STANDARDIZED RESIDENTIAL BUILDING DESIGN IN CHINA: MAJOR DEVELOPERS' PRACTICE OF DESIGN STANDARDIZATION IN RESIDENTIAL PROPERTY DEVELOPMENT

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Standardized Residential Building Design in China: Major Developers' Practice of Design Standardization in Residential Property Development

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Certificate of Originality

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Zhou Fang

Abstract

In the past 20 years, the growth of the real estate industry both supports and relies on the urbanization processes of China and has provided opportunities and challenges to developers. In order to seize opportunities and avoid risks, to achieve a rapid project development mechanism, developers have started to repeatedly use pre-determined project positioning framework and prepared corresponding design deliverables since the early 2000s. Prior research has explored the aims, pros, cons, situation, and developers' preparation and application processes of design standardization. However, little empirical study has been conducted in previous research, and most prior research investigates the use of design standardization from the perspective of the developer. Therefore, this research was designed to 1) quantify the degree and situation, 2) to understand the associated correlating factors, and to 3) gain perspectives of multi-stakeholders of design standardization.

The main results show the overall degree of the use of design standardization is 57.3%, and there are major design strategies and varieties of differences in developers' application of standardized designs. The use of design standardization is related to project positioning at the project level, the developer's development volume at the organizational level, and the land area and population density at the societal level. This research also summarized stakeholders' insights on the aims, pros and cons, estimations, and expectations of the use of design standardization. This research has

attained its research objectives, contributed to advance the knowledge of design standardization, and draw valuable policy and practical implications.

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Chapter 1 Research Statement

1.1. Introduction

The development of China and the Chinese real estate industry since China's opening up in 1979 and the initiation of commercialization and privatization of urban housing in the 1980s have significantly gained world attention (Chen, 1997; Chiu, 1993; Man, Zheng, & Ren, 2011, pp. 3–5; Zhao & Bourassa, 2003). Within the past 40 years, the average annual GDP growth of China has reached nearly 10 percent. With this growth, the urbanization rate surpassed 50% for the first time in 2010 (NBS, 2019) reflecting the millions of migrant populations moving from rural to urban areas in China. Obviously, there is a positive interplay between the process of urbanization and the development of the real estate industry. Urbanization provides opportunities for the development of the property industry, for example, urban housing demands and developed urban infrastructure (Chen, 1997; Logan, Fang, & Zhang, 2010; Man et al., 2011, p. 5; Zeng, Chen, & Tam, 2005; Zou, Zhang, & Wang, 2007). Simultaneously, the property industry drives and supports the urbanization process in China, for example, accommodation of migrants, and the job opportunities provided for migrants (Guan, Feng, & Zeng, 2001; Wu, 2009). In the past 20 years, the real estate industry has experienced a significant development. According to Table 1, generated from government statistics from the National Bureau of Statistics (NBS) of China, annual investments in the Industry has reached 10.26 trillion RMB in 2016 and the areas under construction was 7.60 billion square meters. Nevertheless, the annual investment in the Industry was only 2.53

trillion RMB and the areas under construction was 2.36 billion square meters in 2007 (NBS, 2010, 2011, 2012, 2013, 2014a, 2015, 2016a, 2017b, 2018).

Table 1 Investment and Area Under Construction of China's Real Estate Industry in 10 Years From 2008 to 2017

	Investment Into Real Estate Development (In Trillion RMB)	Investment Into Residential Development (In Trillion RMB)	Area Under Construction (In Billion m^2)	Area of Residential Under Construction (In Billion m^2)
2017	10.98 (+7.0%)	7.51 (+9.4%)	7.81 (+3.0%)	5.36 (+2.9%)
2016	10.26 (+6.9%)	6.87 (+6.4%)	7.60 (+3.2%)	5.21 (+1.9%)
2015	9.60 (+1.0%)	6.46 (+0.4%)	7.36 (+1.3%)	5.12 (-0.7%)
2014	9.50 (+10.5%)	6.44 (+9.2%)	7.26 (+9.2%)	5.15 (+5.9%)
2013	8.60 (+19.8%)	5.90 (+19.4%)	6.66 (+16.1%)	4.86 (+13.4%)
2012	7.18 (+16.2%)	4.94 (+11.4%)	5.73 (+13.2%)	4.29 (+10.6%)
2011	6.17 (+27.9%)	4.43 (+30.2%)	5.08 (+25.3%)	3.88 (+23.4%)
2010	4.83 (+33.2%)	3.40 (+32.9%)	4.05 (+26.6%)	-
2009	3.62 (+16.1%)	2.56 (+14.2%)	3.20 (+12.8%)	-
2008	3.06	2.21	2.74	-

The rapid development of the real estate industry in the past 20 years brought both opportunities and challenges to the developers. ~~the demand for developers has increased, and many people have seized opportunities in the industry.~~ Huge market demands created a large number of developers (Li, 2012), and many developers' have fortunately seized the opportunity and improved their performance dramatically within the past 10 to 20 years according to industry consultancies report and developers open resources. For example, Evergrande Group believes it has turned standardization operational model into a comparative advantage in the market competition, and the official website of Evergrande Group (2019) reveals its key performance indicators (KPIs) have been 142-folded to 294-folded from 2006 to 2017. Looking back at major developers' footsteps, they started to adopt pre-determined design positioning frameworks and prepared corresponding design deliverables since the early 2000s, in order to achieve a rapid and repetitive project development mechanism. It does not only timely respond to the increasing fast-growing industry, but also addressed the risks of project's time constraint and project-to-project learning challenge. Prior academic research has investigated the aims, pros, cons, required prior conditions, and the current situation of the developers' preparation and application of design standardization. These prior studies generally support developer's use of standardizations and design standardization. Many developers have also disclosed materials related to the use of design standardization in their annual reports, published (for example, official websites) and unpublished (for example, internal materials for training purpose) resources, showing the majority of the industry materials also generally supports the idea of the use

of design standardization. Generally speaking, there are some prior research materials that were pertinent, valuable, and authoritative. However, there is still a lack of published scholarly materials on this topic. This research aims to trace the development of the developers' project-level implementation of design standardization. It is hoped that the findings of this research will be proven to be useful in understanding the phenomenon of major developers' use of design standardization in property development in China in the past 10 to 20 years.

1.2. Research Aims and Objectives

The use of design standardization has been examined though different perspectives: for example, Long (2012) adopted a case study approach and conducted research to look into one of the key developer's strategic use of standardization. Mei (2013) adopted a document analysis approach and investigated developers' standardization operational models. It seems the majority of prior research has adopted qualitative approaches. In addition, most previous research took the massive use of design standardization in the property development industry as a research presupposition. The outcomes of previous research are valuable, however perceptions on the degree and situation of the use of design standardization seem to be based on personal experience rather than research evidence. It seems there are currently no quantitative studies available that have been conducted to measure the degree and situation of the use of design standardization. Consequently, the first aim of this research has been built to fill this gap.

Research Aim 1:

The first aim of this research is to quantify the degree and situation of the use of design standardization, and to understand associated correlating factors.

And based on the identified first research gap, research objectives are formulated in order to achieve the first aim of this research through designed Studies 1 and 2.

Research Objective 1A: To quantify the overall degree of the use of design standardization (Study 1);

Research Objective 1B: To quantify the situation of the use of design standardization by developers and cities (Study 1);

Research Objective 1C: To quantify the varieties of the use of design standardization by developers and cities (Study 1);

Research Objective 1D: To identify developers' design standardization strategies (Study 1);

Research Objective 1E: To understand correlating factors of design standardization and multi-level variables (Study 2).

Prior research has also thoroughly investigated the aims, the pros, the cons, and the required and ideal prior conditions of the use of design standardization. Developers' preparation and application processes of the use of design standardization have also been explored. Findings from previous studies will be presented in Section 2.3. However, the majority of prior research examines the use of design standardization from developers' perspectives. Limited research focuses on the perspectives of other stakeholders. Therefore, the second research aim has been identified.

Research Aim 2:

The second aim of this research is to explore the perspectives of multi-stakeholder on the use of design standardization.

Study 3 is designed to discover other stakeholders' perspectives on design standardization, and the developed objectives include:

Research Objective 2A: To gain stakeholders' insights on the initiation of design standardization;

Research Objective 2B: To understand stakeholders' evaluation on the pros and cons of design standardization;

Research Objective 2C: To understand stakeholders' estimation on the situation and corelating factors of use of design standardization;

Research Objective 2D: To understand stakeholders' expectation on the future use of design standardization.

Based on these two established research aims, two studies to collect quantitative data and one study to collect qualitative data were designed to address the first and the second research aims respectively. The research designs of the three studies will be presented in detail in Chapter 3.

Figure 1 Research Framework

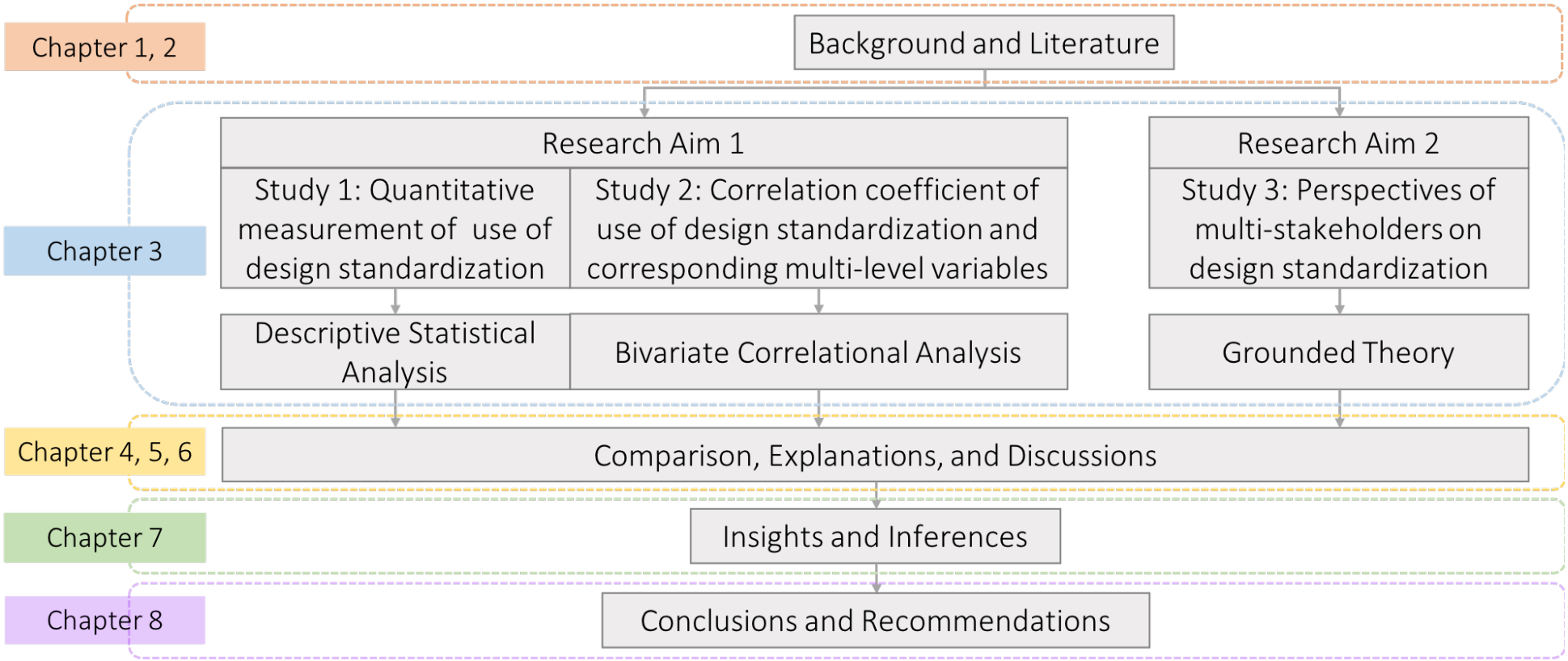
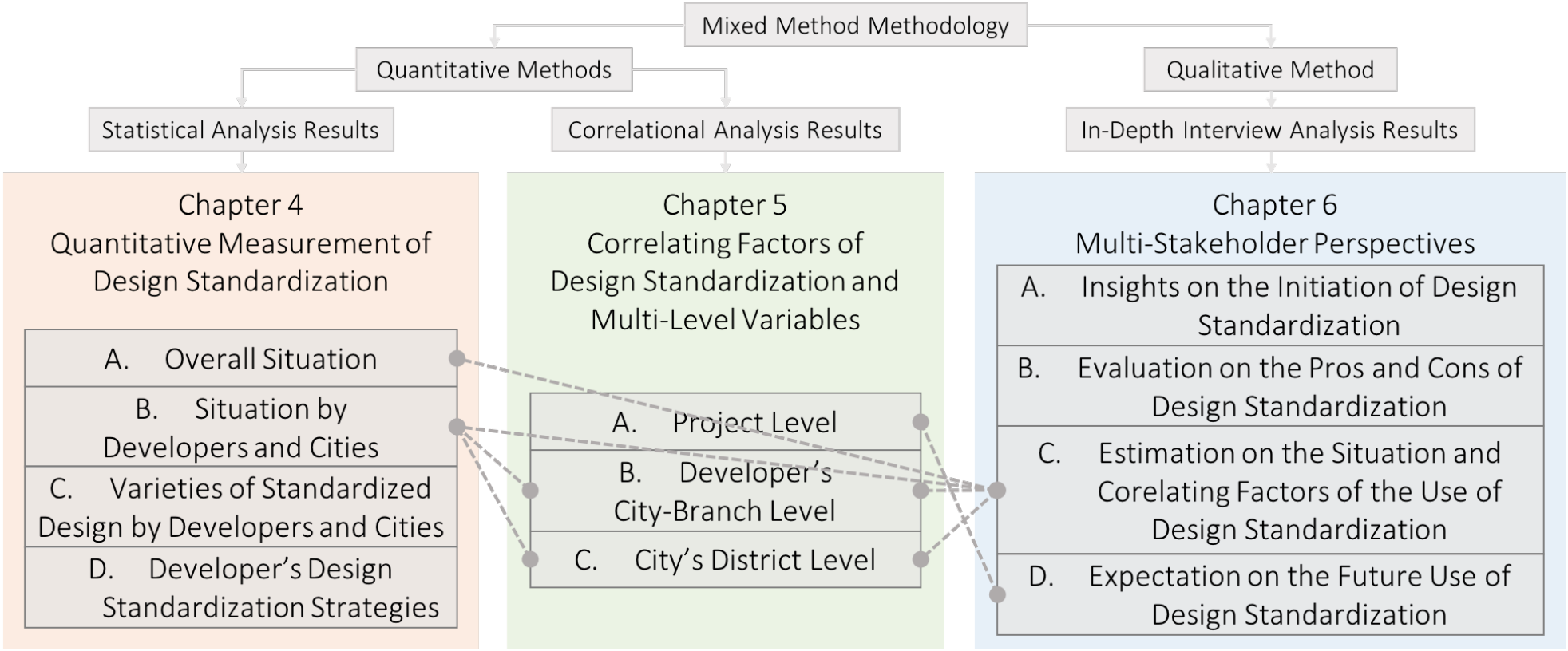


Figure 2 Framework of Research Finding Chapters



1.3. Research Framework

In terms of addressing the proposed research objectives,
Figure 2 illustrated the organization and connections of Chapters 4, 5, and 6. In Chapter 4, four major findings of Study 1 will be presented, including the overall degree of the use of design standardization, the degree and situation by developers and cities, varieties of standardized design by developers and cities, and the developer's design standardization strategies. In Chapter 5, major findings of Study 2 will be discussed, including correlating factors of the use of design standardization and project-level, developer-level, and city-level variables respectively. In Chapter 6, four major findings of Study 3 will be reported, including stakeholders' insights on the initiation of design standardization, evaluation on the pros and cons of design standardization, estimations on the situation and corelating factors of the use of design standardization, and expectation on the future use of design standardization. Furthermore, stakeholders' estimation on the corelating factors of the use of design standardization that collected in Study 3 support the generation of testing variables of Study 2. Therefore, stakeholders' estimations and assumptions on the use of design standardization will be discussed in Chapter 5. In section 6.4, stakeholders' estimation on the degree and situation of the use of design standardization and results of quantitative measurement will be compared and contrasted.

1.4. Significance of Study

1.4.1. A Changing Scenario

The real estate industry is one of China's main economic growth pillars. While the Chinese economy has experienced 40 years of explosive growth, the current Chinese economy and real estate industry are both in its historical transition. As there are always different expectations and predictions for the future economy development of China before and after, the general outlook is for moderate economic growth in the next decades, but at a much slower rate. With the moderate economic growth, it is evident that China's urbanization process will continue in the future. Therefore, new housing construction and investment into the real estate market remain necessary. However, the common understanding is that China's future development will be at a much slower pace compared with the last four decades. The projected annual average GDP growth rate of China is 5.9% from 2021 to 2025 and 5.0% from 2026 to 2030 (World Bank & Development Research Center of the State Council PRC, 2013, p. 84). In 2016, the most authoritative Chinese state media People's Daily (2016) also reports: "it is expected the economic growth of China is slowing down in a relatively long-term." The economic recovery form has been predicted and described as L-shaped instead of U-shaped or V-shaped by the Chinese authorities.

Regarding the overall economy outlook of China, the development and expansion of the real estate industry will gradually slow down within the next 10 years, with the firmly establishment of migration. Some prior challenges for developers will be lifted (e.g. time constrains) and new opportunities and

challenges for developers will abound. It is significant to trace the developers' use of design standardization at this transitional period of time, and it is hoped that results of this research will be useful in improving the understanding of this phenomenon among the government and academic community, in order to better serve and regulate the real estate industry. It is also hoped that this research will improve industry's understanding on the use of design standardization, in order to better adapt to the changing industry atmosphere.

1.4.2. Significance for Residential Design Research

From developers' residential design management point of view, design is a knowledge-intensive process that affects the whole project lifecycle. The work devoted to planning and design stages is significant to a project's overall quality and total cost. Furthermore, residential design is responsible for public safety, public health, and the use of land and other public resources (Li, 2012, p. 4; Wei, 2008, pp. 1, 58). In addition to its physical values, residential design includes also social, economic, and political values (Arias, 1993). In the real estate industry, many developers have started to realize the significances of design quality. From the general public's perspective, there are magnets for people seeking a better residential environment as China has made great strides in living standard improvement along economic growth. Consequently, potential occupants are likely to have higher expectations on residential designs to accommodate personalized and individualized needs. More observations are therefore valuable to find out developers' previous strategies in implementing design standardization.

1.5. Organization of Chapters

There are in total eight chapters of the research. Chapters 1 and 2 introduce the research backgrounds and objectives, and present previous studies within the established scope of the research respectively. Chapter 3 describe the adopted methodology of the research. Chapters 5, 6, and 7 present findings of the research and discuss the connections of findings of the research with reviewed materials. Chapter 7 and Chapter 8 present summary of findings of the research, implications from the findings of the research, and researcher's insights and recommendations based on major research findings.

Chapter 2 Design Standardization in Residential Building Design

2.1. Introduction

The research into design standardization in residential building design in the process of residential property development activities in China is emerging and industry-oriented. It is agreed that there is generally a lack of a common-grounded and well-recognized theoretical framework of design standardization as a developer's design management approach in the process of property development in China (Mei, 2013, p. 54; Zhang, 2012, p. 2). In order to improve understanding of design standardization, this chapter will mainly discuss the following. First, in Section 2.2, the researcher will report findings of the general concept of standardization from a knowledge management point of view and some general concepts of design management related to this study. Then, the researcher will report findings from previous literature specified on the use of design standardization in residential property development in section 2.3. In this section, previous works on the aims, the pros and cons, the current situation, and the preparation and application processes of design standardization will be introduced. The reviewed literature includes not only scholarly materials but also a rich resource of developers' unpublished internal documents and drawings. It is expected to establish a clarified understanding of design standardization in residential property development in China through the reviews in section 2.4.1. In section 2.4.2, the researcher will compare and contrast some similar concepts with design standardization, for example design precedent and mass customization, and discuss the unique nature of

the use of design standardization in residential property development in China.

2.2. Standardization and Design Standardization

2.2.1. Standardization

According to the PRC's national guidelines for standardization (Standardization Administration of PRC, 2014), the concept of standardization is defined as:

> In order to achieve the best order and to promote common benefits within the established limits, to solve problems or potential problems, to establish common and repeated use of documents and the process of preparation, publication and application of documents.

This definition has framed the aims, approaches, and the processes of standardization. The aims of standardization within established limits listed in this definition include (i) to achieve the best order and to promote common benefits, and (ii) to solve problems or potential problems. The approach is to establish the common and repeated use of standardized documents, and the standardization process is the preparation, publication. Most of previous research has also applied similar relatively general definitions of standardization, for example, International Organization for Standardization (ISO), dictionaries (e.g. Merriam-Webster), and standardization organizations of various countries (e.g. United States, Germany, and Japan). However, these general definitions do not provide a basis to afford an analysis of the use of design standardization specific to residential property development in China. In the Industry, although the industry practitioners of design

standardization apply this to their project in daily routine, there is still lacking an agreed industry concept.

In China, according to the Chinese Standardization Law (1991), there are national standards, trade standards, local standards, and enterprise standards (article 11 to 17).

> Article 17: Where there are already national standards, trade standards and local standards, enterprises should be encouraged to formulate enterprise standards that are stricter than the corresponding national, trade or local standards and apply them within their enterprises.

Within the scope of this research, the adoption of design standardizations is at the enterprise level, and to formulate and to apply enterprise standards is encouraged. The aims and the processes (mainly preparation and application processes) of property developers use of design standardizations will be reviewed in later section 2.3, following a review of standardization from knowledge management and design management's point of view in sections 2.2.2 and 2.2.3 respectively.

2.2.2. Standardization in Knowledge Management

The property developers are typically knowledge-intensive and project-based organizations. Due to the tide of globalization and urbanization, today more Chinese developers have expanded from city or regional scale to national or even international scale within a relatively short period of time. Under these circumstances, the major two major common problems for developers from the knowledge management's perspective come from: 1) the team-to-team (project level) and project-to-project (organizational level) knowledge

management, and 2) the level of headquarters' central coordination. In other words, it is critical for developers to try to maintain a balance between standardization and localization. Standardization is the epitome of knowledge reuse. In this process, standardization supports the knowledge management activities at multiple levels, for example, at organization, team, and individual levels.

> One of the most common reasons for using standardization in an organizational knowledge management system is to capture internal 'best practices' or adoption of widely used industry practices. (Druffel & Garfield, 2010)

And "using standardized tools and processes to codify knowledge and to share best practices" are the common-adopted approaches of standardization. Druffel and Garfield (2010) believe the aims to use standardization are to capture both tacit and explicit organization knowledge in order to support reusable and workable solutions. To codify this knowledge, the terminology of standardization has been widely adopted both in the academic field and in real estate practices. The majority of previous research has generally divided standardization into two levels, strategic and operational levels. This understanding is also widely accepted in the industry. In terms of the approaches of standardization, Weber et al., (2002) suggest the levels of standardization are different based on various forms, for example, best practice, common approach, guideline, reference framework, and standard. Druffel and Garfield (2010) also suggest the forms of standardization are different and include forms from procedures to methodologies.

Previous research has proven that the adoption of standardization will increase an organization's operational efficiency and effectiveness, and add customer value and competitive advantage (Druffel & Garfield, 2010). Furthermore, the standardization activities will create transparency and increase common understandings among all involved parties (Weber et al., 2002). These aspects were considered as the general strengths in applying standardization in knowledge management in Europe. This researcher believes these findings are valuable because it is specific and supported by concrete evidence of standardization. Some of these findings are found in published Chinese literature, and it will be discussed in the next Section 2.3. However, the researcher also believes that parts of the research are limited and may not be applicable to Chinese design standardization due to its unique nature. Regarding the use of design standardization in residential property development, it remains unknown whether Chinese developers' implementation of design standardization has benefitted the end users. Some of the participants mentioned this issue, which will be reported in Sections 6.3.1.3 and 6.3.2.3, though the researcher believes it is difficult to quantify the added or lowered value due to lack of research. In addition, regarding the current and expected future contents of design standardization in China, if there are any conflicts between intellectual property rights of concerned parties or if intellectual property helps to improve the industry's transparency is difficult to ascertain at this stage. The participants' perspectives of study 3 on this aspect will be discussed in later Section 6.2.1.3.

