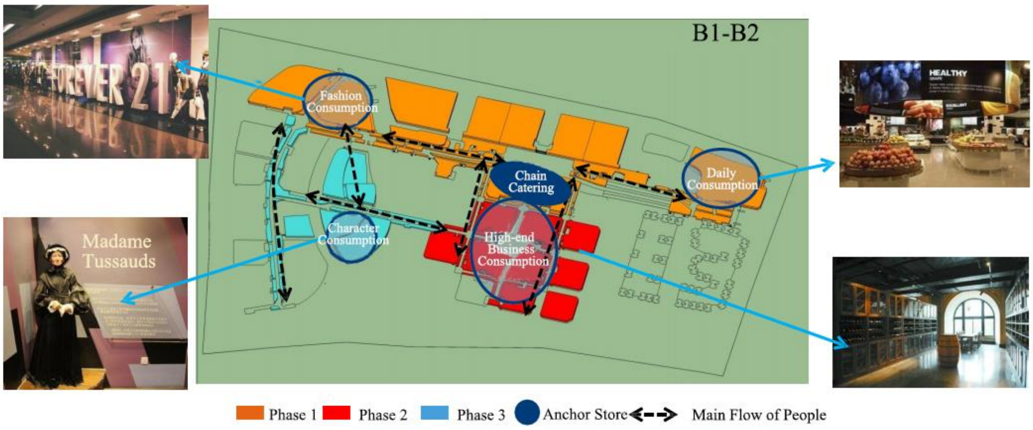

Figure 6.8 Original Business Layout Plan

Project positioning planning is still far from being out of date. The project integrates cultural, financial and local characteristics, presents food specialities and keeps abreast with current cyber celebrities, just as great minds think alike.

3. Overall Development

From the big picture of the performance of underground commercial projects in China, Only relying on underground commercial system is far from enough in today's market.

The underground commercial projects will still find it challenging to run despite strong support from underground traffic systems. It is important to establish an excellent interactive relationship with aboveground commercial circles. Therefore, underground areas in this project cannot be developed only for the purpose of developing independent underground commercial areas. It is advised to have vertical interaction and business interaction with aboveground business circles, jointly develop and operate underground commerce with aboveground commercial projects.

Fortunately, ground construction is moving on steadily. Both high-rise buildings and ground commercial facilities are increasing, and commercial demands are expanding, providing a foundation for interacting with underground commercial areas in future.

4. Traffic System

By relying on the development of the overall underground areas in the financial city of Guangzhou City, this project is closely related to traffic systems. In other words, traffic is a decisive factor for the success of this project. How underground commercial areas connect with aboveground traffic and underground traffic directly affects commercial interests.

5. Planning & Design

This project mainly focuses on economic benefits, but social benefits, environmental benefits and disaster prevention benefits must be simultaneously considered. It is an important part of the plan. The environmental landscaping system of this project mainly includes green plant system, lighting system, guidance system and landscape sketch systems. This project focuses on creating space nodes to reduce consumers' visual fatigue, aiming to enhance the safety measures such as fire prevention and alarm, reserving sufficient parking lots, combining peacetime and wartime and ensuring necessary disaster prevention functions.

The environmental landscape system of this project mainly includes green plant systems, lighting systems, guide systems and landscape sketch systems. The project attaches great importance to creating space nodes and improving consumers' visual pleasure.

Safety measures such as firefighting and alarm are strengthened and sufficient parking lots for civil defense so that the project is functional for peacetime and wartime and capable of dealing with disasters.

6. Operation Management

Though this project focuses on the development work, it is a key point to utilize and manage underground commercial areas. Hence, operation management is still an indispensable strategic decision factor for the success of the project.

In terms of development timetable, the project is divided into three phases based on the timetable of aboveground land transfer, land maturity and the accessibility of road networks.

Phase I is the north of landmass, which is adjacent to one side of Huangpu Avenue. It is somewhat mature with some human traffic from neighbouring residential buildings and subway stations (Keyun Road Station and South Chepi Station), so its business atmosphere has been rapidly improving. Phase II is the centre of landmass. Human traffic can be introduced by subway hubs in Phase I, two-layer bus stations and aboveground commercial areas. Phase III is the southeast of landmass, which relies on the riverside landscape, but aboveground land transfer is lacking. Thus, it requires a long period of commercial cultivation, but it is expected to rely on new traffic modes to introduce more human traffic.