Besides the advantages of the use of standardization, Weber et al., (2002) also summarized four general concerns against standardization. They are mainly:

i. the success of standardization is highly dependent on agreement among all parties, especially the users and stakeholders of the standardized objects. This is decided by the compromising nature of standardization. Other natures of standardization include the challenge and potential to reach a critical mass and the broad level of consensus required. Therefore, a sound process of standardization takes a long time.
ii. the standards risk being out-of-date due to the long preparation required.
iii. to maintain a sensible degree of standardization of a soft subject in a detailed and structured framework while at the same time maintaining a useable and useful framework.
iv. there is a barrier for human development in terms of creativity and flexibility. Some people believe following standards prevents them from creating their own and innovative solutions beyond the routines. Regarding architecture and construction field's creativity specifically, designers must also realize their aesthetic values in their designs (Piroozfar & Piller, 2013, p. 3).

The findings on the negativities of the standardization from knowledge management's perspective are constructive, and it explores and opens the discussion of the nature of standardization. Many discussions specifying the

nature of design standardization in property development process in China are found in previous literature. The majority of the findings seems to be corresponding with Weber et al.'s (2002) study, and will be presented in the next Section 2.3.

As there are two general strategies of managing knowledge: personalization or connection, and codification or collection (Hansen, Nohria, & Tierney, 1999). Druffel and Garfield (2010) have also identified two types of standardizations: the explicating standardization and evaluating standardization. The explicating standardization is used to explicate knowledge and evaluating standardization provides format to evaluate knowledge.

i. Explicating standardization: This type of standardization captures both explicit and tacit knowledge. This, therefore, makes knowledge shareable and accessible. The approaches of explicating standardization include codification. Lower level skill employees can use knowledge and achieve a better performance at higher skill level through this type of standardization (de-skill). However, Mccall and Sutton (2008) have conducted an experiment and according to the result, to adopt a knowledge management system within an organization may have a harmful effect on employees' personal skill development in the long term.

ii. Evaluating standardization: While explicating standardization is tactical-oriented, evaluating is strategic-oriented. Evaluating standardization "provides a format or structure for capturing and accessing complex knowledge context and content", and this type of

standardization requires relatively high-level skill users. While the explicating standardization simplified the knowledge use process, the aim of evaluating standardization is to create common language for communication.

Based on Druffel and Garfield's (2010) framework, it seems the developers' use of design standardization in residential property development in China generally involves both standardization approaches. The types of standardization are valuable and worth noticing. The researcher proposes to adopt her specific standardization type for residential property design and residential property design management based on the scope of this research, as the current framework does not meet this need.

2.2.3. Standardization in Design Management

As Cooper, Junginger, & Lockwood (2011, p. 48) identified, design management is "the function of defining design problems, finding the most suitable designer, and making it possible for the designer to solve it on time and within budget." To summarize and simplify, the design management is the management of design information and the management of designers, while ensuring design qualities (Emmitt, 2017, p. 11). Emmitt (2017, p. 12) believes design management is a bridge to connect the design culture (iterative, creative, and values creation) and construction culture (linear, pragmatic, and values delivery). The concept of design management and the role of design managers are applied to companies and projects of different natures within the architectural, engineering, and construction industries, for example project managers represent developers, contractors, or consultants.

This research is associated with property developer's management of residential development projects.

De Wit (1988) made a distinction between project success and project management success. Other researchers supported this, and Knotten et al., (2017) elaborated: "Project success is the link to the overall objectives of the project, and project management success is linked to the performance against time, cost, and quality." The use of design standardization in residential property development process is also a tool and technique of developers' design management function. Examining the position of residential building design management in the project environment as shown in Figure 3, in the horizontal dimension, it is related to multiple property developers' organizational functions, for example, design management function, construction management function, and marketing function. In the vertical dimension, it is connected to almost every project process, for example, the project initiation stage, the planning and design stage, and the project implementation stage. The implementation of design standardization is also concerning multiple processes and functions in residential property development project's management as demonstrated in Figure 3.

Figure 3 The Process, Functions, and Contents of Typical Residential Property Development Project's Management Flow

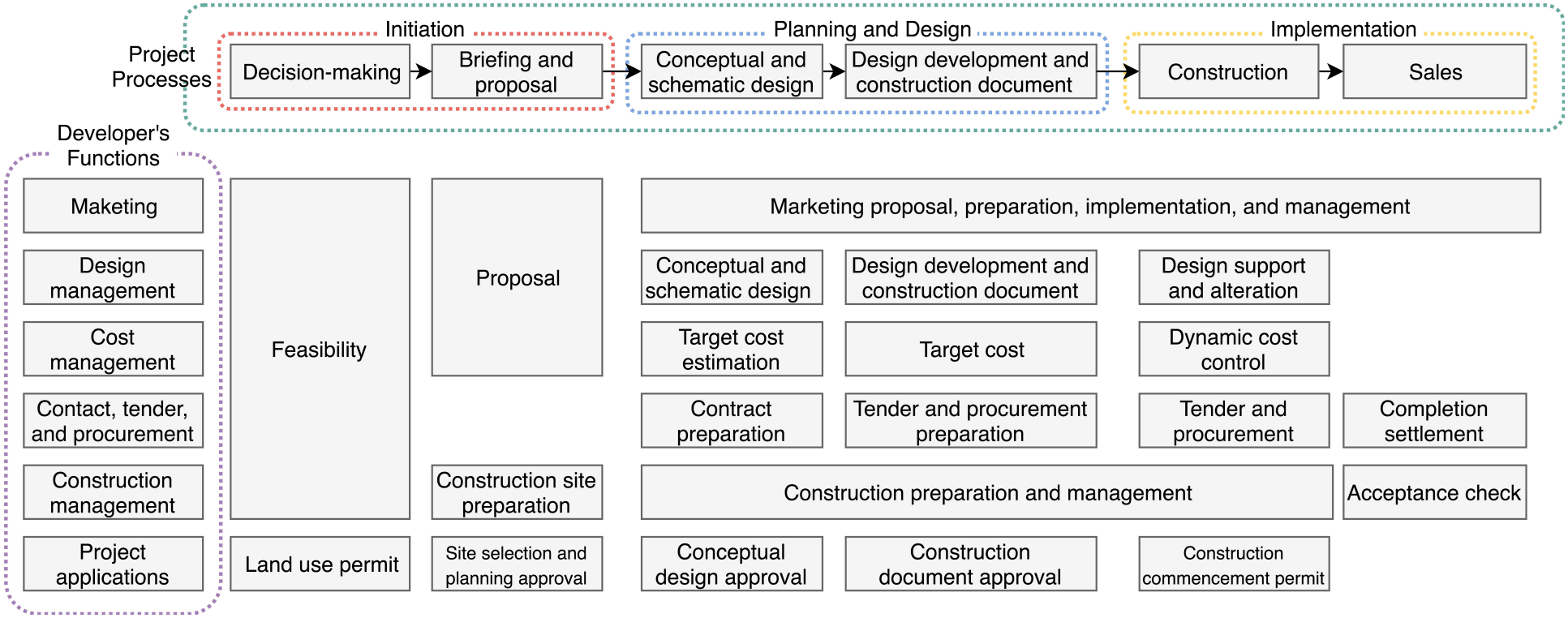


Table 2 The Concerning Processes and Functions of the Use of Design Standardization in Residential Property Development Project's Management

	Project Initiation		**Project Planning and Design**		**Project Implementation**	
	Decision-Making	Briefing and Proposal	Conceptual and Schematic Design	Design Development and Construction Document	Construction	Sales
Marketing	×	×	×	×	×	×
Design Management	×	×	×			
Cost Management	×	×	×			
Contract, Tender, and Procurement	×		×	×	×	
Construction Management	×		×	×	×	
Project Application	×	×	×	×		

2.3. Standardization and Design Standardization in Residential Property Development in China

The developers' extensive use of standardization in residential property development activities in China is a relatively broad concept. It has been primarily examined at organizations strategic level, organizations' functions and projects' processes' operational level, and projects implementation level. For example, Long (2012) has conducted a case study of one sample developer, and focused on the sample developer's organizational standardization strategies systems. Jiang's (2014) postgraduate research was concentrated on large Chinese real estate developers' use of standardizations at operational levels, and has mainly introduced the developers' standardized design, cost, and construction operations. A dissertation by Mei (2013) also focused on the real estate developers' use of standardization at operational levels and has analyzed the Chinese developers' standardized operation models. These research studies are all specifically focus on the developers' use of standardizations and design standardizations in residential property development in China. Furthermore, these authors were affiliated with a reputable university in the related research fields, for example, Jiang (South China University of Technology) and Mei (Chongqing University). The supervisor of Long's research dissertation is the founder and president of the sample developer. Generally speaking, the research studies that have been reviewed are valuable, pertinent, and authoritative. However, few scholarly materials have been published on this topic.

2.3.1. Aims

There are multiple aims of the developers' initiation and adoption of the use of design standardizations in the process of property development in China; nevertheless, the major and the fundamental aims of the use of design standardizations is to implement standardized designs rapidly and repeatedly in multiple projects. According to Jiang (2014, p. 2), while the real estate industry has experienced about 20 years' high-speed development, and many developers have expanded from the city-scale based developer to the national-scale based developer. The developers have accumulated many successful experiences and lessons learned from failures. Therefore, it is necessary for the developers to adopt the standardized designs and to initiate the design standardization operation procedures, in order to develop future projects rapidly and repeatedly. Furthermore, Mei (2013, p. 5) believes it is inevitable for the developers to use standardized designs, in order to realize the repetitive implementations of projects' designs.

In the industry, one of the leading developers conducted a comparative investigation in 2011 in order to compare 15 of this developer's past projects with their competitors' past projects across seven geographical regions of China since 2007 (CRLAND, 2011, pp. 4–7). The main finding of this investigation showed this developer's average project duration is 28 months and the duration ranges from 17 to 52 months, while this developer's three major competitors' average project duration is approximately 12 months only. Then, this developer has further listed the factors that have caused delays of this developer's project development progress. This developer found that

eight out of 15 delayed projects were due to the frequently projects' positioning and design decision-making adjustments. Consequently, this developer has realized the importance and urgency to push forward the establishment and use of design standardization. In this developer's documents for internal training purposes, the aims of the use of design standardizations are described as:

> "To develop projects with high efficiency through the repeated use of standardized designs while within a high design quality framework."

This developer believes a mature standardized design decision-making framework will improve the efficiency of the projects' design decision-making processes. In another leading Chinese developers' internal document, the aims of the use of standardized design decision-making framework and standardized design database are:

> "To establish a fast development framework and to ensure quality, in order to develop projects within the good quality, low cost, and fast delivery framework."

There are more aims of the developers' initiation and adoption of design standardizations. The indirect aims of the developers' use of design standardization mainly include: 1) to reduce project duration and to improve project efficiency, 2) to reduce project cost and indirect operational costs, in order to increase profitability, 3) to ensure or to improve design quality, in order to improve project quality, to minimize human factors, 4) to build developers' brand identity, 5) to improve developers' general management framework (Mei, 2013, pp. 5, 14; Zhang, 2012, pp. 25–26). It seems the majority of the aims of the use of design standardization, especially the

identified main aims, that have been explored in the previous literature were based on the position of developer's project management. The researcher believes that the focus of research on the developer, which although adds value, is not inclusive of the critical perspectives of other stakeholders to provide an overall vision. In later section 6.2, the stakeholders' understandings on the initiation and adoption of the use of design standardization will be conceptualized and reported at societal, industry, organizational, and individual levels. It seems the participants of study 3 have noticed and recognized all of the aims introduced in this section. The interviewee has further identified some additional aspects on the aims of the use of design standardization, and it will be discussed in Chapter 6.

2.3.2. Pros, Cons, and Required Prior Conditions

> Benefiting from the implementation of standardized designs, the sample developer has expanded from a regional-scale developer (project development in two cities) to a national-scale developer (project development in nearly 100 cities) in about only 10 years. (Long, 2012, pp. 24–25)
>
> It is easy to identify the sample developer's projects among many buildings, the sample developer's buildings have specified wall and window's color designs, specified sloped rooftop designs, and specified architectural style designs. (Long, 2012, pp. 24–25)

Previous studies have demonstrated both pros (Jiang, 2014, pp. 3, 5; Long, 2012, pp. 6, 24; Mei, 2013, p. 5; Zhang, 2012, pp. 28–31) and cons (Long, 2012, p. 4; Mei, 2013, p. 18; Zhang, 2012, pp. 28–31) of the use of design standardizations. The benefits from the use of design standardizations

include the use of design standardizations which have 1) increased the developers' project quantity, and have consequently supported the developers' expansion, 2) reduced project duration, 3) reduced project costs, and increased developers' bargaining power, 4) improved design qualities, 5) promoted the common understandings of design among all project processes, 6) formed developers' brand recognition. However, there are two main concerns regarding the use of design standardization. First, the human and financial resources investment into the design standardization's research and development in the industry are insufficient, and there is also a shortage of design standardization research personnel. The second concern is that the current design standardization research in the industry is not scientific enough.

Based on their examination of the pros and cons of the use of design standardizations in the existing literature, the previous researchers have also suggested some ideal prerequisites that design standardization needs to fulfill (Jiang, 2014, p. 4; Long, 2012, p. 15; Zhang, 2012, pp. 32–38), which is applicable as a practical guideline for the research and development of design standardization in the real estate industry. Long (2012) believes that developers' use of standardization is an adopted tool for market competition. Therefore, the preparation of standardization is required to fulfill some general principles. These principles include the expected outcome of the use of standardization being beneficial in: 1) improving developers' market competitiveness, 2) creating platform for innovation, 3) integrating resources and developing the supply chain, and 4) profiting from intellectual properties

in both short-term and long-term. In terms of the developers' use of design standardizations, Jiang identifies some detail principles of the preparation of design standardizations. Jiang (2014) thinks the design standardization works must: 1) be based on mature designs, 2) be recognized and tested in the market by customers, 3) be adaptable and flexible in applying to different cities and regions, 4) be appropriate to apply in relatively long-term. The third and the fourth findings correspond in Jiang and Weber's research studies. Zhang (2012) highlights issues need to be considered in the development and implementation of design standardization, and the main aspects that the development and implementation of design standardizations need to pay attention include: 1) to the adaptation to local city, nature, and culture, 2) to fulfillment of individualized needs, and to introduce occupants' participation, 3) to promote government's role. Some of the above ideal prerequisites of the developers' use of design standardizations are corresponding with Weber et al.'s (2002) concerns against the general use of standardizations discussed in earlier section 2.2.2. The stakeholders' perspectives on the situation regarding whether the current use of design standardizations fulfills the above ideal prerequisites will be presented in later session 6.3. In addition, there is another aspect that triggered discussion. Many researchers and interviewees view the adoption of standardization and the development of industrialization as having a positive interplay. For example, both Jiang (2014, p. 2) and Zhang (2012) agreed that the next development step of standardization is toward industrialization, and it is impossible to apply industrialization without the maturation of the adoption of standardization. Among the interviewees of study 3, P10 holds similar assumptions that there

is a correlation between the adoption of standardization and the development of industrialization, and P1 believes the concepts of standardization and industrialization are always inseparable. It seems it is the common assumption that industrialization will follow standardization because of the discussions linking them. However, the research is less enthusiastic on the correlation between standardization and industrialization because of the view that there is no correlation between them. The researcher believes the adoption of standardization can be a good foundation for the future adoption of industrialization. However, the next step of the development of standardization does not necessary need to be industrialization. Automatically making such a general assumption can lead to oversight of an alternative stage of growth that is also applicable.

Generally speaking, the researcher noticed that the general pros and cons of the use of design standardization have been widely accepted in the academic community. In addition, although it seems some researchers have pushed the boundaries out further and opened discussion on the pros, cons, and ideal prior conditions of the use of design standardization from other stakeholder's standpoints. For example, Zhang advocates the directions of future design standardization works to be based on individual and government perspectives. However, the majority of the discussions are still based on developers' point of view, which is understandable as the developer is playing a dominating role in the adoption design standardization. The researcher believes many other parties' perspectives are also noteworthy, for example the government officials, because many of them are

able to achieve amendments to the use of design standardization. In later Section 6.3, the stakeholders' insights on the pros, the cons, and the ideal conditions of the use of design standardizations will be reported at individual, organization, and societal levels. The researcher will also discuss the connections of findings of Study 3 and the existing literature in Section 6.3.

2.3.3. Current Situation

Prior research generally confirms that there is an extensive use of design standardizations in the Industry (Jiang, 2014, pp. 5, 8; Long, 2012, p. 1; Mei, 2013, p. 18). Both Jiang (2014, p. 5) and Mei's (2013, p. 18) understandings of the current situation of the use of design standardizations are that all first-tier developers have developed the design decision-making frameworks and standardized designs, in order to operate projects in different cities in a repetitive way. Furthermore, the second-tier and third-tier developers in Industry have started to follow the first-tier developers on the use of design standardizations. In terms of the developers' application of design standardizations, Jiang (2014, p. 5) describes: "90% of the project designs based on standardized designs, and 10% of the project designs will be based on the local and project specified circumstances. Developers will not change the standardized elevation design, floor plan design, and building component design easily." Prior research substantiates the belief that design standardizations have been widely adopted by developers. However, little research has been conducted to quantitatively measure the degree of the use of design standardization. There is a lack of quantitative research examining the current situation of the use of design standardization, and only personal-experience-based statements. In later Chapter 5, the results of the

quantitative measurements in the degree and situation of the use of design standardizations will be reported. And in later Section 6.4, stakeholders' estimations of the degree of the use of design standardizations will be discussed.

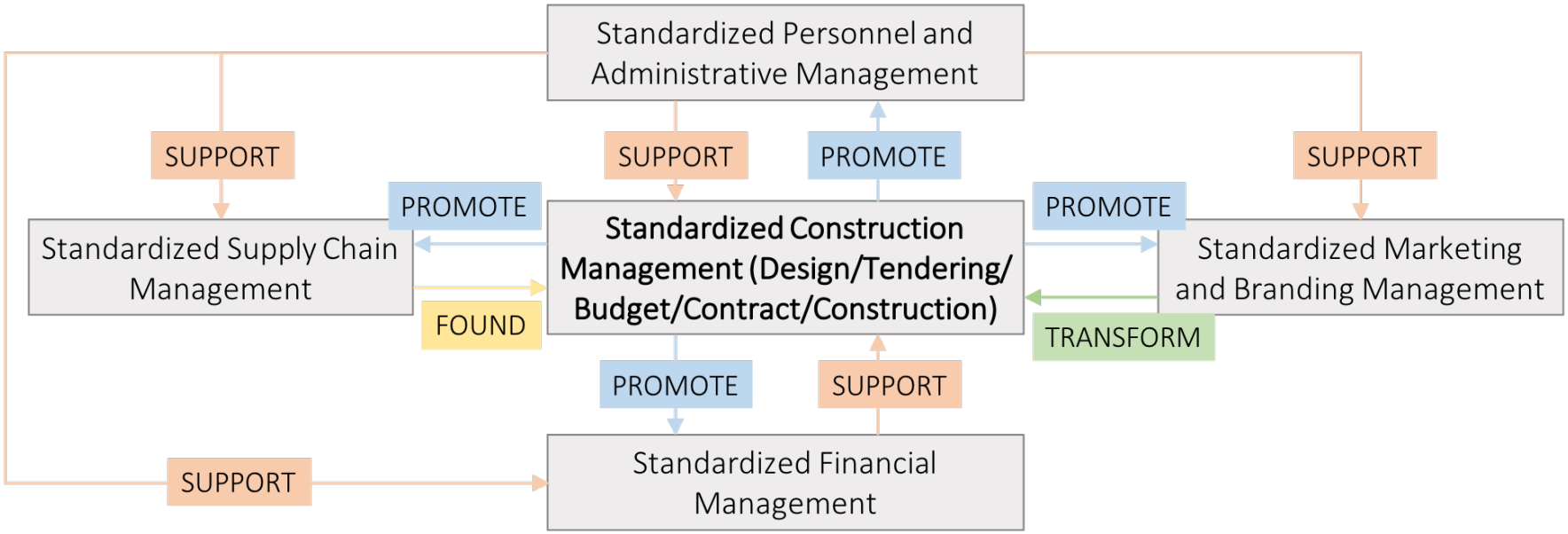
2.3.4. Standardization Framework and Position of Design Standardization

Prior studies have proposed many developers' standardization frameworks (Jiang, 2014, pp. 3, 47; Long, 2012, pp. 19–20; Mei, 2013, pp. 29–32). In his observation and investigation, Long (2012) has conceptualized and reported the sample developer's organizational strategic standardization system and its five subsystems. The five subsystems are: 1) the standardized construction management subsystem, 2) the standardized financial management subsystem, 3) the standardized supply chain management subsystem, 4) the standardized marketing and branding management system, and 5) the standardized human resources and administrative management subsystem. Long has further presented a structure of the sample developer's organizational strategic standardization system and illustrated the types of connections among the 5 standardized subsystems in Figure 4. According to Figure 4, the standardized construction subsystem is the essential foundation of the sample developer's entire standardization system. There are several components under the standardized construction subsystem; the design standardization is one of the components, and other components include 1) the tendering standardizations, 2) the budget standardizations, 3) the standardized construction contact management, and 4) the standardized construction management. According to his postgraduate

thesis, Jiang (2014) has mainly introduced three developers main standardized operation components, as Jiang's study was concentrated on the developers' operational level of the use of standardizations. The three components include 1) the design standardizations, 2) the standardized cost and budget management, and 3) the standardized construction management. Although there are many differences in the above two standardization frameworks proposed by Long and Jiang, Jiang also substantiates that design standardization is the foundation of developers' standardization operations.

Figure 4 Sample Developer's Organizational Strategic Standardization Framework

in English Translation (Long, 2012, p. 20)



2.3.5. Preparation and Application Processes

2.3.5.1. Preparation and Application Processes of Design Standardization

> Before the use of design standardization, we start to design after we have acquired the land. Now, we need to optimize design schedule before the acquisition of land. As we won't have specific project's location and other information, therefore we need to divide all lands into several rough categories, and to divide potential buyers into several rough categories in advance. The standardized design decision-making frameworks were developed based on the above logic. (China Vanke, 2006)

In terms of the developers' use of design standardizations at project level, Jiang (2014, pp. 7–15) has proposed a design standardization preparation process framework. Jiang's framework consists of seven steps: 1) to conceptualize and to simplify the potential customers into several categories, 2) to conceptualize and to simplify the nature of lands into several categories, 3) to match the categories of potential customers and nature of lands, and to initially identify some possible appropriate product designs, 4) to build a framework based on the matching nature of lands, customers, and product's designs, 5) to develop technical standards based on each product's designs at step 4, 6) Based on the developed technical standards at step 5, to develop project's component design standards, for example, floor plan component design standards, landscape component design standards, and interior design component design standards, and 7) to build the design

database based on the developed standards at steps 5 and 6. Regarding the developers' design standardization application, Jiang explains:

> The contents of design standardizations are constantly developing and improving through developers' project experience accumulation. The contents of design standardizations are also advancing with the possible developers' strategy and market orientation changes". Nevertheless, Jiang emphases: "the original design standardization contents and its framework will always remain, and there are only partial and minor modifications. (Jiang, 2014, p. 7)

Mei (2013, pp. 39–41) has outlined another framework for design standardization preparation processes. There are four steps in Mei's framework: 1) to form technical and controlling design standards, 2) to form the product line, this is similar to step 4 in Jiang's framework, 3) to form project component design standards, this is similar to step 5 in Jiang's framework, and 4) to form building component design standards and the entire standardization systems. Mei has illustrated the structure of developers' application of design standardizations in Figure 5. Figure 5 also demonstrated a holistic process of developers' preparation and application of design standardizations.

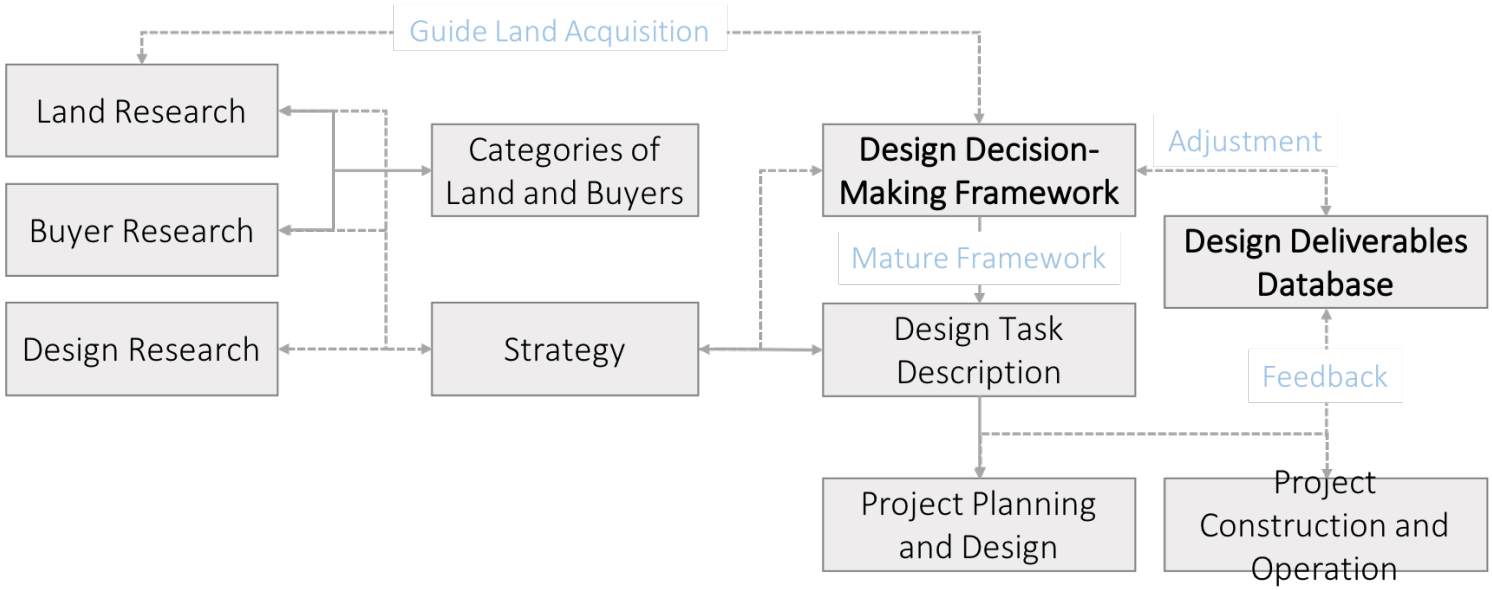
2.3.5.2. Contents of Design Standardizations

The contents of the two frameworks proposed by Jiang (2014) and Mei (2013) are similar. The industry materials generally confirm that the preparation and application of design standardizations follows the above frameworks. Therefore, there are two major contents of design standardizations: 1) the standardized design decision-making frameworks, this is similar to the

results of the step 4 in Jiang's framework and step 2 of Mei's framework, and 2) the standardized design databases, this is similar to the results of step 7 in Jiang's framework. The two main design standardization contents are interrelated and inseparable.

Figure 5 Preparation and Application Processes of Design Standardizations

in English Translation (Mei, 2013, p. 39)



In terms of the general types of standardizations, Long (2012, p. 13) believes there are generally two types of organizational level standards; they are the technical standards and management standards. Furthermore, Long thinks the technical standards are currently the fundamental standards, while the management standards are supporting standards.

> After years of practices, the sample developer have categorized and standardized the floor plan designs, elevation designs, elevation material specifications, and interior decoration designs. Therefore, the sample developer's overall design documents' preparation takes shorter time than other developers.

2.4. Description of Design Standardization

2.4.1. Descriptions of Design Standardization

There are many descriptions of developers' product standardization. For example, according to Jiang, the definition of real estate developers' product standardization is:

> The processes of finalizing replicable deliverables based on the specified design within standardized design decision-making framework. (Jiang, 2014, p. 4)

In Jiang's definition, the design standardization's finalizing processes include to analyze, to categorize, to summarize, and to conceptualize, and examples of standardized design outcomes include replicable methods, data, and texts and drawings. The formed outcomes will then be adopted at different levels, for example, potential buyers' categorization, designs, building components, construction technologies, and budget.

The use of design standardization is developer-initiated, developer-driven, developer-centered. It is a developers' tool for project management and design management. The developers' primary aims in the use of design standardization are to rapidly and repeatedly adopt standardized contents in residential design and residential design management processes, in order to improve the entire project management processes.

2.4.2. Uniqueness of Design Standardizations in Residential Property Development in China

The main uniqueness of real estate developers' use of design standardizations in residential building designs and design management in China is its scale of standardized components. In other words, within the scope of residential designs and design management, to repetitively adopt standardized smaller building components and elements, for example, the standardized residential window and door designs, is completely different from adopting a standardized floor plan or elevation designs. The former style of the use of design standardization is associated with the concept of mass customization and personalization of residential buildings, while the latter style of the use of design standardization is associated with the current use of design standardizations in residential property development in China. As discussed in earlier sections, one of the major aims of the use of design standardizations is to repetitively adopt standardized designs on a project basis. However, mass customization and personalization is another direction towards the use of design standardizations. This paragraph will introduce the concept of mass customization and personalization in the area of built

environment. Piroozfar & Piller (2013, pp. 3–5) reviewed the previous definitions of the general mass customization, and some of the definitions are from Tseng and Jiao (2001, p. 685) and Pine (1993):

> The technologies and systems to deliver goods and services that meet individual customers need with near mass production efficiency." and "developing, producing, marketing, and delivering affordable goods and services with enough variety and customization that nearly everyone finds exactly what they want.

While the objects of general definitions of mass customization and personalization are described as goods and services, Piroozfar and Piller (2013) defined the object of mass customization and personalization in architecture and construction as "the individual creative architect, designing a unique solution for a client and the specific requirements and opportunities of a dedicated site for a specific project in a particular setting." This mass customization can be applied to designs of urban spaces and infrastructures. The adoption of mass customization helps to accommodate stakeholders' conflicting demands in the industry. Apparently, the main aims and approaches of the two directions of the use of standardized designs are totally diversified. Some researchers focus on the developers' use of design standardizations and some of the participants of study 3 have also mentioned about the mass customization and industrialized constructions. These will be discussed in Chapter 6.

An additional uniqueness of the use of design standardization is the degree of the standardized contents. In architectural designs, it is frequent for

architects to reuse previous experience and prior design solutions in multiple ways (Eilouti, 2009; Oxman & Oxman, 1994). According to Oxman & Oxman (1994), the physical recorded design experiences and solutions are regarded as design precedents and the intellectual formed design experience is design memory. It is natural for architectural designers to refer to precedent-based knowledge in the whole design processes (Eilouti, 2009). However, regarding the existing materials of the current use of design standardization in residential building designs in China, the degree is absolutely different. Although there is discussion of the use of precedents' negative effect to design creativity (Goldschmidt, 1998; Xie, Hall, Mccarthy, Skitmore, & Shen, 2016), the use of design standardization in this research might be an extreme of precedent-based design approach. Many stakeholders in Study 3 expressed their uncertainty and concerns on the relationship between the current use of design standardization and design creativity. These will be discussed in Chapter 6.

Chapter 3 Research Methodology

3.1. Introduction

This chapter will discuss the philosophical foundations of this research in 3 sections. Section **Error! Reference source not found.** will present the major existing research paradigms and discuss why a pragmatism paradigm was adopted in this research. Section 3.3 will introduce the research methodologies and explain why this research adopts a mixed method methodology. With the discussions of the adoption of a mixed method methodology, section 3.3 will also outline the three research methods employed for each designed study. Section 3.4 will primarily demonstrate the operational implementation designs of the three designed studies of this research.

3.2. Adopted Research Paradigm: Pragmatism

> Research paradigm is the set of common beliefs and agreements shared between scientists about how problems should be understood and addressed. (Kuhn, 1962)

This paradigm is the foundation and guide to actions. This applies to research as well (Guba, 1990, pp. 17–18). Guba (1990, p. 18) characterized the discussion and contents of paradigm as the ontological (the nature of reality), epistemological (the relationship between the researcher and that being researched), and methodological (process of research) aspects. These three aspects of the research paradigm have been widely discussed and recognized. The well-explored research paradigms include positivism and constructivist. Other research paradigms include pragmatism, critical inquiry,

feminism, and postmodernism. This research has adopted pragmatism as its research paradigm. In addition, different paradigms represent different studies' ontological, epistemological, and methodological positions.

In terms of this study's ontological position, pragmatism "is not committed to any one system of philosophy and reality." Instead, "reality is constantly renegotiated, debated, interpreted in light of its usefulness in new unpredictable situation." Regarding this research's epistemological position, a pragmatist worldview is problem centered and real-world practice oriented. Therefore "the researcher collect data by 'what works' to address research questions" (Creswell & Clark, 2011; Creswell & Creswell, 2018).

3.3. Adopted Research Methodology and Employed Research Methods

Both quantitative and qualitative methods have been designed to address the identified research questions. This research adopts both pre-determined and emerging methods, open-ended and closed-ended questions, and both statistical and text analyses to triangulate and interpret multiple forms of data (Creswell & Creswell, 2018). The use of triangulation provides more reliable, valid, and comprehensive information from a study. To compare the use of mixed method research studies with single methods studies, the use of mixed method may also reveal more details at deeper levels (Jick, 1979). The main research aim of this study is to explore the phenomenon of the project level implementation of design standardizations in residential property development in China, and it is natural to adopt a mixed method methodology for this problem-centered and real-world practice-oriented topic.

Three studies have been designed, based on the two research aims identified and discussed in earlier section 1.2. The first two studies are quantitative-based. And the first two studies are designed to address the first research aim to measure the degree and situation of the use of design standardizations, and to test the correlations of the degree of the use of design standardizations and concerning variables at multi-levels. The Studies 1 and 2 will deploy the descriptive statistical analysis approach and the bivariate correlation analysis approach respectively. Quantitative approaches usually provide snapshots, and are used to address how many and how much based research questions (Fellows & Liu, 2015). The majority of previous research considers the design standardizations which have been widely applied in residential building designs by property developers in China. These research outcomes are valuable, and some of these studies are highly cited and were published by influential authors. Nevertheless, many previous research outcomes were based on their personal experiences rather than quantitative measurements. Consequently, the researcher has designed the Studies 1 and 2, and defines these two studies as the foundation of this research project. And it is hoped that this part of the research's quantitative results proves to be useful in future related studies. Study 3 is qualitative-based. And the design of Study 3 was based on the second research aim that is to explore multi-stakeholders' perspectives on the use of design standardizations. The use of qualitative research methods is human-oriented, and qualitative methods are often used to explore opinions, emotions, and contradictory behaviors (Mack, Woodsong, McQueen, Guest, & Namey,

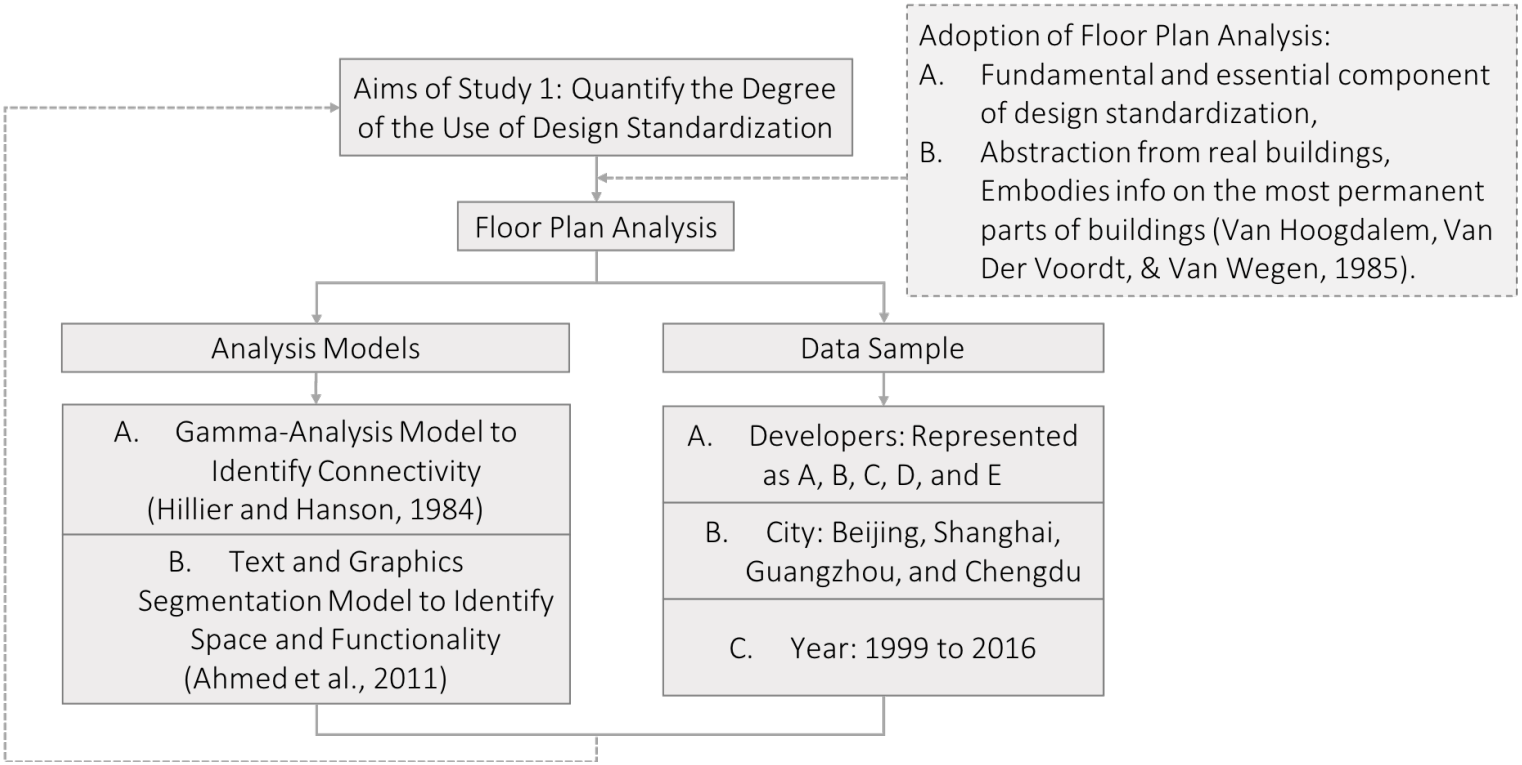
2005, p. 1). Conducting in-depth interviews is one of the three major types and most common adopted qualitative research methods (Mack et al., 2005, p. 2). An in-depth interview is designed to explore informants' individual experiences, perceptions, and even possible sensitive issues in rich details (Britten, 1995; Mack et al., 2005, p. 2). In this research, it is important to explore different stakeholders' perspectives on the use of design standardizations, and it is predictable the interviewees will speak about the good, the bad, and even the ugly of the use of design standardizations. Therefore, it is logical to adopt this research approach. The researcher will employ an inductive open coding analysis.

3.4. Research Implementation: Research Design, Data Collection, and Data Analysis

3.4.1. Study 1

3.4.1.1. Research design of Study 1

Figure 6 The Research Design of Study 1



The main research aim of Study 1 is to quantitatively measure the use of design standardizations. As introduced in earlier sections, the project level's implementation of standardized designs incorporates multiple forms of standardized architecture works and codified documents. For example, the strategically standardized design decision-making frameworks, and the technically standardized floor plan designs or standardized elevation guidelines and designs. Among all the standardize-able design forms in residential building designs in property development, the floor plan design analysis approach was adopted in this study. In academic, industry, and general public's perspectives, the floor plan design is representative among all design contents, and it's valuable to read floor plans in the design standardization studies. In the industry practices, floor plan design is one of the fundamental and essential components of the use of design standardizations according to the evidence from developers' unpublished materials. Furthermore, floor plan is an abstraction from the real buildings, and floor plan embodies necessary information on the most permanent parts of buildings (Van Hoogdalem, Van Der Voordt, & Van Wegen, 1985). This researcher has designed two measurement features to assess if the floor plan design was standardized. These features are the floor plan connectivity feature, and the floor plan spatial and functional feature. Therefore, the two analysis models were identified to measure the use of design standardizations in this study. The first model is part of Hillier & Hanson's (1984, pp. 147–155) Gamma-Analysis Model, this model was planned to identify the connectivity features of the floor plan samples in this study. The gamma-analysis was introduced as an analytic method to building interiors

from a syntactic perspective. By adopting this analysis model, the floor plans will be conceptualized, and represented by circles and lines only. Circles were adopted to represent rooms, and lines were adopted to represent the doors connecting rooms as illustrated in Figure 7 and Figure 8

Figure 7 The Conceptualization Process of Gamma-Analysis Model (Hillier & Hanson, 1984, p. 147)

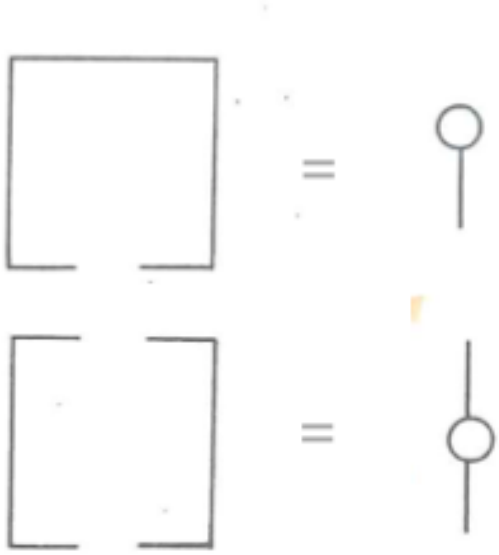
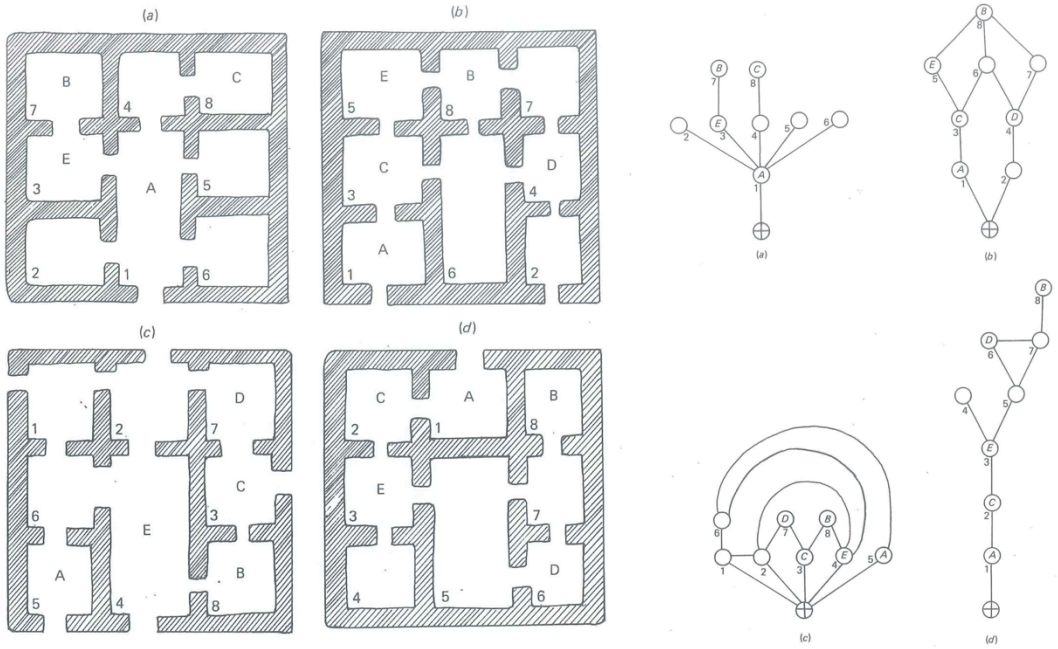


Figure 8 Example of Conceptualized Spaces of Gamma-Analysis Model

(Hillier & Hanson, 1984, pp. 150–151)



The second model is a part of text and graphics segmentation model introduced by (Ahmed, Liwicki, Weber, & Dengel, 2011) as presented in Figure 9. This model was developed to analyze architectural floor plans through text and graphics information segmentations. The text and graphics segmentation model was proposed to be useful in three-dimensional (3D) modeling, and other multiple aims' floor plan research. In this study, the extracted texts with rooms' labels were adopted to identify the spatial and functional features of floor plans.

Figure 9 An Example of Floor Plan Image and Text Extraction (Ahmed et al., 2011)

In terms of the scopes of data samples, the researcher has established several principles. Regarding the selection of sample developers, the research has identified five developers based on two principles. The criteria are the developers' scales and development concentrations. Among over 100,000 developers in China, the five sample developers' annual sales volumes and total areas sold were highly ranked for the past five consecutive years from 2012 to 2016. The statistics of each developer's scales, ranks, and shares are listed in Table 3 and Table 4. In addition, all of these five developers' concentration is residential property development. Some leading developers were not included as samples for this study, as these developers focus on commercial property rather than residential property development.

Table 3 Five Developers' Total Floor Area Sold (in Trillion m^2), National Rankings, and Percentage of National Total in Five Years

	A	B	C	D	E	National (% of Five Developers)
2016	2756.0 (3)	1335.8 (6)	780.6 (9)	4467.6 (1)	3782.7 (2)	137,540 (9.54%)
2015	2094.9 (3)	1285.9 (6)	668.9 (8)	2628.6 (1)	2182.8 (2)	112,406 (7.88%)
2014	1783.9 (4)	950.6 (7)	659.5 (8)	1901.7 (2)	1880.7 (3)	105,182 (6.82%)
2013	1517.3 (4)	991.7 (7)	588.5 (8)	1605.0 (3)	1652.0 (2)	115,723 (5.49%)
2012	1298.9 (2)	746.7 (6)	467.0 (9)	1536.0 (1)	764.0 (5)	98,468 (4.89%)

Table 4 Five Developers' Annual Sales Volume (in Billion Chinese Yuan), National Rankings,

and Percentage of National Total in Five Years

	A	B	C	D	E	National (% of Five Developers)
2016	3622.0 (2)	1925.1 (6)	1080.1 (11)	3731.5 (1)	3090.3 (3)	99,064 (13.58%)
2015	2627.0 (1)	1492.3 (5)	851.1 (9)	2050.4 (2)	1401.8 (7)	72,753 (11.58%)
2014	2120.0 (1)	1152.0 (7)	699.8 (9)	1376.3 (4)	1250.1 (6)	62,396 (10.57%)
2013	1740.6 (1)	1170.0 (5)	681.0 (8)	1082.5 (7)	1097.3 (6)	67,695 (8.53%)
2012	1418.0 (1)	935.0 (4)	500.0 (8)	923.0 (5)	475.0 (9)	53,467 (7.95%)

The four sample cities were selected mainly based on two principles. The principles are to pick major cities while to take cities' geographical location's balance into consideration. The four selected cities are all major cities with population over 10 million (the biggest city category according to the national announcement in 2014). The four selected sample cities and their population and geographical locations are listed in Table 5. Based on the selected developers and cities, available samples of residential property development projects floor plan designs from 1999 to 2016 were retrieved (the projects' time is based on the projects' latest move-in dates).

Table 5 The Selected Sample Cities [a]

	Population (in Million)	Area
City of Beijing	19.6120	(The Largest in) Northern
City of Shanghai	23.0191	(The Largest in) Eastern
City of Guangzhou	12.7008	(The Largest in) Southern
City of Chengdu	14.0476	(The Second largest in) Southwestern[b]

[a] Cities' Population is obtained from the statistics of the latest Sixth National Population Census in 2010 (NBS, 2016b).

[b] Another city, Chongqing, has the largest population in southwestern China; however, Chongqing was not selected as it adopts a different floor area calculation methodology from other cities in China.