In terms of the operation mode, it is dominated by sales and rental. A majority of commercial property giants in Hong Kong build their projects, which are mostly rented. However, based on the actual conditions of mainland China, rental and sales will be combined to ensure the quick withdrawal of funds.

6.6 Chapter Summary

The development of the underground commercial project in the International Financial City of Guangzhou City was considered in this chapter to verify the validity, practicability and objectivity of the strategic management model of an underground commercial project. This project began in 2013, and it is still in the process of planning, construction and investment attraction now (in 2020). The decision-making environment at the beginning is substantially different from today. The original decisions and conclusions have not yet been verified or improved because the project is not successfully confirmed. However, undoubtedly, decision-making methods can be long-term, though effective decisions and conclusions are time sensitive. And decision framework should be stable, effective, mature, integrated and capable of embracing temporal and spatial changes. The methods are eternal despite the fact that everything is renewed. The current decision system can still be used for original decisions, and it can also be used for exploring existing commercial opportunities. It will always be useful regardless of the repeated changes in future commercial environments.

The strategic management model verified in this study is highly targeted and inclusive. It is also a set of mature and integrated decision systems. It contains objective economic environment, market development factors and subjective planning and positioning. It also includes market research and operation management, so it is practical and flexible.

Chapter 7 Conclusions

7.1 Introduction

This chapter begins by reviewing the research objectives to see if they have been achieved. It then summarises the study's key conclusions, identifies the thesis's contribution to the relevant body of knowledge and to industry practice, and finally discusses the research limitations and future research directions.

7.2 Review of Research Objectives

1. Through reviewing the current development, utilization and management of underground commercial areas, this study critically summarises and analyses the basic information of underground commercial areas, the value characteristics of developing underground projects, and the special focuses in the literature on the project development of underground commercial areas. The special focuses are: influential factors including economic level, urban size and underground rail transit; motivational factors including incremental effect and market motivation; and success factors such as the combining with urban agglomeration and expansion, coordinating with aboveground areas, adapting multi-function and environment, balancing urban ecosystems, achieving comprehensive benefits and relying on technological advances. Multiple reviews of the current development, utilization and management of underground commercial areas developed a solid theoretical foundation for this study. Based on the review results combined with document analysis and practical experience, the strategic decision factors covering the

different stages of project development are identified and analysed from internal and external perspectives. There are three external primary strategic decision factors, which are macro environment, market development, and land condition; and three internal strategic decision factors, which are development orientation, planning & design, and operation management. For each primary strategic decision factor, five secondary strategic decision factors are derived: for macro environment, the derived factors are the national economy, regional economy, industry economy, demographic structure, and policy support; for market development, the derived factors are market size, business distribution, market demand, development trend, and consumer demand; for land condition, the derived factors are transport system, surrounding resource, metro system, geological condition, and surface combination; for development orientation, the derived factors are overall orientation, theme orientation, business orientation, market orientation, and functional orientation; for planning & design, the derived factors are spatial design, supporting service, energy saving & environmental protection, internal transport system, and landscape environment; for operation management, the derived factors are operation strategy, property management, facility management, human resource management, and safety management.

2. The strategic management model to improve the quality of decision-making for project lifecycle development of underground commercial areas is established underlying the various strategic decision factors, which consists of strategic

objective layer, primary decision-making layer, secondary decision-making layer, and tactical execution layer. For the strategic objective layer, social benefits, environmental benefits and combat readiness benefits are advised to be comprehensively considered for underground commercial areas in addition to economic benefits to enhance the sustainable strategic advantages for project development. For the primary and secondary decision-making layer, the various strategic decision factors are the key for decision-makers to comprehensively study underground commercial areas at the initial stages of a project. For the tactical execution layer, four specific execution schemes are involved pertaining to underground commercial areas, including the traffic system scheme, commercial supporting scheme, environmental landscaping scheme, and disaster prevention system scheme.