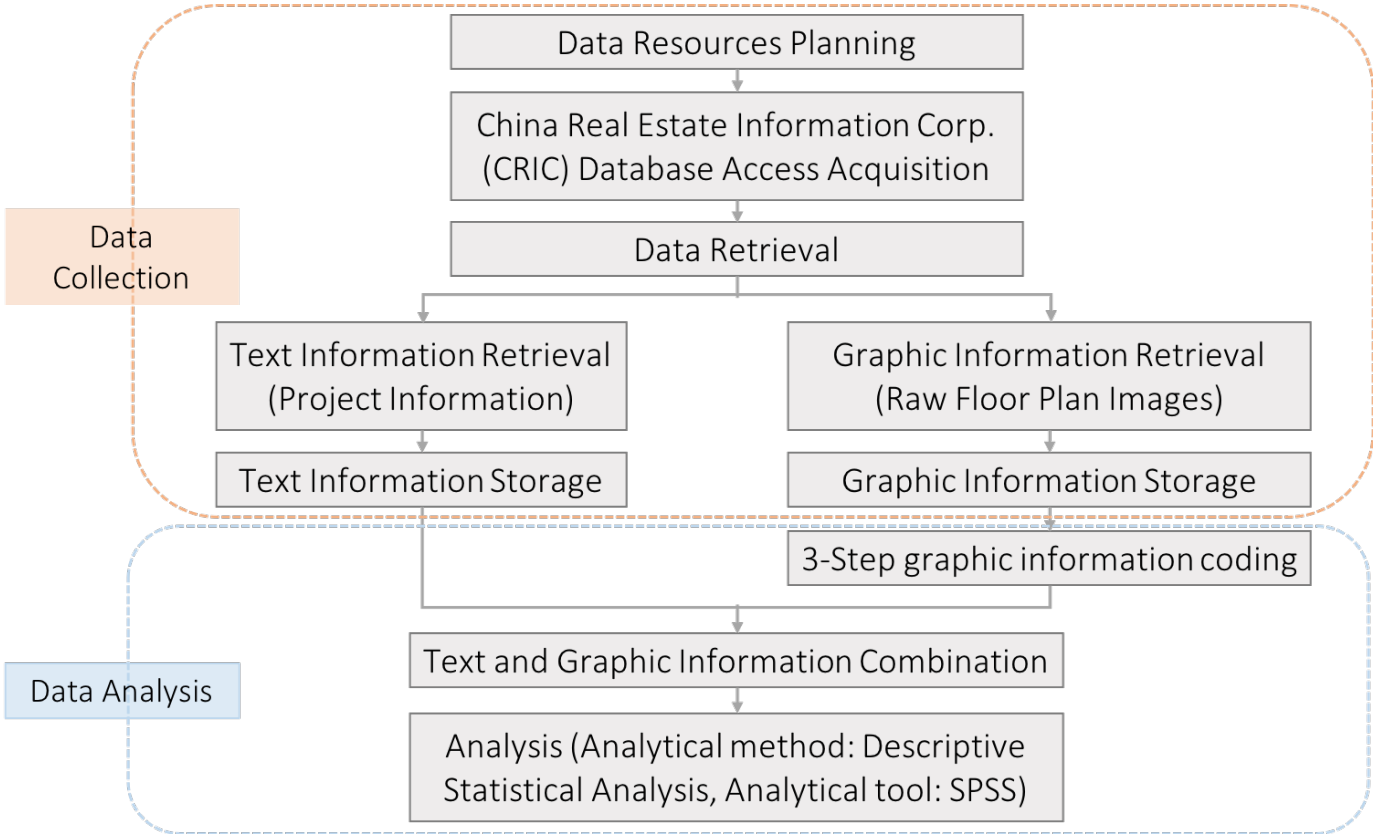
3.4.1.2. Data Collection and Analysis of Study 1

As the project-level based information was necessary according to the data resources planning of this study, the China Real Estate Information Corporation (CRIC)'s Product Database was preferred. The CRIC is one of the most comprehensive project-based commercial databases with a concentration in real estate industry in China. As the majority of government's open data resources does not provide project-level based information, it seems there is no appropriate governmental open data resources in China that is applicable to this study. Fortunately, the journey to acquire authorizations to access the CRIC Database is relatively effective and efficient. Relying on the researcher's previous industry experience, a developer has agreed to support this research, and has sponsored two accesses to the CRIC Database. There are no conflicts of interest between the sponsoring developer and this entire research. Both text and graphic information were manually retrieved from the CRIC database. The entire data collection and analysis flow design is shown on Figure 10.

The floor plan designs' projects' information in text formats and raw floor plan image in graphic formats were first stored and pre-processed separately. Then, the raw floor plan images in graphic formats were analyzed through a designed three-step coding process, to identify if each floor plan has adopted the standardized design contents. The detail designs of the three-step coding process will be introduced in the next Section 3.4.1.3. The results of graphic information processing were represented by codes in text formats. Later, the original floor plan designs' projects' information in text formats and the coded

graphic information in text formats were merged into one database for further analyses based on the research aims of Study 1. The analytical method of Study 1 was descriptive statistical analysis. The analytical tool was SPSS, and the version number is 1.0.0.950.

Figure 10 Data Collection and Analysis Flow of Study 1



3.4.1.3. Steps of Floor Plan Image Processing and Coding

In total, there were 1,533 floor plans images initially retrieved from the CRIC Database, and these floor plan designs were from 368 residential property development projects. Among all of these 1,533 floor plans, the floor plans of single-family occupied buildings were removed from the data sample, for example, the floor plans of townhouses and detached houses. In addition, the researcher has also removed a small group of technically unreadable floor plan images. The total number of validated floor plan design samples is 824, and these 824 floor plans were from 234 residential projects.

The subdivided steps of validated data's processing and coding are presented in Figure 11. The data samples were initially pre-processed. As illustrated in Figure 12, each floor plan's spatial arrangements were conceptualized as four segments and presented by case-sensitive alphabetical abbreviations. They are bedroom (B), bathroom (b), kitchen (K), and living and dining (LD) spaces.

In the first step, all of the floor plans were categorized based on room types through the specific designed program. The numbers of bedrooms and bathrooms were designed to represent room types. And each floor plan was coded based on the NBnb format where the "N" and "B" represent the numbers of bedrooms, and the "n" and "b" represent the numbers of bathrooms. In this step, 15 numbers of NBnb room types were categorized. They are 0B1b (studio), 1B1b, 2B1b, 2B2b, 3B1b, 3B2b, 3B3b, 3B4b, 4B1b, 4B2b, 4B3b, 4B4b, 5B2b, 5B3b, and 5B4b. Then, each floor plan was

identified and coded based on if it has adopted standardized design contents within each NBnb room types categorized in the first step, as demonstrated in Figure 13 and Figure 14 respectively.

Figure 11 The Three-Step Processing and Coding Design

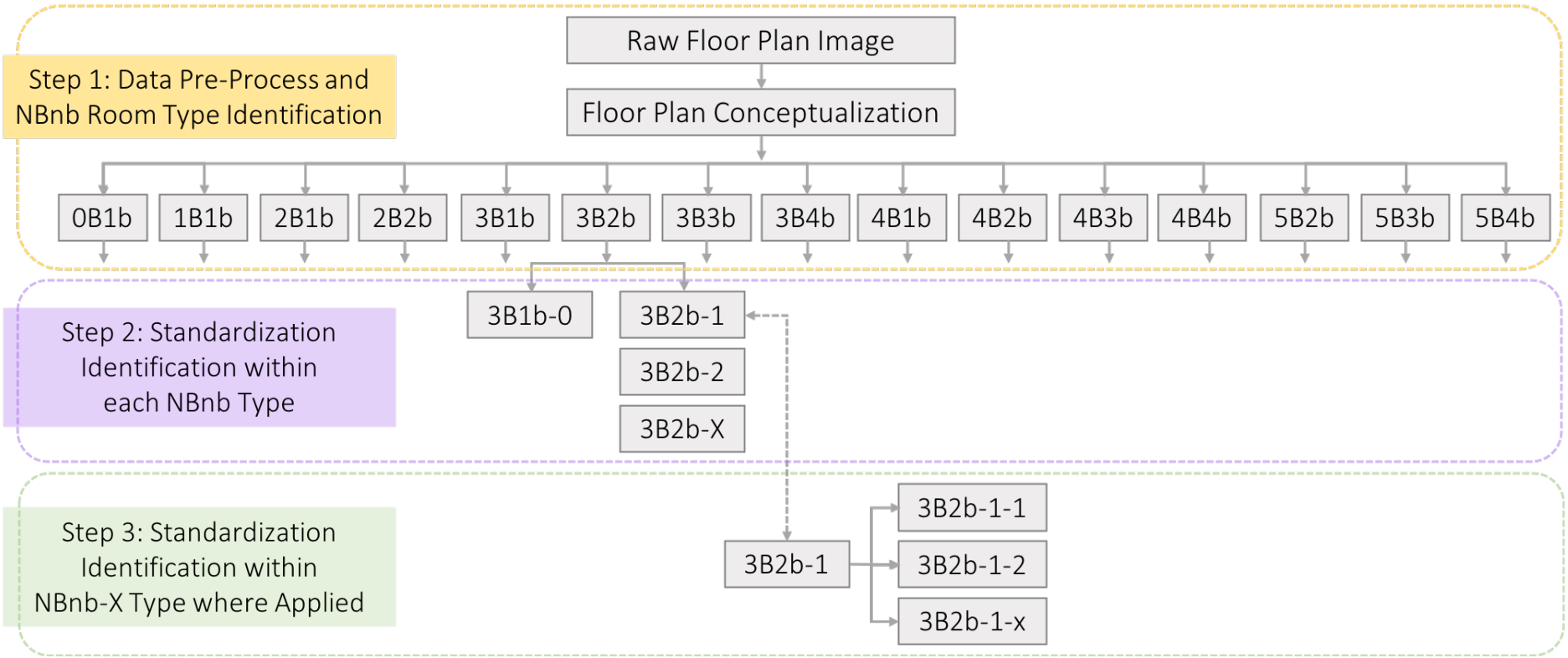


Figure 12 Example of the Pre-Processing of Floor Plan

Figure 13 Example of Floor Plan Connectivity Identification

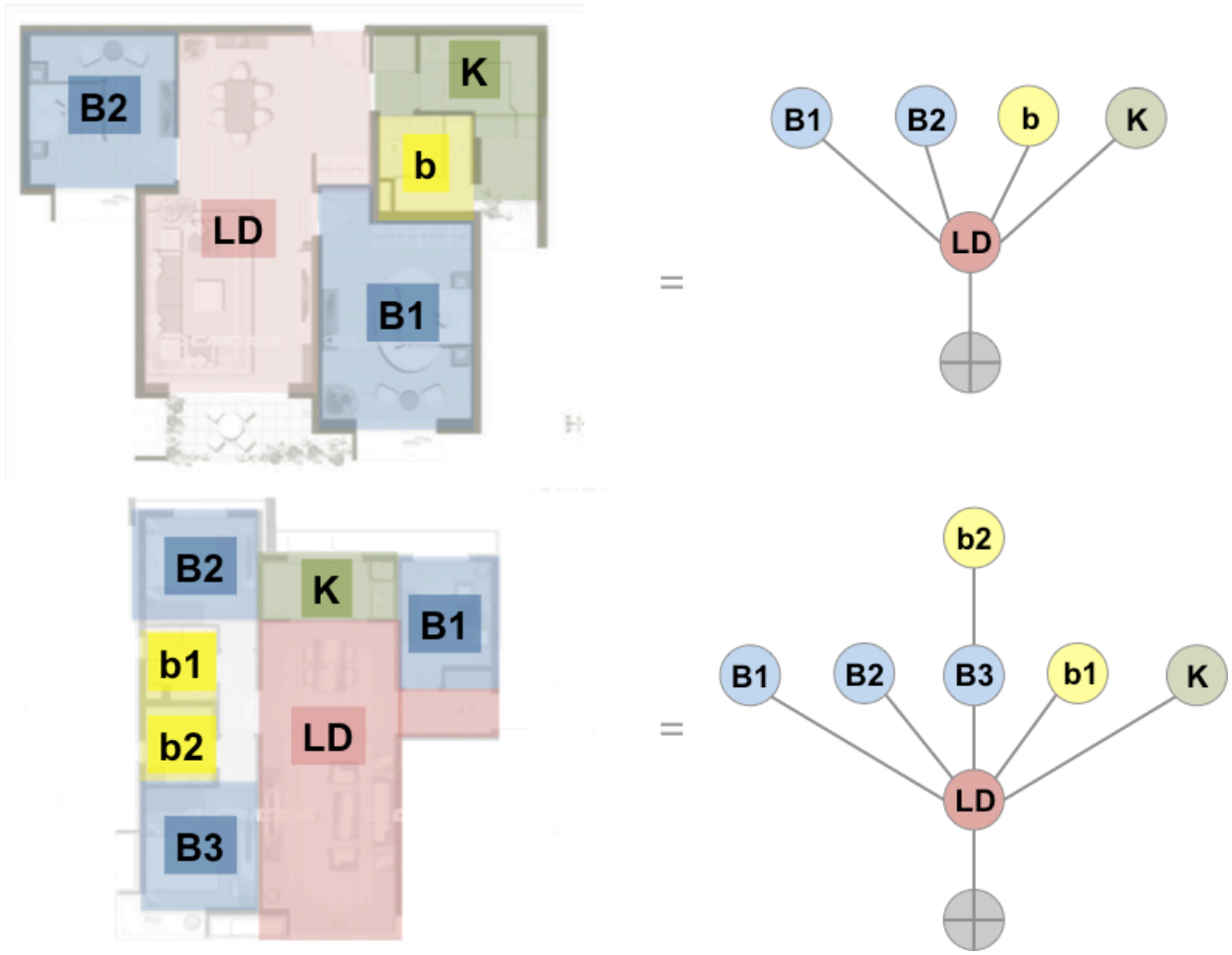
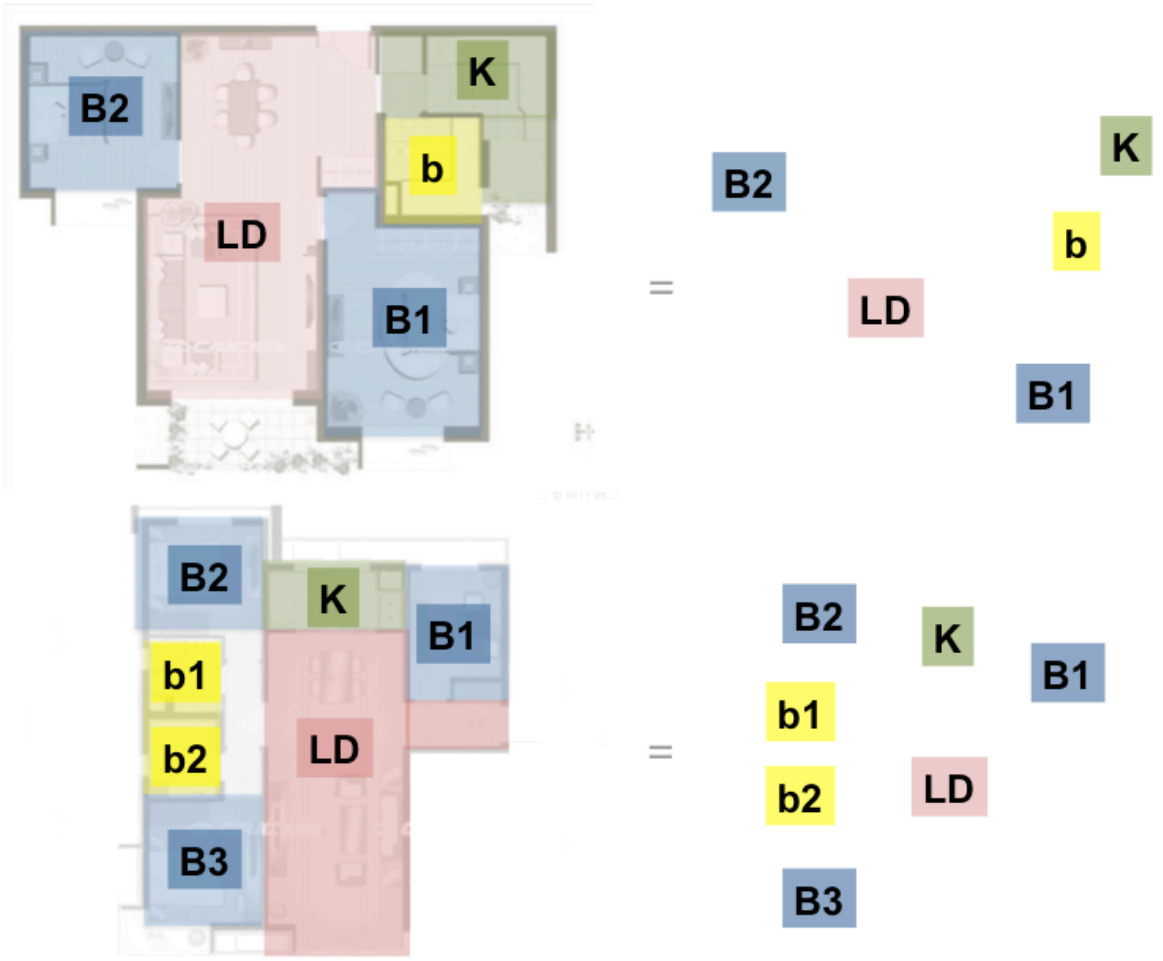


Figure 14 Example of Floor Plan Spatial Arrangement Identification



Through a specially designed program, the non-standardized floor plans were coded as NBnb-0, and the standardized floor plans within each NBnb room types were coded as NBnb-X in this step. Within each NBnb room types, each different standardized floor plan design was coded starting from NBnb-1 to NBnb-2, until NBnb-X. The NBnb room types and the numbers of standardized floor plan designs within each NBnb room type are listed in Table 6.

Table 6 NBnb Room Types and Numbers of Standardized Floor Plan Designs within Each NBnb Room Type

NBnb Room Type	No. of “X”
0B1b	4
1B1b	4
2B1b	8
2B2b	4
3B1b	7
3B2b	5
3B3b	0
3B4b	0
4B1b	0
4B2b	4
4B3b	1
5B2b	0
5B3b	0
5B4b	0

Based on the first and second steps’ processing and coding, some of the NBnb-X types were further coded as NBnb-X-x. The “x” represents groups of floor plan designs with a slightly different spatial arrangement of kitchen, and

living and dining areas, while there is no difference among floor plan's connectivity, and bedrooms and bathrooms' spatial arrangements. The NBnb-X types and numbers of standardized designs within each NBnb-X room type are listed in Table 7. The generalized standardized floor plans (NBnb-X-x types) and their coding tree are included in the Appendix A.

Table 7 NBnb-X Types and Numbers of Standardized Floor Plan Designs within Each NBnb-X Room Type

NBnb-X Types	No. of "x"
2B1b-4	3
2B1b-5	4
2B1b-6	2
2B1b-8	2
2B2b-2	2
3B1b-4	3
3B1b-5	2
3B2b-1	2
3B2b-2	5
3B2b-4	7
3B2b-5	4
4B2b-1	3
4B2b-2	3
4B2b-4	3

3.4.2. Study 2

3.4.2.1. Research Design of Study 2

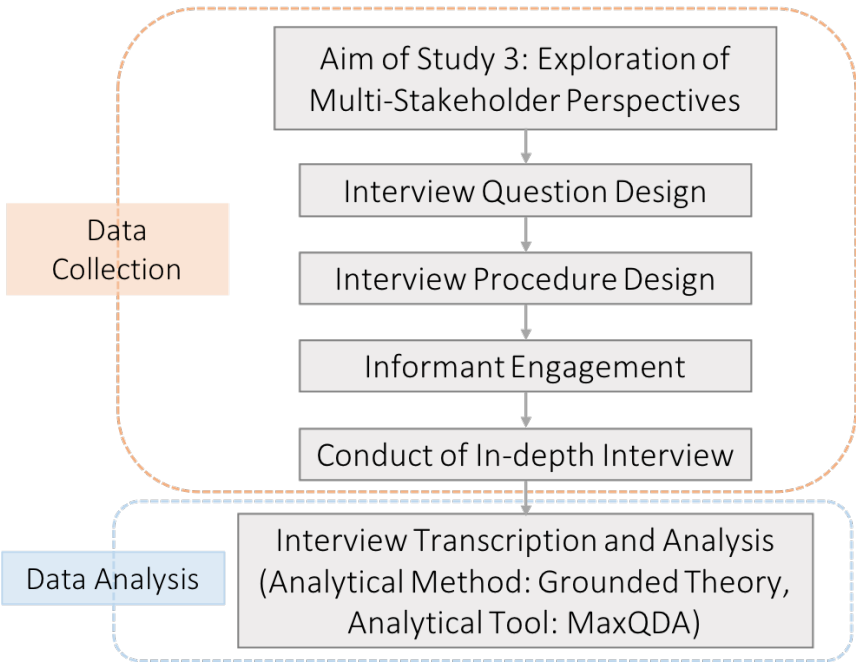
The main aim of Study 2 is to test the correlations of the degree of the use of design standardizations and the relevant variables at multi-level. The 3 levels include project level, developer' city branch level, and the city' district level. Based on the data sample of Study 1, the numbers of data sample were

reduced to 284 from 824. These 284 floor plan samples were taken from the recent three years' projects from 2014 to 2016, while the sample of developers and cities remains unchanged. The project level information was retrieved from the CRIC database and was prepared in Study 1. The city branch developers' operational statistics were calculated from project level statistics. And the city's district level statistics were obtained from each city's Statistical Yearbooks of 2016, which present statistics of 2015. The analytical method is bivariate correctional analysis. The analytical tool is also SPSS, and the version number of SPSS is 1.0.0.950.

3.4.3. Study 3

3.4.3.1. Research Design of Study 3

Figure 15 The Research Design of Study 3



The in-depth interview as a research approach was adopted in Study 3 to explore multiple groups of stakeholder's perspectives towards the use of

design standardization. According to the research design of Study 3 demonstrated in Figure 15, the interview questions were designed based on two sets of instruments of perspectives, and the interview procedures were also designed. The designs of interview questions and the interview procedures will be discussed in Section 3.4.3.2. The researcher has approached the targeted interviewees through a network informant recruitment strategy, and the detailed informant engagement journey will be reported in Section 3.4.3.3. In terms of the data analysis, the analytical method of this study is grounded theory. The analytical tool is MaxQDA 12 and MaxQDA 2018, and the version numbers are 12.3.1 and 18.0.5 respectively.

3.4.3.2. The Design of Interview Questions and Procedures

The researcher has designed the interview questions based on two sets of instruments of perspectives. The first set is the past, the present, and the future of the use of design standardizations. And the second set of instruments is the participants' evaluations, the estimations, and the expectations of the use of design standardizations. In total, there are six interview questions and eight sub-questions. After the pilot study, the researcher included an ice-breaking question in the beginning of the interviews, a close-up question at the end of the interviews, and follow-up questions for the specific interview questions. In terms of the interview procedures, the research has planned three major components. These components of interview procedures include the introduction, the main interview questions, and the end based on King and Horrocks's (2010) research. The contents of each interview component are listed on Table 8.

And the interview procedure and proposed interview questions are included in Appendix B (in original Chinese language) and Appendix C (in English translation).

Table 8 Procedure Design of the Interview

Procedure	Contents
Introduction	To introduce research topic, aims, and scopes of this research. To introduce procedures of this study. And to obtain consent from interviewees on the information and privacy issues.
Main Body	Interview questions
End	To express thanks, and to discuss additional points, queries, and ethics issues.

3.4.3.3. Informant Engagement

Regarding the selection of interviewees in this study, each interviewee possesses in-depth and extensive knowledge of the property developers' use of design standardizations in residential buildings designs in China (Johnson, 2001, p. 106). All interviewees have either worked on or have been involved in forming design standardization contents, for example, have participated in developing standardized design strategies, design standards, or standardized design databases. Or the interviewees have adopted standardized design contents, for example, following the standardized design decision-making frameworks, or referring to standardized floor plan designs in the design database. The majority of interviewees were contacted through researcher's personal networks (a snowball sampling method), for example, through researcher's personal connections from her previous industry experiences. The researcher believes the targeted interviewees are better

motivated and willing to participate through shared networks (Rubin & Rubin, 2012, p. 77). The interviewees and a summary of their backgrounds are listed on Table 9. There is a rich combination of interviewees' backgrounds: interviewees with relatively shorter and longer experiences, interviewees at comparatively higher-level and lower-level positions, and interviewees that work for organizations of different natures (for example, state-owned and private enterprises). We also see a well mixture of both female and male, and relatively younger and elder interviewees. The interviewees are located in diversified Chinese cities.

Table 9 List of Interviewee

Group of Stakeholder		Participant Initial	Position	Company	Experience (yrs.)
Government and education (n=2)		Participant 1 (P1) (Dr.)	County Secretary	County Government	17
		Participant 2 (P2) (Prof.)	Professor and Deputy County Secretary	University and County Government	28
Practitioner	Developer (n=3)	Participant 3 (P3)	Architect	Developer	14
		Participant 4 (P4)	Interior Architect	Developer	6
		Participant 5 (P5)	Interior Architect	Developer	10
	Consultant (n=3)	Participant 6 (P6)	Architect	Consultant	6
		Participant 7 (P7)	Interior Architect	Consultant	20
		Participant 8 (P8)	Architect	Consultant	5
Real estate finance expert (n=2)		Participant 9 (P9) (Dr.)	Real Estate Industry Analyst	Securities	6
		Participant 10 (P10)	Real Estate Industry Analyst	Securities	24
Real estate legislative expert (n=1)		Participant 11 (P11)	Real Estate Legal Specialist	Developer	9

Chapter 4 A Quantitative Measurement of the Use of Design Standardization

4.1. Introduction

For this study, the researcher has collected and analyzed 824 valid floor plan designs to quantitatively measure the degree and to understand the situation of the use of design standardization in the residential property development in China. The characteristics of the study sample are listed on Table 10. These 824 floor plan designs were delivered in 234 residential development projects, and 348 designs were delivered by developer A, 195 were delivered by developer B, 145 were delivered by developer C, 72 were delivered by developer D, and 64 by developer E. Among all these 824 samples, 195 were residential floor plan designs in Beijing, 203 were in Shanghai, 178 were in Guangzhou, and 248 were in Chengdu.

This chapter will present the quantitative findings primarily in three sections. Section 4.2.1 will firstly introduce the overall degree and situation of the use of design standardization. In this section, statistical results of the degree of the use of design standardized will be reported based on the NBnb room types, cities, and developers. Section 4.2.3 will focus on the developers' use of design standardizations base on NBnb floor plan types, in order to further understand developers' strategies on the use of design standardizations. Section 4.2.3 will focus on the five primary types of NBnb room types, and reports developers' possible strategies in adopting design standardizations to these five room types differently.

Table 10 Characteristics of the Study Sample of Study 1 (N=824)

	No. of floor plans
Total	824
No. of projects	234
Developer	
A	348 (42.2%)
B	195 (23.7%)
C	145 (17.6%)
D	72 (8.7%)
E	64 (7.8%)
Cities	
Beijing	195 (23.7%)
Shanghai	203 (24.6%)
Guangzhou	178 (21.6%)
Chengdu	248 (30.1%)
Years	
1999	1 (0%)
2000	4 (0%)
2001	3 (0%)
2002	19 (2.3%)
2003	15 (1.8%)
2004	11 (1.3%)
2005	31 (3.8%)
2006	20 (2.4%)
2007	27 (3.3%)
2008	73 (8.9%)
2009	76 (9.2%)
2010	67 (8.1%)
2011	91 (11.0%)
2012	61 (7.4%)
2013	41 (5.0%)
2014	63 (7.6%)

2015	92 (11.2%)
2016	129 (15.7%)

4.2. Findings

4.2.1. The Overall Degree of the Use of Standardized Design

Within the whole study sample of 824 floor plan designs, 472 (57.282%) floor plans have adopted standardized designs. There are in total 15 coded NBnb room types as introduced in section 3.4.1.3. The sample sizes of each coded NBnb room types, and the numbers and rates of floor plans that have adopted standardized designs within each room type are listed in Table 11. Among all 15 coded NBnb room types, the 10 room types' sample sizes are significantly smaller than the other 5 room types' and these 10 room types' sample sizes are from 1 to 27. The 5 coded NBnb room types with larger sample sizes and the numbers of the samples are 1B1b (55), 2B1b (240), 3B1b (106), 3B2b (256), and 4B2b (72). It is understandable that the sample sizes of each coded NBnb room types are different, and it is reasonable that these 5 room types' sizes are significantly bigger in China. Among these 5 room types, the rate of standardized floor plans of room type 2B1b and 3B1b reached the highest at 67.971% and 73.585% respectively, and the rate of standardized floor plans of 1B1b, 3B1b, and 4B2b are all approximately at 50%.

Table 11 The Overall Degree of the Use of Standardized Design

Floor Plan Type	No.	No. of standardized floor plans
Total	824 (100%)	472 (57.282%)
0B1b	26 (3.156%)	18 (69.231%)

1B1b	55 (6.675%)	27 (49.090%)
2B1b	240 (29.126%)	163 (67.917%)
2B2b	27 (3.277%)	13 (48.148%)
3B1b	106 (12.864%)	78 (73.585%)
3B2b	256 (31.068%)	125 (48.828%)
3B3b	5 (0.607%)	2 (40.000%)
3B4b	1 (0.121%)	0 (0.000%)
4B1b	1 (0.121%)	0 (0.000%)
4B2b	72 (8.738%)	41 (56.944%)
4B3b	21 (2.439%)	5 (23.810%)
4B4b	9 (1.092%)	0 (0.000%)
5B2b	2 (0.243%)	0 (0.000%)
5B3b	2 (0.243%)	0 (0.000%)
5B4b	1 (0.121%)	0 (0.000%)

The distributions of each city and each developer's sample sizes and the overall degree of each city and developers' use of design standardizations is shown in Table 12. Regarding the degree of the adoption of design standardizations in different cities, the percentage rates of floor plans that have conformed to standardized designs in Guangzhou and Shanghai are comparatively higher at 66.854% and 65.039% respectively. In Beijing, the rate of floor plans that have adopted standardized designs is the lowest among the four cities at 49.744%. The sample sizes of each city are distributed relatively regularly at about 200 (about 20% to 30%). In terms of the overall degree of the use of design standardizations by different developers, 71.875% of developer E's floor plans have adopted standardized designs, and this is the highest rate among all developers. The degree of developer C's adoption of design standardizations is 46.897%, and this is the

lowest among all developers. Developers A, B, and C's percentage rates of the use of design standardization are extremely close at 58.046%, 58.974%, and 56.944% respectively. The researcher further conducted Study 3 to understand stakeholders' perspectives on the use of design standardizations and have collected interview data on stakeholders' estimations on the overall degree of the use of design standardizations. The results of participants' estimations and the comparison between results of this study and Study 3 will be reported in Section 6.4.

Table 12 The Overall Degree of the Use of Standardized Designs among Cities and Developers

	No. of Floor Plan	No. of Standardized Floor Plan
Total	824	472 (57.282%)
Cities		
Beijing	195	97 (49.744%)
Shanghai	203	130 (65.039%)
Guangzhou	178	119 (66.854%)
Chengdu	248	142 (57.258)
Developers		
A	348	202 (58.046%)
B	195	115 (58.974%)
C	145	68 (46.897%)
D	72	41 (56.944%)
E	64	46 (71.875%)

Table 13 The Developers' Adoption of Standardized Design across Cities

		A	B	C	D	E
Beijing	No. of Project	37	8	10	3	3
	No. of Floor Plan	111	20	51	4	9
	No. of Standardized Floor Plan	56	12	23	1	5
	Percentage of Standardized Floor Plan	50.45%	60.00%	45.10%	25.00%	55.56%
Shanghai	No. of Project	30	13	4	7	0
	No. of Floor Plan	115	40	19	29	0
	No. of Standardized Floor Plan	87	22	4	17	0
	Percentage of Standardized Floor Plan	75.65%	55.00%	21.05%	58.62%	-
Guangzhou	No. of Project	18	11	0	3	14
	No. of Floor Plan	57	52	0	14	55
	No. of Standardized Floor Plan	35	36	0	7	41
	Percentage of Standardized Floor Plan	61.40%	69.23%	-	50.00%	74.55%
Chengdu	No. of Project	25	20	22	8	0
	No. of Floor Plan	65	83	75	25	0
	No. of Standardized Floor Plan	24	45	41	16	0
	Percentage of Standardized Floor Plan	36.92%	54.22%	54.67%	64.00%	-

Table 13 indicates the number of projects, the number of floor plans, and the overall degree of the use of design standardizations of each developer in different cities. Based on Figure 16, the degree of developer B's use of design standardizations in four cities is close within the range from 54.217% to 69.231%. Developers A and D' use of design standardizations varies in degrees in the four targeted cities, from 36.923% to 75.652% and from 25% to 64% respectively. Regarding the use of design standardizations in the four cities, the five developers' degree of the use of standardized floor plan designs in Guangzhou and Chengdu are similar, ranging from 50% to 74.545% and from 36.923% to 64% respectively.

Figure 16 The Developers' Use of Standardized Design in Four Cities

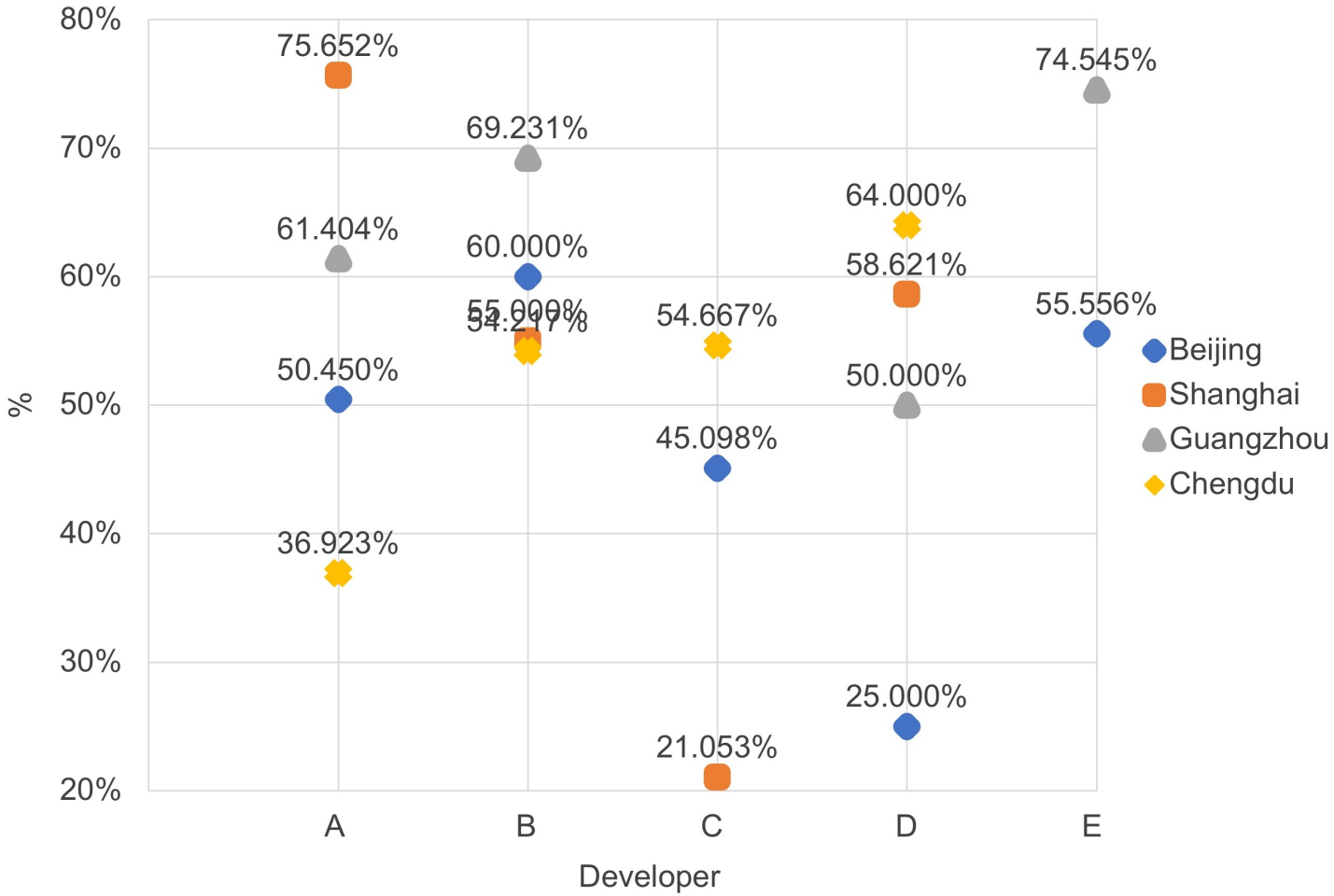
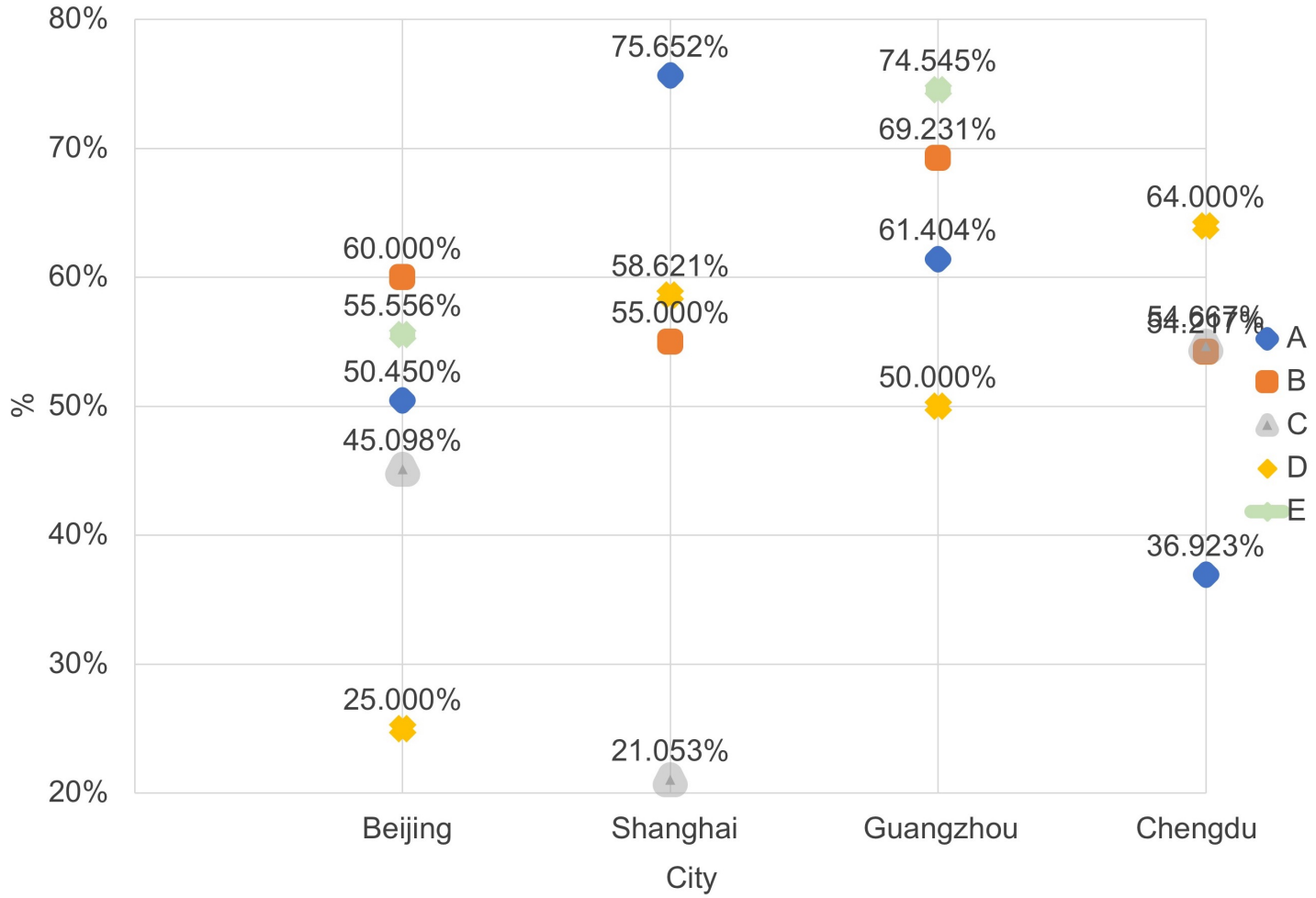


Figure 17 The Developers' Use of Standardized Design in Four Cities



4.2.2. Varieties of Design Standardization

4.2.2.1. Standardized Floor Plan Types

There are in total 58 generalized standardized floor plan types. In terms of the 1B1b room type, there are four standardized floor plan types. There are eight generalized standardized floor plan types in 2B1b room type, seven generalized standardized floor plan types in 3B1b.

Table 14 Numbers of Standardized Floor Plan Type and Sub Standardized Floor Plan Type of the Five Primary NBnb Room Types

Room Type	No. of Standardized Floor Plan Type	No. of Sub Standardized Floor Plan Type
1B1b	4	4
2B1b	8	15
3B1b	7	10
3B2b	5	19
4B2b	4	10
Total No.	28	58

4.2.2.2. The Use of Standardized Design Based on Floor Plan Type

Among the 58 generalized sub standardized floor plan types, developer A adopted 47 types of standardized floor plans (81.03%), and also adopted the highest number of standardized floor plan design types. Developer B, C, D, and E adopted 34 (58.62%), 27 (46.55%), 14 (24.14%), and 22 (37.93%) types of standardized floor plan designs respectively. According to the overall degree of the use of design standardizations presented in section

4.2.1, developer A's percentage rate of the use of design standardizations is 58.046%, and this is moderate among all developers' degree of the use of design standardizations. Consequently, developer A has adopted the most standardized design varieties. On the contrary, while developer E's rate of the use of design standardization is the highest among all developers, the developer E has adopted a relatively smaller number of standardized floor plan types. Therefore, developer E has adopted comparatively fewer standardized design varieties.

Table 15 The Developers' Use of Standardized Design

Based on Floor Plan Type

Standardized Floor Plan Type	No. of Floor Plan	Developer				
		A	B	C	D	E
1B1b-1	16	√	√	√		
1B1b-2	6	√		√	√	
1B1b-3	2	√		√		
1B1b-4	3	√				√
2B1b-1	11	√	√			
2B1b-2	14	√	√	√	√	√
2B1b-3	9	√				
2B1b-4-1	19	√	√	√	√	√
2B1b-4-2	3	√	√			
2B1b-4-3	8	√	√	√		
2B1b-5-1	20	√	√	√		
2B1b-5-2	10	√	√			
2B1b-5-3	33	√	√	√	√	√
2B1b-5-4	7	√	√		√	
2B1b-6-1	7	√		√		
2B1b-6-2	7	√	√			√
2B1b-7	8	√	√	√		

2B1b-8-1	4					√
2B1b-8-2	3					√
3B1b-1	2	√				√
3B1b-2	2			√		√
3B1b-3	16	√	√	√		
3B1b-4-1	22	√	√	√	√	√
3B1b-4-2	3	√		√	√	
3B1b-4-3	5	√	√			
3B1b-5-1	3	√		√		
3B1b-5-2	9	√	√	√	√	
3b1b-6	13	√	√	√	√	√
3b1b-7	3					√
3b2b-1-1	4			√		
3b2b-1-2	3	√				
3b2b-2-1	6	√	√			
3b2b-2-2	4	√				
3b2b-2-3	1	√				
3b2b-2-4	2	√	√			
3b2b-2-5	4	√	√		√	
3b2b-3	6	√	√			
3b2b-4-1	22	√	√	√	√	√
3b2b-4-2	7	√		√		√
3b2b-4-3	5	√	√			
3b2b-4-4	8	√				
3b2b-4-5	21	√	√		√	√
3b2b-4-6	6		√	√	√	√
3b2b-4-7	8	√	√			√
3b2b-5-1	3	√				√
3b2b-5-2	7	√	√	√		
3b2b-5-3	2		√			
3b2b-5-4	5		√	√		√
4b2b-1-1	2	√				
4b2b-1-2	2	√		√		

4b2b-1-3	2			√		√
4b2b-2-1	2		√			
4b2b-2-2	5	√	√		√	
4b2b-2-3	4	√	√			
4b2b-3	3	√				
4b2b-4-1	8	√	√	√		
4b2b-4-2	10	√	√			√
4b2b-4-3	3			√		√
Total No.	433	47	34	27	14	22

Regarding the 58 generalized sub standardized floor plan types, six (10.34%) standardized designed floor plans types have been adopted by all five developers. Three (5.17%) types of standardized floor plan designs have been adopted by four developers. Within these three types of designs, one design was adopted by Developers A, B, C, and D, one design was adopted by Developers A, B, D, and E, and one type was adopted by Developers B, C, D, and E.

There are 17 (29.31%) types which have been adopted by three developers. Among these 17 types of standardized floor plan designs, over three-quarters (13 types) of design were adopted by Developers A, B, and another developer (seven types were adopted by Developers A, B, and C, three types were adopted by Developers A, B, and D, and three types were adopted by Developers A, B, and E). There are two types of standardized designs adopted by Developers A, C, and D. There is one type of design adopted by Developers A, C, and E, and one type was adopted by Developers B, C, and E.

There are 19 (32.76%) types adopted by two developers. Within these 19 types of standardized floor plan designs, almost 50% of types (nine types) of designs were adopted by Developers A and B, four types adopted by Developers A and C, three types were adopted by Developers A and E, and three types were adopted by Developers C and E.

There are 13 types (22.41%) of standardized designs were adopted by one single developer. Among these 13 types of standardized designs, over half (seven types) were adopted exclusively by the developer A, three types were adopted by developer E only, two types by developer B, and the remaining one type was adopted solely by developer C. It seems developer A and B has adopted a large number of the same types of standardized designs. This situation seems to be corresponding with some interviewees' perceptions and it will be discussed in later chapters.

4.2.2.3. The Use of Standardized Designs at Four Cities Based on Floor Plan Type

Table 16 The Use of Standardized Design at Four Cities Based on Floor Plan Types

Standardized Floor Plan Type	No.	City			
		Beijing	Shanghai	Guangzhou	Chengdu
1b1b-1	16	√	√	√	√
1b1b-2	6	√			√
1b1b-3	2	√			√
1b1b-4	3			√	
2b1b-1	11		√	√	√
2b1b-2	14		√	√	√
2b1b-3	9	√			
2b1b-4-1	19			√	√
2b1b-4-2	3			√	√
2b1b-4-3	8	√		√	√
2b1b-5-1	20	√	√		
2b1b-5-2	10	√	√		
2b1b-5-3	33	√	√	√	√
2b1b-5-4	7		√	√	√

2b1b-6-1	7	√	√	√	√
2b1b-6-2	7	√	√	√	
2b1b-7	8	√			
2b1b-8-1	4		√		
2b1b-8-2	3		√		
3b1b-1	2	√		√	
3b1b-2	2			√	√
3b1b-3	16	√	√		
3b1b-4-1	22			√	√
3b1b-4-2	3	√	√	√	
3b1b-4-3	5			√	√
3b1b-5-1	3			√	√
3b1b-5-2	9			√	√
3b1b-6	13	√		√	√
3b1b-7	3		√		
3b2b-1-1	4				√
3b2b-1-2	3			√	
3b2b-2-1	6	√	√		√
3b2b-2-2	4	√			√
3b2b-2-3	1	√			
3b2b-2-4	2		√		√
3b2b-2-5	4	√	√		√
3b2b-3	6	√	√		√
3b2b-4-1	22	√	√	√	√
3b2b-4-2	7		√	√	√
3b2b-4-3	5			√	√
3b2b-4-4	8		√		
3b2b-4-5	21		√	√	√
3b2b-4-6	6			√	√
3b2b-4-7	8			√	√
3b2b-5-1	3	√		√	
3b2b-5-2	7	√	√	√	√
3b2b-5-3	2		√		

3b2b-5-4	5	√			
4b2b-1-1	2			√	√
4b2b-1-2	2			√	√
4b2b-1-3	2			√	√
4b2b-2-1	2		√		
4b2b-2-2	5		√		√
4b2b-2-3	4		√		√
4b2b-3	3	√			
4b2b-4-1	8		√	√	√
4b2b-4-2	10		√	√	√
4b2b-4-3	3			√	√
No.	433	25	29	34	38

According to Table 16, among the 58 generalized sub standardized floor plan types, there were 25 (43.10%) types of designs adopted in Beijing, 29 (50.00%) types were adopted in Shanghai, 34 (58.62%) were adopted in Guangzhou, and 38 (65.52%) were adopted in Chengdu. It seems there is no obvious distinction among different cities' varieties of the use of standardized design types.

Within these 58 generalized sub standardized floor plan types, five types of designs were adopted in all four cities, and 14 types of standardized floor plan designs were adopted in three cities. Among these 14 types of standardized floor plan designs, seven types of designs were adopted in Shanghai, Guangzhou, and Chengdu. There are three types of designs were adopted in Beijing, Shanghai, and Chengdu; two types were adopted in Beijing, Shanghai, and Guangzhou; and two types were adopted in Beijing, Guangzhou, and Chengdu.

There are 25 types of standardized floor plan designs adopted in two cities. Within these 25 design types, over 50% types (14 types) were adopted in Guangzhou and Chengdu, three types in Beijing and Shanghai, another three types in Beijing and Chengdu, two types in Beijing and Guangzhou, and the remaining three types in Shanghai and Chengdu.

There are 14 types of floor plan designs were adopted in only one city. Among these 14 types, five designs were adopted exclusively in Beijing, six designs were adopted in Shanghai, two designs were adopted in Guangzhou, and one design was adopted in Chengdu only. It may then accept that the residential development in Guangzhou and Chengdu has adopted a large number of the same standardized floor plan design types.