3. In the application of the AHP method and Yaahp software, the strategic management model is verified and validated by taking the strategic objective of optimal economic benefits for Guangzhou International Financial City, scored and evaluated through the Delphi method. By applying the strategic management model with optimal economic benefits updated based on AHP, it can empirically analyse the indicators and data such as site selection, positioning, planning and operation for developing underground commercial projects in Guangzhou International Financial City. The results show that the strategic management model established in this study is applicable to effective development, utilization and management of

underground commercial areas.

7.3 Research Conclusions

The following conclusions can be drawn from this study:

First, with the development of the economy and improvement of people's living standards, underground commercial areas have become an important direction for developing urban spatial resources, and the effective development, utilization and management of underground commercial areas has been a symbol of urban commercial maturity. The comprehensive understanding of underground commercial areas, particularly of the influential factors, motivational factors and success factors of the project development of underground commercial areas, lays a solid foundation for further study of underground commercial areas in any direction. Consideration of the various strategic decision factors identified and analysed in this study cover the different stages of project lifecycle development of underground commercial areas to enhance the ability of high-level decision-makers working for state-owned and private enterprise developers concerned with the overall project situation and long-term development.

Second, the strategic management model established in this study is comprehensive, objective and practical, serving as a scientific management system and a comprehensive body of knowledge, which can greatly help developers improve the quality of decision-making for project lifecycle development of underground commercial areas. This will help top decision-makers to explore and achieve the project strategic objectives and aspirations, and gain sustainable strategic advantages for effective development, utilization and management of underground commercial areas.

Third, the strategic management model in the application of the AHP method and Yaahp software is applicable to effectively determine the ranking of weight and ratio of the various strategic decision factors in order to screen out and focus on key factors that need to be analysed explicitly in different projects. The study results show that the established strategic management model underlying the various strategic decision factors established in this study can significantly lead to the determination of effective development, utilization, and management of underground commercial areas.

7.4 Research Contributions

7.4.1 Contributions to Knowledge

From an academic perspective, this study enriches theoretical development in the fields of underground development, commercial development, project management, strategic management, and project decision-making.

First, it is the first attempt to investigate such comprehensive strategic decision factors covering the different stages of project lifecycle development of underground commercial areas from the developer's perspective. And the in-depth theoretical study of the definition, classification, historical development of underground commercial areas, and the value characteristics of underground projects, and the special focuses regarding influential factors, motivational factors and success factors of the project development of underground commercial areas lay a solid foundation for any study related to underground commercial areas from a multi-scale perspective. The various strategic decision factors derived in this study not only fill the gaps in this field but also guide further related study to meet the needs of academic development. And such identification and analysis method applied in this study contributes to further theoretical research on project development of underground commercial areas along with rapid knowledge update. Such in-depth study and application have been ignored in previous studies.

Second, it is the first attempt to establish a strategic management model consisting of different levels including strategic objective layer, primary decision-making layer, secondary decision-making layer, and tactical execution layer to improve the quality of project decision-making by developers of underground commercial areas. The strategic management model underlying the comprehensive strategic decision factors covering the project lifecycle development of underground commercial areas make up a scientific management system and comprehensive body of knowledge to best achieve the effectiveness and success of underground commercial projects. Such in-depth study and application have been ignored in previous studies.

7.4.2 Contributions to Practice

From a practical perspective, this study can help developers improve the quality of decision-making for project lifecycle development of underground commercial areas, thus exploring and achieving the project strategic objectives and aspirations, and gaining sustainable strategic advantages for effective development, utilization and management of underground commercial areas.

First, For the long-term development of an enterprise, strategy is a matter of life and death. Regardless of which strategy is chosen for investment or development, it is a key issue affecting the future. For enterprises, without a long-term strategy, they could be eliminated by the changing market or competitors. For enterprises and decision-makers, strategy and strategic thinking are important issues. Therefore, only when a clear strategy is formulated can the development of enterprises have goals, organizations have cohesion, and personnel have motivation and centripetal force. The established strategic management model in this study can enhance the ability of high-level decision-makers from developers to do a feasibility study for the overall project situation and long-term development for a real-life project of underground commercial areas providing a comprehensive, objective and practical tool for positioning and evaluation at the initial stage of a project. The various decision-making factors covering the different stages of project lifecycle development can greatly enhance the ability of high-level decision-makers from developers to address concerns over the overall project situation and long-term development.

Second, an enterprise needs a capable leader, and a capable leader needs to be able to formulate the right strategy, otherwise the enterprise could be eliminated to a certain extent because it cannot keep up with changes in the market. Meanwhile, a good strategy needs to be implemented by executive management and executed by a talented and informed management team, otherwise all the visions will come to nothing. A good strategy depends on a scientific management model for implementation. After formulating a comprehensive strategy, it relies on a scientific management model to implement the strategy. The application process of such management model established in this study can help developers carry out the strategic decision factors screening and ordering and do specific case analysis for more accurate development of real-life projects. Meanwhile, as the main purpose of most modern commercial development is to operate and profit, sometimes a conflict may occur between urban development and environmental protection. The strategic management model in this study is established to achieve comprehensive project benefits. It suggests that social benefits, environmental benefits and combat readiness benefits must be considered in addition to economic benefits. This will significantly help developers to scientifically implement strategic objectives to facilitate the effective development and management of commercial projects, which is applicable and meaningful to all commercial development projects.

7.5 Research Limitations and Further Study

The research findings in this study are mostly to improve the quality of decision-making for project development of underground commercial areas. It covers the whole project lifecycle development, and the research findings are mainly working for the stage of project decision-making from the viewpoint of developers. However, it should be noted that usually there are risks and uncertainties during the development process of a real-life project, some of which may not be fully addressed or previewed at the stage of decision-making. For a real-life application to a project, it still needs concrete analysis for specific cases in consideration and combination of the internal ability and resources of the developers. At the same time, there are other concerns worthwhile for further study, such as the design undertakings, contract procurements and construction work, especially from the viewpoint of contractors, etc. With the speeding progress of industry and the update of knowledge, there will inevitably be more concerns to be focused and researched about underground commercial areas.

All things considered, when land is horizontally expanded for today, we turned our attention to underground areas for expansion tomorrow. There can be little doubt that underground development, which at present is a novelty, will become a massive revolution once the commercial benefits are fully realized by developers. Advice from the author of this thesis is that the government needs to realize the importance of marketization and industrialization of underground commercial areas, and positively encourage and support private capital to participate in the development, utilization and management of underground commercial areas. Meanwhile, developers and managers of underground commercial areas should carry forward the enterprise spirit and pay close attention to social benefits, environmental benefits and combat readiness benefits in addition to economic benefits when developing underground commercial projects, which will realize the true sense of effective development, utilization and management of underground commercial areas.

Appendix I: Expert Interview Sheet

Research Title:

Effective Development, Utilization and Management of Underground Commercial Areas.

Brief Introduction:

This study aims to develop a strategic management model to help developers improve the quality of decision-making for project lifecycle development of underground commercial areas, thus explore and achieve the project objectives and aspirations, and gain sustainable strategic advantage for effective development, utilization and management of underground commercial areas.

To satisfy the research aim, three research objectives in this study are presented as below:

1. To identify and analyse the strategic decision factors covering the project lifecycle development of underground commercial areas.
2. To establish a strategic management model to improve the quality of decision-making for project lifecycle development of underground commercial areas.
3. To evaluate the strategic management model by a case study.

Open-ended Questions:

1. What is the status and potential of underground commercial areas in China and the world?
2. How to measure the success and effectiveness of the development, utilization and

management of underground commercial areas?

3. What are the core value and particularity of underground commercial projects in China?
4. What are the main developers of underground commercial projects in the current industry?
5. What are the key issues for the development, utilization and management of underground commercial areas from the viewpoint of developers?
6. What are the possible guiding thoughts of developing underground commercial areas from the viewpoint of developers?
7. How to investigate and facilitate the project decision-making of underground commercial areas?
8. What aspects and factors need to be considered for the project decision-making of underground commercial areas?
9. What are the possible elements that make up the management system of project decision-making for underground commercial areas?
10. How to identify and analyse the above elements to best make up the management system? And what could be the research methods for validation?

Appendix II: Questionnaire Sheet I

This interview is to assess the proposed strategic management model underlying the various strategic decision factors covering the different stages of project lifecycle development of underground commercial areas. And the strategic management model is established to improve the quality of project decision-making of underground commercial areas for developers. The attachments are a brief introduction to the overall research and a specific introduction to the strategic management model underlying the various strategic decision factors.