4.2.3. The Use of Standardized Designs Bases on the Five Primary NBnb Floor Plan Type

This section will concentrate on the developers' adoption of design standardizations based on the five primary floor plan types 1B1b, 2B1b, 3B1b, 3B2b, and 4B2b. The total number of these five floor plan types is 729 out of 824 and constitutes the majority of the data sample in this study. According to Figure 18, it seems there are two groups of developers that have adopted similar strategies in terms of the degree of the use of design standardizations in the five primary floor plans. In terms of the differences among the rates that developers have applied to different types of floor plans. The developers A and B's standardized designed floor plan rates of the five primary floor plan types are similar at from 50.48% to 68.63% and from 52.78%

to 71.43% respectively. In addition, as Figure 19 indicates Developers A and B's standardized designed floor plan rates of types 3B1b (68.66% and 64.71%), 3B2b (50.48% and 52.78%), and 4B2b (64% and 61.54%) are extremely similar. To compare with Developers A and B's strategies in adopting standardized designs on the 5 primary floor plan types, Developers C, D, and E have adopted standardized floor plan designs at different degrees regarding different floor plan types. The Developers C, D, and E's standardized floor plan design rates across five primary floor plan types are from 30.770% to 81.250%, from 25% to 80%, and from 33.330% to 91.670% respectively. Among Developers C, D, and E, Developers C and D's strategies in the degree of the use of design standardizations to different floor plan types are also similar. The Developers C and D's standardized design rates of floor plan types 2B1b, 3B1b, 3B2b, and 4B2b are 72.73% and 78.26%, 81.25% and 80%, 32.5% and 31.82%, and 30.77% and 33.33% respectively. According to Figure 19, although five developers' percentage rates of use of standardized floor plan designs are different in different floor plan types, all five developers have adopted relatively high rates in floor plan type 3B1b (from 64.71% to 91.67%) and 2B1b (from 63.25% to 78.26%).

Table 17 The Developers' Use of Standardized Designs in the Five Primary Floor Plan Types

		1B1b	2B1b	3B1b	3B2b	4B2b
A	No. of floor plans	24	117	51	105	25
	No. of standardized floor plans	13	74	35	53	16
	Percentage of standardized floor plans	54.17%	63.25%	68.63%	50.48%	64.00%
B	No. of floor plans	8	49	17	72	26
	No. of standardized floor plans	5	35	11	38	16
	Percentage of standardized floor plans	62.50%	71.43%	64.71%	52.78%	61.54%
C	No. of floor plans	16	33	16	40	13
	No. of standardized floor plans	7	24	13	13	4
	Percentage of standardized floor plans	43.75%	72.73%	81.25%	32.50%	30.77%
D	No. of floor plans	4	23	10	22	3
	No. of standardized floor plans	1	18	8	7	1
	Percentage of standardized floor plans	25.00%	78.26%	80.00%	31.82%	33.33%
E	No. of floor plans	3	18	12	17	5
	No. of standardized floor plans	1	12	11	14	4
	Percentage of standardized floor plans	33.33%	66.67%	91.67%	82.35%	80.00%

Figure 18 Developers' Use of Standardized Designs Based on Five Primary Floor Plan Types

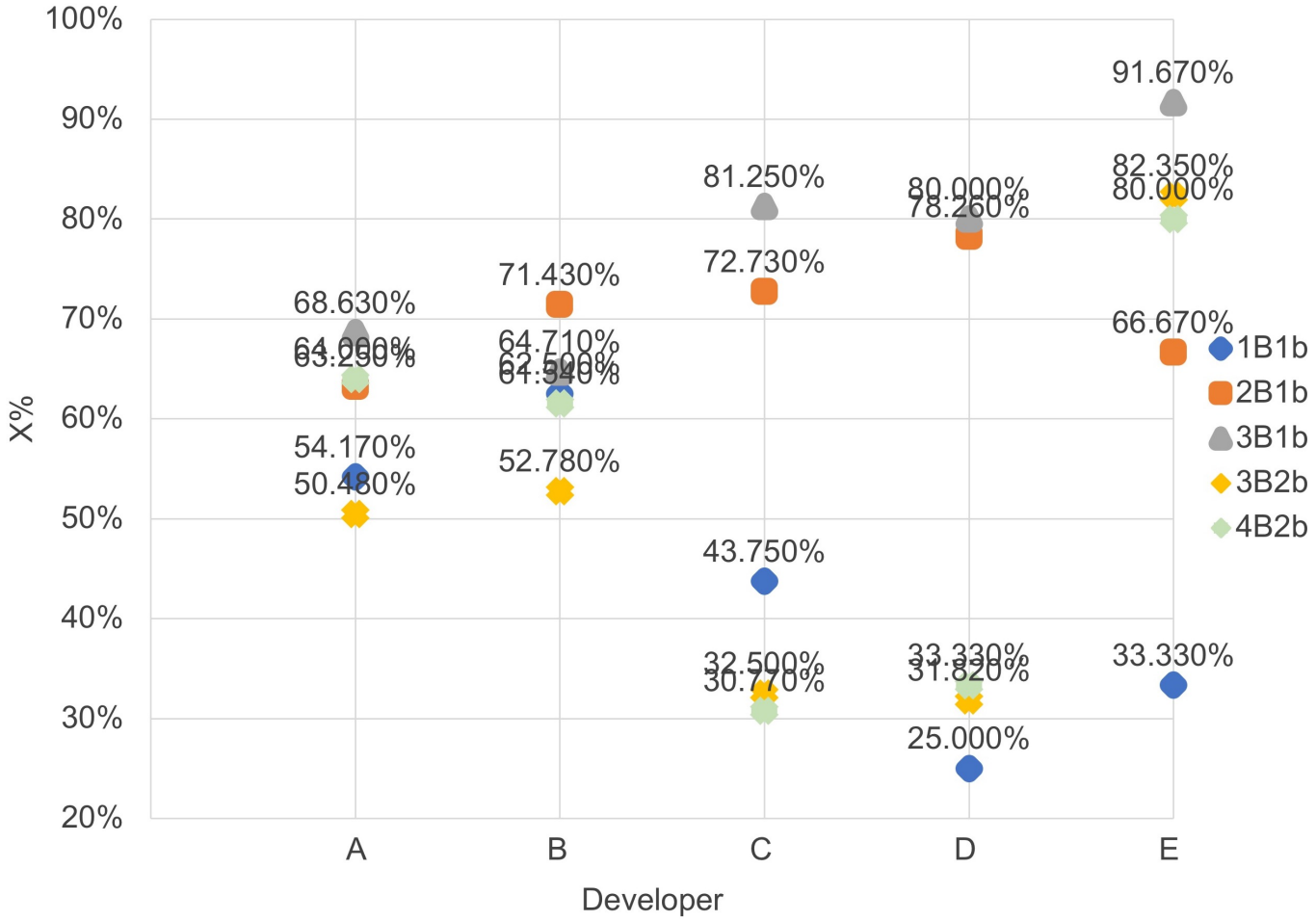
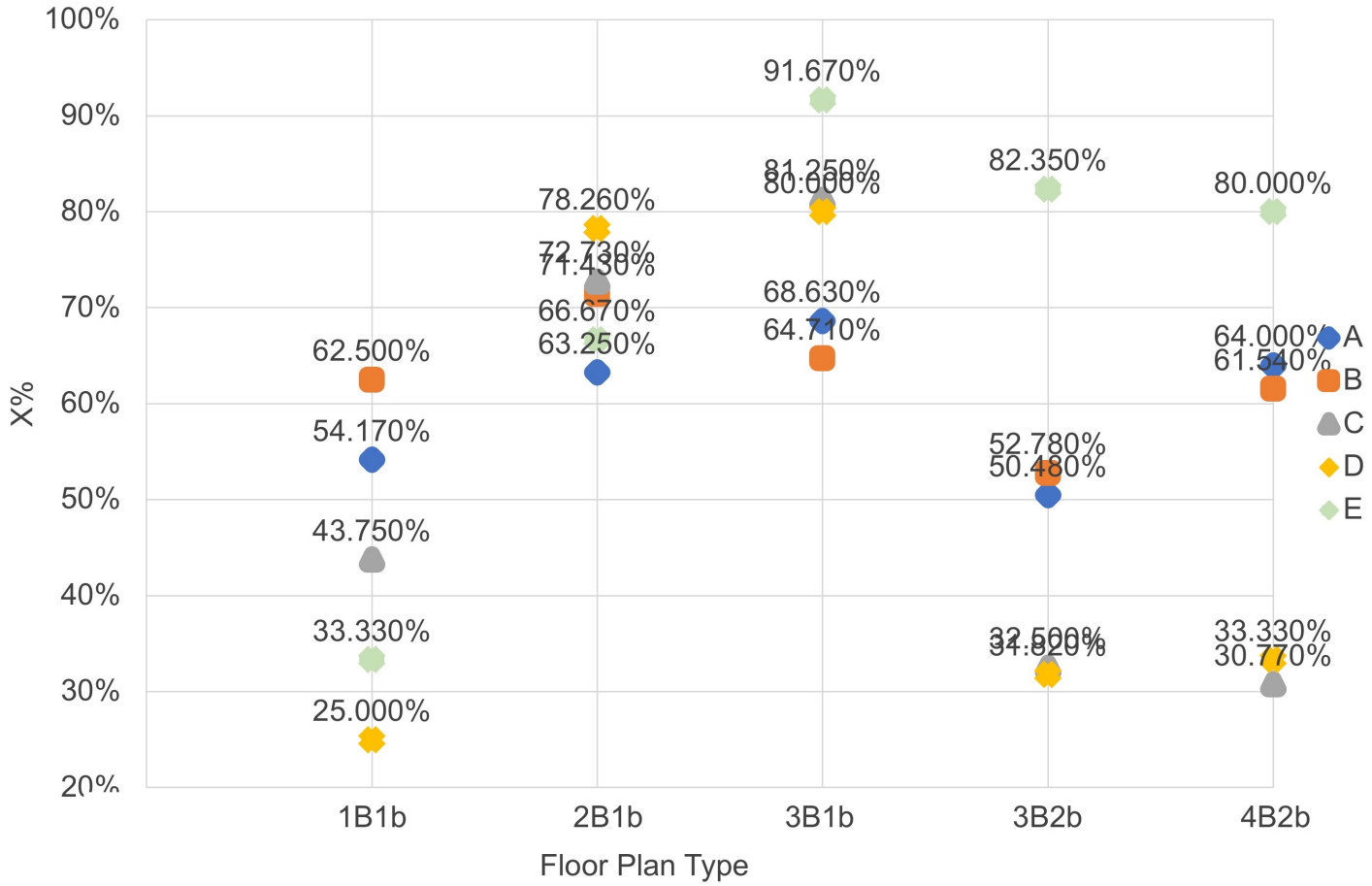


Figure 19 Developers' Use of Standardized Designs Based on Five Primary Floor Plan Types



Chapter 5 A Correlational Test of Use of Design Standardization and Project-Level, Organization-Level, and City-Level Variables

5.1. Introduction

This chapter will present test results of the correlational study between the degree of use of standardized designs and the concerning indicators at different levels, in order to further understand developers' strategies in adopting design standardizations and the possible factors' effects on the use of design standardizations. There will be three discussion sections in this chapter, and each section will present results of each level. This chapter will also report stakeholders' perceptions and assumptions at each section on the possible factors' effects on the degree of the use of design standardization. The sample size of this study has been reduced from Study 1, and the scope of sample size of this Study 2 is floor plans of the most recent three years 2014, 2015, and 2016. The characteristics of the data sample are listed in Table 18.

Table 18 Characteristics of the Study Sample of Study 2 (N=284)

	No. of Floor Plans
Total	284
No. of projects	77
Developer	
A	117 (41.2%)
B	50 (17.6%)
C	59 (20.8%)
D	29 (10.2%)
E	29 (10.2%)
Cities	

Beijing	56 (19.7%)
Shanghai	69 (24.3%)
Guangzhou	93 (32.7%)
Chengdu	66 (23.2%)
Years	
2014	63 (22.2%)
2015	92 (32.4%)
2016	129 (45.4%)

5.2. Findings

5.2.1. Project Level

The variables at project level that have been tested in this study are based on three questions that have not yet been answered, and the list of project level variables is included in Table 19. The first question is whether the degree of the design standardization implementation is related to the projects' positioning. In other words, if there are any differences in the degree of applying design standardizations to luxury and low-end nature property projects. From the outcome-oriented perspective, the question is if the current standardized design outcomes represent a higher design quality in order to support the high values of projects, or project-specified and none-standardized designs represent a higher design quality in order to support the high values. This question has been discussed in the industry widely, and two general assumptions were generated from the findings of Study 3. According to some stakeholders' experiences, the first assumption is:

> "It is unlikely to apply design standardizations to high-end and good-quality targeted projects"

For example, one of the participants P3 said: “there is no way to adopt standardized designs in high-end projects,” and P3 feels the unique designs support properties’ high prices, and developers’ need to present individualized design as the highlights of projects to convince their customers. Another interviewee P4 believes: “if a developer is targeting to deliver some good-quality projects in order to establish the corporate identity, this developer will consequently invest more design resources to the targeted projects. The projects’ design qualities will be improved. In contrast, developers will implement standardized designs if they are aiming to expand their businesses in a quantity-first way.” The second assumption is:

> “In terms of design qualities, the standardized design outcomes’ are better than non-standardized and project-specified designs.”

For example, P7 argues the design qualities of standardized designs are better. P7 thinks the standardized designs were usually developed by developers headquarter personnel, and these groups of head offices’ people are more capable than developers’ project-based personnel.

Table 19 The List of Project Level Related Variables

Variable	Description
Project location	
x (0) = Central city area	165 (58.1%)
x (1) = Suburbs area	119 (41.9%)
No. of phase	
x (1) = Phase 1	201 (70.8%)
x (2) = Phase 2 and 2+	83 (29.2%)
Sales quotation as new construction (Chinese Yuan/m^2)	
Mean (SD)	25273.22 (20619.52)
[Min, Max]	[5250, 120000]
Property management fee (Chinese Yuan/m^2/Month)	
Mean (SD)	3.43 (1.20)
[Min, Max]	[1.60, 7.70]
Sales quotation of interior decoration (Chinese Yuan/m^2)	
Mean (SD)	3031.38 (1814.92)
[Min, Max]	[850, 9000]
Facade style	
x (1) = Art Deco	46 (16.2%)
x (2) = North American	7 (2.5%)
x (3) = European	16 (5.6%)
x (4) = Modern	165 (58.1%)
x (5) = New Chinese	50 (17.6%)
Exterior wall finishing material	
x (0) = Stone	75 (26.4%)
x (1) = None-Stone	209 (73.6%)
GAR (Green Area Ratio)	
Mean (SD)	0.34 (0.06)
[Min, Max]	[0.15, 0.48]
Interior decoration features	
x (1) = Roughcast	37 (13%)

x (2) = Fully Decorated	168 (59.2%)
x (3) = Both	79 (27.8%)
Total GFA (Gross Floor Area) (m^2)	
Mean (SD)	1150839.81 (472211.71)
[Min, Max]	[70000, 2109000]
Total No. of planning household	
Mean (SD)	10056.67 (4519.69)
[Min, Max]	[527, 15879]
FAR (Floor Area Ratio)	
Mean (SD)	3.02 (1.66)
[Min, Max]	[1.00, 8.77]
Car park ratio	
Mean (SD)	1.06 (0.54)
[Min, Max]	[0.25, 4.50]
No. of registered architects of project architectural consultant	
Mean (SD)	52.44 (41.58)
[Min, Max]	[3, 303]

In Table 20, there are five factors that reflect the positioning of a project which have showed connectivity with the degree of the use of design standardizations. Among all variables, four are negatively related to the degree of the use of design standardizations. And all testing results of five variables support the first assumption. The significance of the sales quotation (0.001), property's management fee (0.000), and the sales quotation of interior decoration (0.009) are at the level of 0.01. The location (0.035) and the car park ratio's (0.019) significant level are at 0.05. Therefore, according to the current empirical evidence, it seems that standardized designs are more likely to be applied to lower-end projects in the industry, instead of projects in relatively central areas of cities, with higher sales quotation, higher interior decoration quotation, higher management fee, and higher car park ratio. To further interpret this phenomenon, the researcher thinks the results may also support some of the previous literature queries if some developers' standardization design outcomes are based on scientific and systematic research. Mei (2013, p. 18) has summarized some Chinese real estate developers' general operational problems. Mei points out many developers' design standardization contents are based on the collection and summary of its previous projects' design materials and outcomes, instead of the scientific and systematic research processes.

Table 20 The Use of Standardization Designs and Project's Positioning Related Variables

by Correlation Coefficient

		y(0)= non-standardized y(1)= standardized
Location	Pearson Correlation	.125*
	Sig. (2-tailed)	0.035
Sales quotation as new construction (m^2)	Pearson Correlation	-.199**
	Sig. (2-tailed)	0.001
Property management fee (m^2)	Pearson Correlation	-.268**
	Sig. (2-tailed)	0.000
Sales quotation of interior decoration (m^2)	Pearson Correlation	-.166**
	Sig. (2-tailed)	0.009
Car park space ratio	Pearson Correlation	-.139*
	Sig. (2-tailed)	0.019

The third question is if the degree of standardized design adoption is correlated to other processes of residential property development. During the interview section of Study 3, a lot of interviewees raised other processes of residential development that may be related to the degree of the use of design standardizations. For example, if the degree of the use of design standardization is connected to the projects' interior decorated features (fully interior decorated or rough casted) or the projects' use of prefabricated technologies. Regarding the projects' use of design standardizations and projects' interior decoration features, P5 believes the implementation of fully interior decorated flats is based on the use of design standardization. P5 feels: "if a developer has decided to deliver fully interior decorated flats in a residential property development project, this developer has to equip with design standardization contents first. There is no way to implement fully interior decorated flats in a residential property development project without the foundation of standardized design contents." However, P7's assumption is the fully interior decoration design is another relatively individual sub standardized design system. P7 states: "it is also possible for the non-standardized and project-specified projects to apply fully interior decorated feature." P7 also shared his experience and believes: "the fully interior decorated flats' interior designs are currently within many developers' design standardization frameworks." Therefore, the researcher has conducted the correlational study on this variable in two tests, and it seems there is no correlation found between the use of design standardizations and the projects' interior decoration features.

Table 21 The Use of Standardization Designs and the Interior Decoration Features

by Correlation Coefficient

			y (0) = non-standardized y (1) = standardized
Interior decoration features	x (1) = rough casted x (2) = fully decorated x (3) = both	Pearson Correlation	-0.085
		Sig. (2-tailed)	0.152
Interior decoration features	x (1) = rough casted x (2) = with fully decorated	Pearson Correlation	-0.045
		Sig. (2-tailed)	0.45

In the interviews, many participants have also mentioned the relationship between the use of design standardization and the use of prefabricated technologies. P2 and P10 suggest the use of design standardizations is the foundation of the use of design standardizations and is possible to promote the future development of prefabricated technologies. P1 identifies: “the use of design standardizations and the use of prefabricated technologies are inseparable. They support each other’s development.” Unfortunately, the researcher has not yet detected any project-specified statistics on the information of the project’s use of prefabricated technologies. Therefore, this variable has not been tested in this study. In later Section 8.4, the researcher will further discuss this problem as one of the limits of this research.

5.2.2. Developer’s City-Level Branch Level

In this section, the developers’ city level branch’s operational statistics on the total amount of work-related variables were tested, and the list of variables is shown in Table 22. It seems the developers’ total amount of work is related to the degree of the use of design standardizations. According to Table 23, the three developers’ workload related variables are related to the degree of the use of design standardizations. The three variables are the developers’ city level branch’s total number of projects in 2014, the total developed gross floor area in 2014, and the total developed numbers of planning household. The 3 variables are positively related to the degree of the use of design standardizations at the 0.05 levels, and the variance inflation factors (VIF) values are less than 10 at 3.473, 5,197, and 7.877 respectively. There are also two different assumptions behind this test. The first assumption is the developers will adopt greater proportion of

standardized designs when the developers' total project number is smaller. In other words, the city branch developers are likely to adopt design standardizations when the scale of a developers' city level branch is small. For example, the city branch developers will seek design supports from the head offices and adopt standardized design solutions. The second assumption is the city branch developers are likely to adopt more standardized designs with greater numbers and scales of projects. In other words, the city branch developers will adopt standardized designs when the workloads are relatively heavier. On the other hand, the developers' city-level branches will develop non-standardized and project-specified project designs when the amount of work is smaller. The results seem to support the second assumption.

Table 22 The List of Developers' City Level Branch Related Variables

Level	Variable	Measurement
Developers' City Level Branch	Developers' total No. of project of 2014	-
	Developers' total No. of planning household of 2014	-
	Developers' total gross floor area (m^2)	m^2
	Developers' total No. of architectural consultancy partners of 2014	-

Table 23 The Degree of the Use of Standardization Designs and Developer's Workload by Correlation Coefficient

		y (0) = non-standardized y (1) = standardized
Developers' total no. of project	Pearson Correlation	.136*
	Sig. (2-tailed)	0.022
Developers' total gross floor area (m^2)	Pearson Correlation	.152*
	Sig. (2-tailed)	0.010
Developers' total no. of planning household (m^2)	Pearson Correlation	.136*
	Sig. (2-tailed)	0.022

To further interpret this test's results, it can be seen that it corresponds to the two contrasting expectations on the future's use of design standardizations. The first assumption is there will be fewer uses of standardized designs when the future industry development slows down. One of the interviewees P5 feels there will be no use of standardized designs in the future if the development slows down. P5's rationale is developers' will be able to spend time on projects' designs and to provide professional design solutions based on different customers' need, if the pace of developments gets slower in the future. In addition, both P2 and P9 believe there will be less use of design standardizations in the future. The second expectation is the future use of design standardization is not related to the future's amount of new developments. This will be discussed in detail in Section 6.5.2 on stakeholders' expectations on the future use of designs standardizations. This test indicates that the developers are likely to apply more standardized designs when their workloads are heavier. Therefore, the test may also support the first assumption of the future use of design standardizations.

5.2.3. Cities' District Level

It is well known that the demographics and economic indicators are the fundamental and key factors of the property market. Therefore, this study has tested the correlations of the degree of the use of design standardization and the population, density, and economy variables. The list of variables is shown in
Table 24.

According to the test results listed in

Table 25, two indicators are related to the degree of the use of design standardizations. The district's land area is positively correlated to the degree of the use of design standardizations, and the significance level is at 0.05. Therefore, the degree of the use of designs standardizations is higher in city districts with greater land areas. The permanent population density is negatively related to the degree of the use of design standardizations, and the significance level is 0.01. Consequently, the degree of the use of design standardization is higher in city districts with smaller population density.

Table 24 The List of City Level (by District) Related Variables

Level	Variable	Measurement
District of City	Total No. of permanent population by district	10,000
	Total No. of registered population by district	10,000
	Total No. of permanent migrant population by district	10,000
	Land area by district	km^2
	Permanent population density by district	People per km^2
	Gross domestic product (GDP) by district	10,000 Chinese Yuan
	Gross domestic product (GDP) growth by district	%

Table 25 Degree of Use of Standardization Design and City Level (by District) Demographics Indicators by Correlation Coefficient

		y (0) = non-standardized y (1) = standardized
Land area by district (km^2)	Pearson Correlation	.158*
	Sig. (2-tailed)	0.021
Permanent population density by district (people per km^2)	Pearson Correlation	-.183**
	Sig. (2-tailed)	0.007

Chapter 6 Multi-Stakeholder Perspectives on Design Standardization

6.1. Introduction

This chapter will present findings of stakeholders' perspectives from in-depth interview studies in four sections. Section 6.2 summarizes and analyzes stakeholders' insights on the adoption of the use of standardized design in property development in China at four integrated levels (society, industry, organization, and individual) and Section 6.3 presents stakeholders' understanding on the pros and cons of the use of standardized design at three levels (individual, organization, and societal). Section 6.4 discusses stakeholders' estimation on the degree of the use of standardized designs, and compares stakeholders' estimation with quantitative measurements reported in earlier Sections 4.2.1 and 4.2.3. Section 6.5 also examines stakeholders' evaluation on the past use of standardized design and expectation of the future use of standardized design. The third section of this study also contributes the Study 2 of this research. The measurable aspects correlated to the degree of the use of design standardization proposed by stakeholders have been examined in Study 2 and the results were reported in Chapter 5.

6.2. The Initiation and Adoption of Standardized Design

According to stakeholders' insights, there are various and multi-level factors resulting in the initiation and adoption of standardized design in residential property development in China in the past decades. And it seems the implementation of standardized design is developers' natural and inevitable action according to the majority of stakeholders' understanding. Table 26 summarizes the stakeholders' perspectives on the reasons of developers' implementation of standardized design. The reasons proposed by interviewees were analyzed and organized at four levels: the societal, industrial, organizational, and individual. These four levels were integrated.

Table 26 The Reasons for the Use of Design Standardization

Level		Interpretations
Society	Social Background	Focus on efficiency and trying to catch-up to developed countries in terms of development level (P2).
	Construction Governance	1. Due to limited number of government personnel and great amount of workload, it is almost impossible to work within an efficient framework while managing different complex designs (P2). 2. The government's approval procedures for the whole project are very complex and full of uncertainty. Therefore, replicating successful designs can increase the likelihood of approval being granted for the project (P2).
	Architectural Education	The architectural education is highly professional yet society in general lacks the basic knowledge and background in the field. By nature, architectural education is interdisciplinary, but the education system is highly segregated and focuses on individual areas of specialty (P2).
	Urban Planning (Cityscape)	There is no negative impact on cityscape, and developments tend to be perceived not bad as in the predevelopment area (P1).
	Legislation	1. There is no effective intellectual property protection for architectural designs (P1, P8, P11). 2. There is no intellectual property awareness in the industry (P11). 3. The government has a lot of mandatory detailed and strict requirements and restrictions on architectural designs. As a result, architects and designers have little room for deviations and

		innovation designs (P4).
	Culture	Buyers tend to consider traditional aspects on architectural design (such as Feng Shui and directions of windows). Architects and designers are therefore constrained in design innovations (P9 and P10).
Industry	Industry Development	1. Great opportunities and rapid development are present in the early stage of the industry. The developers do not need to pay much attention to the project management and design management processes (P2, P4, and P8). 2. Developers' management generally tends to be more casual in the early stage of the industry (P8). A matured management approach is the future trend, and one of the tools in achieving that is to push for standardization in the industry (P7). 3. Potential buyers have higher expectations now, which leads to competition and a survival of the fittest process among developers. The surviving developers with larger economies of scales have incentives to further standardize their designs, and this in return boosts the competitiveness of developers (P10).
Organization	Organization Management	1. Local developers have expanded on a national scale, and it is natural (P4 and P5) and inevitable (P8) for them to replicate their past successful designs. 2. Many developers lack research and development capabilities; therefore, it is the norm for developers to adopt each other's design (P4, P5, P8, and P11). 3. Investors are demanding faster returns, and there is pressure for a faster investment turnover rate. Minimizing the design time and planning process helps to shorten the project period (P4).

		4. As opportunities and sales are always readily available in the industry, the developers lack incentive to invest in research and development for better designs (P4).
Individual	Practitioner	1. Under the practice of development under compressed time in the industry, architects have limited time, limited resources, and lack of experience to develop individualized designs (P2, P4, and P8). 2. Architects (practitioners) have adopted the industry routine of doing repetitive work (P8).
	Residents and potential buyers	The use of standardized design is not of concern to potential buyers in their consideration when purchasing properties (P5 and P6).

6.2.1. Societal Level

More than rapidly accommodating migrants through the urbanization process as a general social background supporting the use of standardized design in property development industry, stakeholders have posited multiple additional social aspects which compose an integral part of the initiation, adoption, and development of the use of standardized design, including general social background (P2), the governance of urban planning and construction (P1 and P2), architectural education (P2), legislation (P1, P4, P8, and P11), and culture (P9 and P10). Even broader than the concept that urbanization in China creates increasing demands for properties, P2 mentions that the use of standardized design is natural as the Chinese society, in this period of time, is focused on efficiency and is trying to catch-up with developed countries in terms of development level.

6.2.1.1. Governance in Urban Planning and Construction

While new discussions arise on the cityscape of China, both P1 and P2 in the government and education stakeholder group expressed their feelings on the urban planning related issues during the interview. P1 holds a positive attitude towards the use of standardized design (P1's comprehensive evaluation over the use of standardized design will be discussed in section 6.5) and P1 shares his project experience on a public-private partner residential property development project. In this project, P1 served as a local government official and P1's partner is a major national-scale developer (represented as CG). P1 believes this is a highly effective project saying: "We've established our partnership successfully within only seven days. We

were first introduced and later we had two face-to-face communications (they visited me and later I visited them). Within seven days, we have achieved cooperation agreement and officially signed the contract. This project started the construction and broke ground within ten weeks." In terms of the implementation of design standardization, P1's reviews of this project are: "Without the adoption of standardized design, it is impossible for our partner developer to prepare designs within such short time framework. It was also my intention and request to prepare two to three single-family occupied house designs and another two to three floor plans for multi-family occupied building designs on a piece of approximately two hundred acres' land. I am satisfied with this project."

The researcher asked a follow-up question on the interviewee's view towards government's role on cityscape management and control. P1 believes it is government's responsibility to manage and control the cityscape and further states the cityscape is currently under control. P1 further explains: "For cityscape, I will control things such as the architectural style design and color designs. These aspects should also definitely meet the local aesthetics value. I will also control the density of each areas of the city and the floor area ratio of individual projects." P1 further assumes the use of design standardization does not have much negative impact on the cityscape. And technically, there is no way for the government to detect whether standardized designs were adopted in the management process. "I personally disagree with some of the current voices consider the use of design standardization totally against the uniqueness of cityscape. Plus, a lot of developments and constructions are in

pre-developed areas. It is better to build something there rather than leave it empty." The researcher explored this matter deeper, and P1 admitted: "To be honest, I have been reflecting and considering this issue. I know there are more or less some impacts on the cityscape, but there are also plenty of great benefits. The demands of the real estate industry are ever changing (Currently, we must first fulfill the basic demand and solve the basic safety issues. Later, we need to improve such as the level of comfort-ability. There will be even further needs to accommodate once we solved the above problems). We might be able to solve this cityscape problem in the future with better solutions. However, the use of standardized design is the best solution under the current circumstances."

Towards the Chinese urban planning and construction governance, P2's view is slightly different from P1's. P2 agrees there are some similarity problems in building designs in China, such as to plagiarize both local and overseas' building designs. However, P2 feels: "The current issue of China's cityscape has been emphasized excessively. I mean there are plagiarism problems in building designs (this is also due to various reasons), but these are not cityscape's problem." According to previous literature, Qiu (2003) the then-vice minister of Ministry of Construction predicts the next 2 decades will be a period of rapid urbanization and development. Qiu, therefore, proposed several challenges that China will be facing and one of the challenges is "the similar cityscapes, the lack of local features, and unified architectural style designs." Qiu further discussed the reasons of this challenge and proposed possible solutions.

Furthermore, P1 explained another distinctive feature of Chinese governance on urban planning, construction, and related felids and P1 elaborated: “I feel our government is babysitting (spoon-feeding) us. Our current government is taking up many responsibilities (both greater and smaller responsibilities), especially Chinese government is taking the economic development responsibility (while some western governments are comparatively service-oriented).” Therefore, to specify to the management of real estate development activities and residential building designs, it is almost impossible to work within an efficient framework while managing different complex designs due to limited number of government personnel and heavy workloads. P2 also noticed the difficulties for developers to get project permits and P2 described: “The property development projects need to go through at least ten government departments or functions’ procedures to get approvals. One project could be easily delayed for years if extra process time were required at each function;” however, at the same time “property developer’s arrangement and use of project development funds are extremely tight, especially the private developers. The majority of developers’ funds are relying on loans and credit. Therefore, almost every single developer is having enormous pressure to repay interests and loans.” Under these circumstances, by replicating successful designs, developers can increase the likelihood of the project being approved while the producers are full of uncertainty.

While both P1 and P2 in the government and education group seemingly denied that developers' implementation of design standardization is related to the cityscape issues, stakeholders from other groups expressed their concerns on the use of standardized design's negative effect on the cityscape and this will be discussed in later sections. One of these stakeholders' (P4, P5, P6 and P11) concerns is that they have started to identify buildings of similar designs in different locations (P4 and P5's experiences are at project level and P6 and P11's are at city level), and they assumed this is associated with the wide use of design standardization in property development activities.

> The developer I am currently working for has been working on certain styles and we have been dedicated to present these styles in an extreme way (as we are engineering-oriented). Sometimes, once I saw a residential project when I walking through a random crossroad in a random city, I instantly knew this must be our project. It is an overall feeling; maybe it is because of the elevation design, the balcony, or any other small detail's design. (P4)
>
> The CG's percentage rate of the adopting standardized designs must be relatively high. In the industry, CG is famous for standardization. It is always easy to recognize CG's projects. (P5)
>
> When I defended my postgraduate research in France, I presented and compared 2 aerial views of my home city. The first one was from many years ago and displayed different ancient local buildings (including architecture with black colored tiles, white colored walls, and surrounded by horse head shaped high walls). The second

picture showed the current situation (including many high-rise buildings with similar designs). I remember my supervisor pointed at the second picture and asked me not and never to get it wrong. My supervisor believes the current situation is not good as my supervisor won't be able to identify any local features. I feel the problem to adopt standardized design is it will gradually make cities looking similar. I mean I will not know which city it is, I will not know whether this is Shanghai or Guangzhou. (P6)

The problem of the use of design standardization in real estate development activities is cities are losing their uniqueness. Although different developers have various standardized developing frameworks, the natures behind them are all the same. (P11)

Apparently, different stakeholder groups understand how the use of design standardization affects the cityscapes differently. This researcher will discuss the cityscape-related issues based on findings from this study and relevant discussions in previous studies in Chapter 7.

6.2.1.2. Architectural Education

P2 compared the two housing standardization directions in the United States (the mass customization) and in China. Based on these 2 directions, P2 talks about the rationality of the use of design standardization in China regarding the public aesthetics foundation and architectural education style. "Firstly, in the United States, the residential housing construction is based on the mass production of standardized housing components. Therefore, housing design are standardized (it is to combine different standardized building component designs), but also individualized (to have freedom to choose from varieties of

standardized component designs). The housing design and construction in the United States is a different system. This is also due to the different land supply systems. Secondly, even if we are having similar system or our standardized designs could have provided more choices to residents and potential buyers, I am afraid it will not work here because the general public is lacking basic knowledge and background of architecture and aesthetics The architectural education is highly specialized and professionalized in China, unlike in the United States some architectural and related subjects are general educational or elective. Therefore the college graduates' common senses on architectural knowledge are relatively stronger. However, the majority of engineering graduates in China may not have basic understanding of architecture, even students in the sociology programs can't either. But we could have equipped them basic architectural knowledge." In section 6.2.4.2 in this chapter, P4 and P5's assumptions on current potential buyers' criteria for property purchase decision-making. P4 and P5 both believe the design of the property is generally not an influential factor in the current Chinese property purchase habits.

6.2.1.3. Ethical and Legal Aspects of Standardized Design

Four interviewees (P1, P4, P8, and P11) mentioned the legislative related aspects upon the adoption and rapid development of standardized designs. Three of the interviewees' (P1, P8, and P11) discussions were focused on intellectual property (IP) and intellectual property protection (IPP). Their arguments primarily focus on the awareness of IPP, a possible loophole in the current IP and related laws and regulations, and the degree of protection of intellectual property related laws and regulations.

> I think we have learned IP and related laws and regulations, however in terms of design IPs, it is basically a blank. (P1)

P8 is current an architect and has been working for two design firms for five years in total (in both first-tier and second-tier cities, state-owned and private enterprises, national- and local-scale). P8 states he has never met any legislative related problems and described his typical experience on adopting designs from the standardized design database. “We will refer to standardized designs in database while we design, but the new designs and the designs in database we referred to will never be 100% the same. Taking the floor plan designs as an example. The floor plan designs’ overall similarity will be very high, but it is impossible to violate the IP laws and regulations if we slightly make some minor adjustments on the detail arrangements, such as floor plan’s dimensions (based on the requirements of developers) and building’s structural designs (based on the specified geological conditions).” The researcher asked a follow-up question on the industry climate of the above design process and operation, and P8 responds: “From my personal experience and my observations, about 30% to 40% of developers will provide floor plan designs they feel confortable and confident to us for direct references. The majority of developers will not, we will also adopt standardized designs based on developers’ requirements due to various reasons. Of course, I feel the current IP laws and regulations might have some loopholes too.”

A similar situation applied to P11, a real estate developer’s legal specialist for 9 years, too. P11 said he has never heard about any legal dispute upon

building designs in the industry and P11 analyzed: “Firstly, the architects and consultants are legally responsible to avoid IP disputes by making possible technical alterations. Therefore, developers as client will not pay much attention on IP issues. Secondly, according to my observation, instead of focusing on IPP, developers are focusing on learning each other’s good designs. There is no awareness of IPP. The circle is narrow and the community is small, developers are all studying each other’s designs both with and without getting permission.” The researcher therefore asked some follow-up questions about the legal risks from adopting standardized designs and P11 explained his feeling about the current industry climate.

> There will be potential risks to copy other developers’ design too much, but the industry currently taking this for granted. It is sometimes the design managers’ work to study other developers’ good designs.

The current situation is also possibly associated with the societal efficiency framework and is relevant to the industry background. This will be discussed in section 6.2.2. P11 also mentioned the current IPP awareness and imagines the awareness of IPP might be improved in the future: “There is currently no IPP awareness. The IPP awareness in the industry may get better in the future, but not in the near future. I know some organizations have started to pay attention to protect their designs as their IPs, such as there are 2 consultancy firms and more, they will raise the IPP issues at the business negotiation stage. I feel there are about 60% to 70% of the architects and consultants have started to be aware of IPP, but there are only definitely less than 30% of developers have the awareness.”

P4 elaborates on the legislative issues from another perspective and points out the residential design and related regulations and requirements might limit the flexibility of design. “The detail controlling requirements of floor plan designs are relatively restrictive, such as the dimensions, the direction of major windows, the lighting, and ventilation. And the design of floor plans in an economical way will contribute a lot to the overall competitiveness of a project. Therefore, developers will all conduct research on other developers’ good designs and tries to combine the highlights of other developers’ designs together in their own design process. And it is natural for every developer to think in this way. As a result, a lot of developers’ designs will be looking very much alike.”

6.2.1.4. Cultural Aspects

Besides the legislative aspects, P9 mentions the traditional cultural needs in China might also limit residential building designs’ flexibility. P9’s logic is: “The percentage rate of the use of standardized designs will be high. I feel this is normal and this is based on residents and potential buyers’ preferences that are hard to change. The floor plan designs must be based on several cultural needs (such as southern exposure as floor plan’s orientation, all squared rooms in good dimensions and ratios, and consideration of Feng Shui are all preferred). Apparently, to accommodate all these preferred aspects, there are only limited numbers of good combination of floor plan designs.” The researcher therefore asked some follow-up questions about the issue to accommodate individual needs. P9 responds: “Firstly, I personally don’t mind the floor plan design of my property is similar or the same with other’s. I also don’t know how other people’s home were

designed. There is no communication channel on this information. But personally I have changed the structures and room arrangements of my own apartment based on my needs (my future plan is to have babies). There are individual demands on floor plan designs (but it is not a big deal and not the most important). In terms of this, flexible floor plan designs are more popular in the market."

6.2.2. Industry Level

Five interviewees talked about the initiation, adoption, and development of the standardized designs at the industry level. There discussions were generally concentrated on industry's rapid development. The rapid development of the real estate industry is also based on the corresponding society backgrounds, such as to concentrate on the efficacy of development (discussed in section 6.2.1.1). There are great opportunities in the industry under the social backgrounds such as focus on the efficacy of development have been discussed in early section 6.2.1 and to accommodate migrates have been reviewed in early chapter. As it is believed by a lot of interviewees the project's planning and design were not the keys to the success of projects in the early stages of industry. Three interviewees (P2, P4, and P8) agreed it is natural for developers to not focus on project's design but other project management processes.

> The real estate industry's previous years' development was very fast, and indeed, too fast. (P2)

P4 also believes the developers would want to catch the opportunities of the peak period of population inflow to build and sell more properties and therefore: "The developers knew they will have no problem to easily sell out

all the flats, even these flats' designs were standardized. If this were the case, why would the developers still spend time and pay efforts to investigate to develop new designs. The developers will either adopt similar designs of their previous projects or adopt each other's good designs." P8 also mentioned this issue and states: "The current industry's routine is to minimize development processes and time to catch the best timing."

Some interviewees' (P7 and P8) discussions are focus on project management. P7 and P8 both mentioned the developers' general management tends to be relatively casual in the early stage of the industry. The push for the use of standardized design is one of the approaches in achieving a more matured management. And P8 further explains: "In the early stages of the industry, to be able to get lands is the key to the success of projects. At later stages, development funds are the key to success. Today, I believe the project's management will be the key of the future success of project. The use of standardized designs is one of the approaches for better project's management. All the major developers are currently working on the development of their standardized designs."

P10 has been working for a securities company for 10 years as a real estate analyst. P10 worked for a developer for 14 years prior to this experience. P10 expressed his thoughts from the economics (supply and demand) perspective. P10 argued that potential buyers are having higher expectations on properties, and that leads to higher competition among developers. The surviving developers with larger economies of scale have incentives to

further standardize their designs. P10: “The design standardization will only become meaningful while the developers are big enough. While one developer is big in scale, there is no way to run it without the use of standardized designs. And the use of design standardization will further strengthen the performance of developer.”

6.2.3. Organizational Level

Five interviewees addressed the initiation, adoption, and development of standardized designs at the organizational level. There are a lot of involved organizations. This section will primarily discuss developers’ perspective, as the use of design standardization is developer initiated. The first discussion is based on the developers’ nation-wide expansion. Three interviewees hold the opinion that it is natural (P4 and P5) and inevitable (P8) for developers to choose to replicate successful designs from the past as developers expand on a national scale. P4 explains the developer she was working for has about 20 to 30 city branches and about 100 projects in total. Under this situation, P4 thinks it is reasonable to repeat the project designs of their previous successful (popular and cost-efficiency) projects.

> We can simply apply “ctrl C + ctrl V” command to copy the whole thing. (P4)

P4 feels to adopt standardized designs in the way described above is not only effort and time saving but can also improve the competitiveness of the project. P8 reviews his previous experience in a developers’ subsidiary architectural design company. And one of P8’s reflections is to adopt standardized designs and to develop projects in a repetitive way is an inevitable path for large developers. “When you are small with maybe only

one to two projects, you may not be aware of this problem. However, when you have done 10 or 30 projects, or you are developing nationally, you will definitely start to consider this question of how to apply designs to all projects to minimize project time." (P8)

The second discussion concentrates on developers' research and development capabilities. P5 believes: "Once major developers conducted research on standardized floor plans and applied these designs into their projects; many developers will therefore investigate, learn, and borrow the major developers' designs." Similar to P5's observation, P8 also noticed this phenomenon and exemplifies:

> Art deco has been everywhere within these several years, maybe 90% residential developments' architectural style are art deco. (P8)

P8 feels this may be because many Chinese developers are not yet equipped with research and development capability, and these developers will not be able to independently develop innovative products and designs. Therefore, large quantity projects with similarity appear.

As discussed in the previous section 6.2.2, the industry has been developing rapidly and there are huge opportunities for developers to grow. From the perspective of developers, P4 argues: "Why would developers want to spend time to conduct research on non-standardized designs if developers' felt their properties will be easily sold out by adopting standardized designs. Furthermore, if persuading profit is the most important aim of a developer, this developer will also not invest in independent research and development."

While investors and developers are demanding faster returns, and this is natural in today's business world (P4 and P8), to adopt mature and standardized designs helps to minimize design process and time. Additionally, under the pressure for a fast turnover rate while great opportunities and sales are always readily available, the developer lacks incentives to invest in research for better designs.

6.2.4. Individual Level

6.2.4.1. Practitioner

In terms of the initiation of design standardization, under the background of rapid project development routine, P2's observations focus on the architects, especially junior architects, who are generally fully-loaded or over-loaded. This is an opportunity for architects to practice. But this is also challenging, as they will not have much time, resources, and experience to develop individualized designs.

> A lot of junior and fresh graduated architects in China will be responsible for hundred thousand square meters (approximately several-billion square foot) scale projects. This is almost impossible and hard to imagine in other countries. (P2)

The current project designs processes are under compressed time in the industry. P4, P5, and P8 all demonstrated examples from to their experiences. P4 has been working as a design manager for a major developer for six years and she feels the current schedule for design processes has been compressed intensively and she shared:

> We require to run project from acquiring land to getting sales permit within 100 days. The whole planning and design processes are within 30 to 40 days. (P4)

P5 has been working as an interior design manager for two developers for ten years in total and she mentioned: “We once operated a residential property development project. The scale of that project is about several hundred square meters. And we spent nine months from acquiring that piece of land to partially competing the construction that we were allowed to then sell to get returns from our investment. In other countries, in nine months, some projects’ conceptual design might just get approved.” The narratives of architects and designers working for design firms seem to be comparative extremes. P8 as an architect shared:

> We usually have one week or maximum two weeks to prepare the package of conceptual design (and government required documentations for submissions and approvals). (P8)

Under such tight time constraints, P4 explains the developer’s position: “It is impossible for designers to follow the traditional design routines to work innovatively step by step based on project’s situation, maybe they will find something similar for references and to finish designs punctually.” P8 defended himself: “As an architect, I am hoping that I could have enough time to create innovative designs based on project site’s specific features.” However, “I don’t have time to do so.” P4 describes: “This is also the reality and a practical problem in our industry. The development speed is getting faster and faster.”

Speaking of this industry's reality, P8 at the same time raised another point and believes that designers have formed the habits of doing repetitive works: "From architects' perspective, we have formed the habit and tendency of using standardized designs. We might proactively recommend similar floor plans or elevation designs to our current developer clients. These designs were created in previous projects with good feedback from clients." And the researcher asked a follow-up question about the possible risk of breaking the intellectual protection and other related laws. It seems P8 and other stakeholders are not anxious about this issue at all. The rationales behind were presented in earlier section 6.2.1.3.

6.2.4.2. Residents and Potential Buyers' Aspect

P5 and P6 both feel that in potential buyers' minds, whether potential buyer's targeted property adopted standardized design is not within their major concern in the purchase decision-making process. Based on this, P5 and P6 have slightly different understandings on standardized designs' quality. P5 argues: "Currently, the buyers only got to see limited designs, for example Type one, two, three, and four floor plans. The buyers basically don't look into details of the design, it will be fine for them if the location and the price are acceptable." P5 believes the developers have not yet presented good-enough design solutions. While P6 feels the use of design standardization can be considered good for the occupants as: "The residents don't care if the design of their property is innovative. They also will not be staying in concept houses. It will be fine if it is a good value for money." This assumption is associated with the actual residents and potential buyers' perspectives, where residents really will not consider the designs, where the property

buyers are limited by their budget (P5 and P10), where they have not yet equipped with sufficient architectural and aesthetic knowledge to understand designs and make decisions (P2). Due to the established research aims, collecting residents' and potential buyers' voices was not included in this study. However, the researcher believes this will be a good and valuable direction for future studies and the researcher will later discuss this direction in 8.4. Another noteworthy angle is these two respondents' resistance to the current use of design standardization. There will be some discussions on the findings of stakeholders' attitude and feelings, and the researcher will also present her insights on this issue later in Chapter 7.

6.3. The Pros and Cons of the Use of Design Standardization

Table 27 The Pros and Cons of the Use of Design Standardization at Individual Level

	The Pros	The Cons
Project management	1. Takes less time to get designs done within certain time limit (P3 and P5) 2. Time saved on design can be used for detail enhancement (P4) and reduce errors (P3) 3. Can control budget in project planning at the design stage (P3) 4. Easier for new entrant into the industry to acquire the knowledge and experience on project management (P4). And to accumulate working experience (P2 and P5). 5. To reduce the risk of making human errors and to minimize the psychological pressure associated with making errors (P5 and P11).	1. The current standardized design frameworks are not universal enough (P3). 2. It will reduce the employment opportunities of design management posts (P5). 3. To adopt standardized design will help to accumulate working experience but not professional capabilities (P5). 4. There is no feeling of accomplishment (P5 and P6).
Design and consultation	1. To reduce the amount of workload (P8) and therefore it will take less time to design. And to get a higher pay within certain time limit (P6). 2. To improve the quality of design and the outcomes will be more meaningful (P7).	1. Feeling trapped (P4), the majority of design work is to make technical alterations instead of developing creative designs (P6), not possible to realize innovations values to design (P8). 2. Feeling guilty (P6).

	3. To participate in research and development of design standardization itself requires architects' capabilities and will improve architect's capabilities (P8).	
Residents and potential buyers	The standardized designs have been adopted and tested repeatedly and therefore there should be no major problems of the design (P4). The quality will be slightly higher and the price will be slightly lower theoretically (P8).	Ignored the needs of different groups of people.

6.3.1. Individual Level

6.3.1.1. Project Management

From project managers' standpoint, many stakeholders' descriptions support the arguments in previous literature, for example the majority of the stakeholders believes the use of design standardization has a positive influence on projects' schedule (P2, P3, P4, P5, and P11) and costs (all interviewees). In terms of project management triangle approach, surprisingly, none of the interviewees mentioned the use of standardized design's influence on design qualities. Instead of focusing on design standardizations' influences at a project level, this section will firstly discuss the good and the bad of design standardization at the individual level.