Open-ended questions

1. Is the strategic management model established in this study reasonable and effective? Please give specific comments and suggestions.

____

2. Besides the strategic management model, what key points need to focus on the effective development, utilization and management of underground commercial areas? Please give specific comments and suggestions.

____

Expert Name:

Organization:

Sign: ____________

Date: ____________

Appendix III: Questionnaire Sheet II

Research Title:

Effective Development, Utilization and Management of Underground Commercial Areas.

Survey Scope:

This questionnaire survey is to adopt the Delphi method to evaluate the proposed strategic management model underlying the various strategic decision factors covering the different stages of project development of underground commercial areas. And the strategic management model is established to improve the quality of decision-making for project lifecycle development of underground commercial areas for developers, and involved in the model establishment and the empirical study chapter of the thesis in the application of strategic management model for effective development, utilization and management of underground commercial areas, taking Guangzhou International Financial City Project as an example. The attachment includes a specific introduction to the research, the strategic management model, and each factor is coded to simplify the expression.

Survey Notes:

1. The purpose of this questionnaire survey is to determine the weight ratio of various strategic decision factors for the effective development, management and utilization of underground commercial areas in Guangzhou International Financial City.

2. This questionnaire adopts the design form of the Analytic Hierarchy Process or AHP method. This method compares the importance of the factors at the same level, and the measurement scale is divided into nine levels.

Scale	Description (comparative factors i and j)
1	Factor i is as important as j
3	Factor i is slightly more important than j
5	Factor i is medially more important than j
7	Factor i is heavily more important than j
9	Factor i is definitely more important than j
2, 4, 6, 8	The intermediate value of two adjacent judgments
Count Backwards	When compare the degree of insignificance between factor i with factor j

For example

Comparison	Factor i	Factor j
Factor i	No scoring area	Scoring area

(1) Choose 1, it means that factor i is as important as factor j;

(2) Choose 3, which means that factor i is slightly more important than factor j;

(3) Choosing 1 / 9 means that factor i is not extremely important compared to factor j, or that factor j is extremely important compared to factor i;

(No need to fill in the grey bottom frame)

3. This questionnaire has about 15 major questions and takes about 30-60 minutes.
4. The results of the questionnaire survey will be strictly kept confidential, please feel free to score.

Survey Questions:

1. How do you contrast score the weight of the two factors regarding the economic objectives of the underground commercial project in Guangzhou International Financial City?

Two-factor Comparison	C1	C2	C3	C4	C5	C6
C1						
C2						
C3						
C4						
C5						
C6						

2. How do you contrast score the weight of the two sub-factors in C1?

Two-factor Comparison	S1	S2	S3	S4	S5
S1					
S2					

S3					
S4					
S5					

3. How do you contrast score the weight of the two sub-factors in C2?

Two-factor Comparison	S6	S7	S8	S9	S10
S6					
S7					
S8					
S9					
S10					

4. How do you contrast score the weight of the two sub-factors in C3?

Two-factor Comparison	S11	S12	S13	S14	S15
S11					
S12					
S13					
S14					
S15					

5. How do you contrast score the weight of the two sub-factors in C4?

Two-factor Comparison	S16	S17	S18	S19	S20
S16					
S17					
S18					
S19					
S20					

6. How do you contrast score the weight of the two sub-factors in C5?

Two-factor Comparison	S21	S22	S23	S24	S25
S21					
S22					
S23					
S24					
S25					

7. How do you contrast score the weight of the two sub-factors in C6?

Two-factor Comparison	S26	S27	S28	S29	S30

S26					
S27					
S28					
S29					
S30					

8. How do you contrast score the implementation layer which is more affected by C1 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				
P4				

9. How do you contrast score the implementation layer which is more affected by C2 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				

P4				

10. How do you contrast score the implementation layer which is more affected by C3 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				
P4				

11. How do you contrast score the implementation layer which is more affected by C4 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				
P4				

12. How do you contrast score the implementation layer which is more affected by C5 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				
P4				

13. How do you contrast score the implementation layer which is more affected by C5 factors?

Two-factor Comparison	P1	P2	P3	P4
P1				
P2				
P3				
P4				

Expert Name:

Organization:

Sign: _____________

Date: _____________

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