To begin with, all of the interviewees accepted that the use of standardized design reduces design costs and helps with projects' budget control at the design stage. P3 and P5 highlighted that implementing standardized design maximized their time through to finalize designs faster. And P4 further emphasizes the time released from earlier design stages will be allocated to later design stages' detail development. P4 believes: "After the adoption of standardized designs and design frameworks, I knew the project's design is unlikely to have major problems. Later, I entered the design development stage quickly and I will be able to work on the details that I personally pay attention to. For example, we are concentrating on the interior designs of kitchen and bathroom. I will therefore spend more time on that. Of course, the detail developments are also within standardized frameworks."

P4 considers the adoption of standardized design has also provided an opportunity for the new entrants in the industry. As P4 explained: “As a recent graduate or someone without much relevant experiences, it will be easier to start to work by adopting standardized designs. I knew the standardized designs at least would not be something totally wrong. It might not be the best solutions and practices, but it is not wrong.” Additionally, P2’s observation on newly graduated architects’ practices opportunities has been discussed in earlier section 6.2.4.1. The phenomenon that P2 described also supports P4’s view that the use of standardized design is helpful for new entrant practitioners to start to work. P4 and P6’s discoveries are consistent with previous research results. By adopting standardized designs, P5 proposed it will also be easier for every project manager to accumulate working experience. However, P5 emphasized the differences between working experience and professional capabilities. P5 feels that adopting standardized design in the project design management work will be useful to accumulate working experience, but not design capabilities. P6, as an architect, also considers her design capabilities were not getting trained through practices of standardized designed projects. In later paragraphs of this section, stakeholders’ comparison of working and professional experiences will be further discussed. More benefits of the use of design standardization include reducing the risk of making human errors (P3) and minimizing the psychological pressures associated with making mistakes (P5 and P11). P5 explains: “From my own perspective, the risk to my personal work will be reduced as basically I will not make big mistakes. The major

problems have been erased in the formation process of design standardization. I can also almost predict the final outcomes."

In contrast to the discussions above on the good of the use of design standardization to involved individuals, interviewees also expressed their concerns. P3 mentions the current standardized designs' general applicability is not yet strong enough. The standardized designs are not applicable to every project, especially for some relatively smaller projects. And P3 predicts it will become more challenging for developers to acquire large-scale lands, therefore there will be more limitations and restrictions to the application of design standardization. P3 introduced the situation of the use of design standardization in the developer he works for. P3 states they have listed the use of design standardization as one of the appraisal measurements recently. P3 feels: "Project managers will certainly like the project's design to be standardized. However, it is necessary to put many aspects into consideration from upper management's point of view. For example, the marketing function within developer will prefer to see designs with highlights." P3 also noticed a phenomenon in acquiring lands started several years ago. "Some developers have consciously picked lands that will fit in their standardized design frameworks. These developers may not consider to opt for improper lands anymore." (P3) Regarding the applicability of the current designs, P11 also shared the communication contents among he and his colleagues in meetings and P11 quotes his colleague's words: "The landscape and local circumstances of this project is different, I won't be able to use standardized design frameworks." The applicability nature of

standardization has been reviewed in 2.2.2 and 2.3. As previous materials consider the applicability as both one of the concerns (Weber et al., 2002) and natures (Jiang, 2014) of standardization. According to interviewees, it seems the current standardized designs' applicability is one of Chinese developers' challenges and concerns. The stakeholders also proposed possible future solutions upon the standardized designs' applicability and these will be discussed in later section 6.5.2.

Besides the contents' applicability of standardized designs, P5 expressed her anxiety about a project manager's job opportunities. P5 quoted her senior's words ten years ago when she first entered the industry. P5 explains that her senior was developing the standardized designs contents for their employer. P5 quotes her senior:

> What we are doing right now is something equivalent to dig tombs for ourselves.

P5 said she still remembers this quotation very clearly and described this in ironic humor. P5 further elaborates: "My senior means once he standardized designs, project managers do not need to be equipped with creative thinking any more. Therefore, my senior and other project managers can lose their jobs at any time." The researcher asked a follow-up question on P5's observation of project management employment opportunities in ten years. P5 reports that the number of project management employments indeed fell, and she illustrates: "The design management work is definitely still needed. As it is still necessary to have design managers to control and keep balance

among time, cost, and quality of outcomes even there is are standardized designs as templates." P5 emphasizes again:

> I mean there are no more creative works. (P5)

P5 gives an example: "In the past, if there are 300 households in one building, it may be necessary for every family to hire an interior design manager to manage the interior decoration. After the adoption of design standardization, maybe only one manager will be appointed to take care of the whole building." From a design managers' perspective, whether this is considered to be good remains unknown. However, another interviewee P7 also exemplifies another similar scenario, and he considers this is good to save families' effort and to promote environment protection.

As mentioned in earlier paragraphs, P5 feels to adopt standardized design will help to accumulate working experience. But P5 also points out managers' design capabilities will not be developed in terms of their professional path. P5 compared two of her previous working experiences at two different developers in terms of their levels and strategies of the use of design standardization. She describes: "My daily works with the first developer were primarily based on standardized designs, everything including design processes and design standards are matured. Therefore, I only need to follow the routine processes and standards to finish work, it will be ok and there will be no major problems. There is no such system in the developer I later worked for. The majority of my work is to manage new interior designs of display flats and sales offices. The standardized contents were not involved that much. In terms of the results, some projects turned out very

well, some were not that good." And from P5's individual perspective, P5: "I definitely prefer to work with the second developer. I personally prefer to work creatively."

P5 further mentions she will not be able to feel accomplishments from her project experience after the adoption of standardized designs. The major issue is there is no more creative design works. P5 expressed she personally does not like to implement standardized designs. She prefers personalized designs in a long-tern perspective.

> I do not like that everything was copied, copied, and copied. (P5)

P5 shares she has the feeling that there are many residential project developments (The interviewee adopted three repetitive words "many" to describe this idea that there are many developers). And P5 feels there is no unique design idea integrated into these projects, and the feelings of these building are alike. P5 said:

> Sometimes, I will joke my husband by saying that I feel even you can design these buildings.

Another project manager P4 describes her feelings about the implementation of standardized designs at work. P4 is not feeling absolutely negative about the use of design standardization, P4's only concern is:

> To us, project managers, the current adoption of standardized designs is like dancing with a pair of shackles on my feet.

Another interviewee P6 in the design consultants group also mentions she lacks a feeling of accomplishment. P6 even shares she feels a little bit guilty, and this will be discussed in later paragraphs of the next section 6.3.1.2.

6.3.1.2. Design Consultant

In terms of the good of design standardization, discussions from practitioners who work for design consultants are primarily focused on its positivity to projects' time and quality. In terms of the negatives, this group of stakeholders concentrates on their individual design capabilities.

Both P6 and P8 mention the adoption of standardized designs significantly reduce the design time. P8 believes this is due to the reduction of the amount of design work, and P8 states: "As an architect, the workload will be reduced by using standardized designs, this is a fact. For example, the workload will be reduced if we adopt standardized floor plan designs from database. In later construction drawing stage, there are many previous drawings and specifications we could refer and use. These expedite our design processes." P6's concentration on the reduced design time shows it is helpful in getting higher pay within a particular time limit, as P6 said:

> By adopting standardized designs, I don't need to aimlessly try here and there.

Therefore, P6 could "produce more drawings and designs within time limits. As there are fewer changes of designs, there will be more productions of design drawings. The amount of my salary depends on the number of designs I have completed."

> I don't like to always make changes of my designs, as to go back and forth will take long time, and this is taking my money away from me. (P6)

Another interviewee P7 fully supports the use of standardized designs. P7 founded an architectural and interior design firm 20 years ago. P7 considers the standardized designs and frameworks as pre-project and pre-design elements, and his design outcomes are more meaningful based on standardized designs. P7 thinks: “The use of standardized designs made my works and design outcomes more meaningful. In the past, I might take short time to finish ten designs, but my design outcomes’ success and satisfactory rate are not high. This was not because my design capabilities were not good enough. This is because I was given limited time to work on the designs, and I had no support from developed standardized designs. Therefore, I don’t have necessary information to comprehensively understand the aims of projects. In this situation, I have to submit works of only 60 points. Today, within the same limited time framework, I got more design time for each project with standardized designs’ support. Right now, all of my works are 90 or 100 Points.” And P7 summarizes: “As designers, I definitely hope all of my works can be rated as good as 90 or 100 points, I sincerely hope to avoid submitting works of 60 points. But I had no choice before.”

On the other hand, P8 expressed his mixed feelings on architects’ participation in design standardization research. P8 feels: “It is a very high capability demand for architects to take part in the design standardization research. The architects are required to identify and retrieve the most valuable contents among large amount of materials, and later to apply them

into standardized design's framework. To go through this process will further improve architects' capabilities."

However, as some project managers are upset about the use of design standardization removing the creative and innovative part from their work, practitioners working for design firms (P6 and P8) and developers (P4) also voice this concern regarding consultants' work. P4 feels the use of standardized design may have limited designers' creative thinking and caused those designers to feel upset and disappointed. P4 said some of the liaison designers from her partner consultants sometimes gave feedback such as: "Ha! You are also and still applying this style to this project over all these years" after P4 communicated the design requirements with them.

P6, as an architect, expressed a strong contradictory feeling on the use of standardized designs. From P6's perspectives we see that though use of standardized designs may have boosted the property development industry's development, at the same time it may have shrunken the design industry's development. P6 said: "When talking about designs as an architect, I am always feeling that I will need to create something. It will be boring if I am always only repeating or making changes based on the standardized designs. There is maximum 40% rate of my current work involved a little bit of my creativity. In fact, I will consider this as creativity. For example, this means I can decide the color designs based on the standardized architectural styles. I can also decide one little column's shape and color." P8 also outlines his intention to realize his own innovation values as an architect although P8

recognizes the pros of the use of design standardizations to all involved parties.

P6 even expressed that she sometimes feels guilty about the current urban cityscape. As discussed in earlier section 6.3.1.1, some design managers expressed they are losing the feeling of accomplishment in their work by adopting standardized designs. P6 also has similar feelings: “In my heart, my feeling of guilt is much heavier than my feeling of accomplishment. The cityscapes are looking terrible, but this is not something I could possibly control as this is at city and national levels.” P6 further assesses her feelings: “In terms of accomplishment, I signed off the design documents of those buildings. I am officially the architect of those buildings. When someone goes to see the buildings, I can tell them I designed this. This somehow made me feel accomplished. This is actually my vanity. My feeling of guiltiness came from my beliefs on design works should be innovative and creative.” I worry about the cityscape due to my design complex.”

6.3.1.3. Resident and Potential Buyer

Some interviewees mentioned the pros and cons of using standardized designs from residents and potential buyers’ perspectives. About the quality of current adopted standardized design contents and frameworks, some interviewees stated their opinions. P4 feels the current standardized residential designs available on the market have been adopted and tested repeatedly, therefore there should be no major problems of the designs:

> “The adopted standardized designs might not be the best design solution that fully fits buyers’ requirements. But it is at least definitely not wrong designs.”

P4 suggests the use of design standardization may promote competitions among developers and further benefit occupants and buyers. This will be discussed in later sections from organizational and societal levels. P8 also feels theoretically the design quality will be slightly higher and the property’s prices will be slightly lower by adopting standardized designs.

According to P2’s observation, one of the major problems of the current use of design standardization regards the future development and transformation process of the use of standardized designs: “We need to pay more attention to the characteristics and needs of individuals, and to take care of all of different groups of people. We can’t use one measurement to rule the needs of people in the future.”

With these responses, we can surmise the quality and flexibility of standardized designs remain unknown; however, this is not within the established research focuses. In later section 8.4, the researcher will discuss these issues as one of the limitations of this research and propose possible future studies.

Table 28 The Pros and Cons of the Use of Standardized Designs at Organizational Level

	The Pros	The Cons
Project management	1. To reduce project time in order to reduce cost (P4, P7, and P9), and to improve efficiency (P2 and P10) and to minimize project duration (P8 and P11). To reduce investment turnover time (P8). 2. To reduce and to control cost through: increasing bargaining power (P5 and P7), and reducing human labor costs (P2, P4, and P6). 3. In terms of quality: to maintain basic or even higher standards (P2), to improve quality (P7), to reduce repetitive works (P11), and to set up standards and feasibility factors for future stages of a project (P8) 4. To comprehensively improve the competitiveness of projects in order to improve developer's competitiveness (P4 and P5). 5. To reduce operational risks due to unknown variables (contingencies) (P10) and reduce possibilities of making mistakes (P11). 6. To reduce extra time and costs spent (design alterations) in future stages of projects due to design defects made at design stage (P5). 7. Potential buyers will form brand identity (P6 and P11).	1. The amount of land supply will diminish in the future and will further limit the use of standardized design (P3). 2. The repeated use of designs will affect the quality (P4), not specifically fine towards the local circumstances (P9), look repetitive (P10).
Design and	1. To reduce design time (P4), and amount of work (P3).	1. The consulting fees being cut down (P3).

consultation	2. To reduce risks (P4). 3. The involvement in the research of standardized design is an opportunity to review previous works and to better understand the market trend, in order to improve their future works (P8).	2. It is not rare to find designs are coming from other designs (P4). 3. Discourage innovative thinking and design (P2 and P8).
Resident and potential buyer		1. The general public needs time to become accustomed to standardized design (P1) 2. Standardized designs can't guarantee the residents' practical use of the design (P2 and P5) 3. The update of standardized designs is slow (P4)

6.3.2. Organizational Level

6.3.2.1. Developer

In this section, we find the majority of interviewees' discussions regarded project's schedule and cost management. There are fewer discussions on the quality of designs compared with project's time and cost management. Firstly, almost all the interviewees believe adopting design standardization will benefit the developers by reducing their projects' cost and time, though the interviewees' emphases are slightly different. P4, P7, and P9 said the projects' costs are expected to drop because the project's time was shortened. P4 interprets adopting design standardization saves developers' time:

> To save time is to save money. For developers, to save time is like getting an advanced place in the race in the market competition.

P4 also points out the use of standardization designs will reduce developers' labor costs. Interviewees in other stakeholders' groups also mentioned the use of design standardization will reduce human resources costs of more involved parties. This will be discussed in the next paragraph of this section and the next section 6.3.2.2. P7, as a designer and founder of an architectural and interior design firm, described the processes of developers' use of design standardization: "Develops' headquarters will prepare the standardized designs in advance. Therefore, the city level braches and project level offices will only need to execute based on the headquarters' work. It will definitely reduce project time." P9 thinks:

The use of design standardization will shorten the project development processes, as project's design stage will definitely waste time.

In P2 and P10's perspectives, both project development and developers' general efficiency were improved by adopting design standardization. P2 believes the use of standardized designs will undoubtedly and significantly improves developers' efficiency. P10 explains this issue from 2 different perspectives. From project and construction management's point of view, the efficiency was improved, and the costs were deducted. From finance's point of view, P10 states: "While in the past several years the whole industry's profits have not been improved and even have fallen, large developers' return on equity (ROE) has increased. This indicates the turnover rates of developers are accelerating." P8 also mentions: "The slogan of the developer I worked for is to develop project rapidly in order to sell quickly. To apply design standardizations is helpful for developers in achieving this goal." The researcher believes this is also associated with developers' tight fund resources and the higher turnover rate demand. These have been discussed in earlier session 6.2.3.

The above paragraph discussed the developers' direct cost and time reduction though the use of standardized designs. Interviewees also identified some indirect advantages of developers that are adopting standardized designs. P5 and P7 indicated the use of design standardization is helpful for developers' budget control through the increased bargaining power. P5 shares her experiences on furniture purchase after the adoption of

standardized designs. P5 states: “Taking to order a specific style wardrobe for all projects in one city as example. We can talk to the higher-level suppliers directly for ordering. The quality, detail designs, and prices of large quantity orders will be definitely better than the project-basis orders.” P7 also identifies: “The costs will be deducted as developers have integrated their resources during the design standardization’s preparation process. For example, headquarters will communicate with material suppliers about future materials’ order quantities, schedules, and discounted prices.” Additionally, P2, P4, and P6 outlined the use of standardized designs will reduce the human resources costs. P2 believes “the use of design standardization will reduce human labor costs for all involved parties.” P4 considers the use of design standardization will reduce developers’ human resources cost. P6 states, “Nowadays, there is a shortage on the manpower and material resources. Especially the manpower resource costs in the industry are getting higher and higher,” and according to P6’s observation:

> With design standardizations, our design works are simplified, construction drawing works are simplified, and structural design works are simplified as there is a whole set of templates. Everyone likes to do simplified things.”

P4 thinks the use of standardized design will improve the overall competitiveness of developers’ projects in order to improve developers’ comprehensive competitiveness. P4 believes “in short term, to adopt standardized designs will improve developers’ competitiveness in the industry as it is really time-saving and energy-saving.” P4 also explains the improvement of developers’ overall competitiveness from a supply and

demand point of view, and P4's understandings are: "If I am a buyer, and I might find out the floor plan designs of the three targeted projects are about the same. In this case, I might not be 100% satisfied with floor plan designs, but I might feel the designs are acceptable. Therefore, I might start to compare projects' other aspects and facilities. For example, the landscape designs, the floor area ration (FAR), and the amount of car parks." Under these circumstances, the developers' projects' overall performance will be improved. According to P3's understanding: "To look at the current industry, the developers' speed of development and the developers' use of design standardization is related. The higher degree of the use of design standardization, the faster developers' development speed."

As mentioned in the earlier 6.3.1.1 section, informants (P3, P5, and P11) believe the use of standardized design minimizes their personal psychological pressure associated with making mistakes. Some interviewees further assumed by adopting standardized designs, the operational risks of developers (P10 and P11) and design consultancies (P4) have been reduced. The reduction of consultancies' operational risk will be discussed in later 6.3.2.2 section. The current section will primarily discuss developers' operational risks. P10 shares his experiences on the use of standardized designs from his previous working experiences as developers' project finance manager: "From project management's perspective, it is easier to estimate the costs of projects after standardized designs have been adopted. It is easy to estimate the costs as similar designs have been applied to previous projects." Additionally, P10 thinks: "From the standpoint of

developers' partners' works, a lot of large developers' partners are long-term based, the partners have been practiced on similar designs. The partners are familiar with it." P11 believes:

> The standardized designs have provided the reusable templates. This, consequently, reduces the possibilities of making mistakes.

To look at the project's whole life cycle, P5 mentions the use of design standardization will reduce potential extra time and costs in the future project stages, for example, to minimize future construction stage's design alterations due to design errors. P5 feels: "Since at least five years ago, I started to realize the use of design standardization will reduce extra time and costs spent due to design defects made at design stage."

From the perspective of marketing, two interviewees (P6 and P11) believe the public and especially the potential buyers will form brand identity more easily by adopting the standardized designs. P6 closed up the session by sharing her feelings on not doing much innovative works, but P6 also expressed this is understandable by making the following comments: "Real estate development will be like this. The developers will definitely need to adopt standardized designs. Otherwise, how do you know if this property is developed by A or E." P11 also considered the use of design standardization has formed developers' brand identity: "The use of design standardization is money-oriented. This has improved the accuracy of developers' project positioning. Later, the buyers have formed a long-term and stabilized brand identity. For example, one of Developer A's standardized projects is designed for young people, one of Developer C's standardized project is

high-end designed, and speaking of Developer E's projects, people will think they are far away. Therefore, people have formed a fixed understanding, and their understandings will affect their decision-making. Consumer behavior is subjective," and "property buyers will first target potential projects based on their financial situation. The use of design standardization has provided a framework for buyers to evaluate a project, and therefore to save purchase decision-making time." P11 believes developers will also be able to consciously promote their projects through various channels based on standardized frameworks.

At the end of the interview, P6 shared her communication with the human resources recruiting specialist during the job interview and quoted the specialist's words: "As we are a developer, a big proportion of your work will be standardized based. We might not need much of your personal thoughts."

As mentioned in 6.3.1.1 the current standardized design frameworks are not universal enough. P3 also discussed this from developers' point of view and P3 believes: "From the current situation in the industry, my employer is findings it more difficult to acquire relatively large pieces of land. Under these circumstances, there will be more limits to the application of standardized design."

In terms of the quality of standardized designs, P2 believes the use of design standardization is helpful to maintain the basic or even higher design quality. And P7 considers the use of design standardization improved the design

quality. While a lot of interviewees believe the use of design standardization is positive to design qualities, three interviewees expressed their concerns on design qualities. P4 thinks:

There is a contradiction between development's quantity and quality. P4 believes "if a developer is growing fast, this developer will definitely operate projects repetitively. If a developer is planning to establish its brand and to develop some benchmarking projects, this developer will invest more into designs for better design solutions." P4 expresses her opinion that "to respectively use design standardizations will affect the design quality. For example, it is almost impossible to accommodate the different needs of cities in the north and cities in the south." P9 feels it is impossible to accommodate each projects' local circumstances based on the current adoption standardized designs, and P9 also took the differences between the North and the South as an illustration. P10's overall evaluation on the use of design standardization is relatively high, however P10 still feels there is a conflict between standardization and individualization: "Developers' standardization is to classify different designs. But this is only a general classification. Each classified and standardized design may still look repetitive. Some individualized needs cannot be fully entertained in the current design standardization frameworks." Although some of the interviewees think the current adopted design standardization may not fully entertain localized and personalized needs, most of the interviewees acknowledge the current designs are definitely good enough to fulfill purely residential needs. The stakeholders' overall evaluation of the use of design standardization will be discussed in section 6.5.1.

6.3.2.2. Design Consultancy

From a design consultant's aspect, both project managers (P3 and P4) and designers (P6 and P8) recognize that the use of design standardization has reduced design consultants' amount of workload, and further reduced design consultants' working time. Additionally, P4 believes design consultants' risks have been reduced through the adoption of standardized designs. As P4 understands design consultants' situation: "The current design time is getting shortened and shortened. By adopting standardized designs, the design firms will accomplish the design works within limited time framework, and the design outcomes are acceptable, therefore it will not destroy design consultants' reputation."

Another design consultant's opportunity from the use of design standardization was proposed by P8. P8 believes the design consultants' involvement into standardized design research and development provide them opportunities to review their previous design works, to better understand the market, and in order to improve their future design works. P8 shared his experiences while he participated in standardized designs' research and development projects: "We have worked for several developers to develop their standardization designs frameworks. In fact, we were reflecting something in these processes. We were trying to improve our designs according to the market trend, societal needs, and related laws and regulations. To be involved in developing design standardizations urged us to create more reasonable designs in the future."

There are also some negative impacts to design consultants. P3, as a project manager, mentions one of the biggest impacts is the reduced consulting fees: “Frankly speaking, by adopting design standardization, the consulting fees have been cut. For one project with a lot of repetitive designs, of course we will reduce the fees.” As P3 said: “They spent less time to consider how to design the project and their workloads were reduced.”

P4, as a project manager, thinks the design standardization’s impacts on design consultants are not very good. According to P4’s observations: “Basically, we will ask the designers to go over and have a look once we found some projects with good designs. This is actually to ask designers to refer to the designs of that project. The current situation is it is not rare to see projects’ designs referring each other’s.”

Several interviewees consider the current mechanism discourages innovative thinking in the design processes. Both P2 and P5 believe this is also associated with the limited design time as discussed, several times in earlier sections. P8 also mentions the current mechanism obstructed the design innovations in the residential development process: “Every project is unique, we were supposed to create designs based on each project’s specific characteristics. However, in order to shorten project’s life cycle, standardized designs were adopted. As a result, the project’s designs were less innovative.”

6.3.2.3. Resident and Potential Buyer

P2 thinks although the adoption of design standardization supports the developers' project development operations, but the current standardized designs can't guarantee the practicalities of designs. P2: "The developers can maintain the basic design qualities through the use of design standardizations. However, this does not guarantee the good functionalities of designs. The current design frameworks have not established standards for a specific group of people." P5 also points out the current standardized designs were not carefully considered based on people's practical residential needs: "I feel I can't say the current standardized designs were not innovative. The case is everything was happening too fast, the developers will not even think about designs based on occupants' real residential needs." P5 feels: "Everything was happening too fast, developers will not even think about designs. Think about this, many people and families are using their lifetime savings for property, why can't developers think deeper and design something for buyer's real residential needs." Upon this issue, P5 expressed: "I was having attitudes towards this and that used to make to want to quit my job. Now, I don't have it, I don't think it has anything to do with me now." Sometimes, the use of design standardization also restricted occupants' future soft decoration designs and P4 exemplifies: "We, in total, have only three interior decoration styles. This has a particular restriction on residents' future soft decoration designs. For example, one of our styles is only compatible with classical style furniture, but not modern style furniture." and P4 said: "Some of our customers will say something critical about these."

P4 illustrates another issue that the current standardized designs were partially out-of-date: “For some designs, for example the guard booths and the gates designs, were updated maybe only every three years. This is infrequent and may not fulfill the aesthetic needs of the market.”

6.3.3. Societal Level

This section will primarily discuss the pros and cons of the use of design standardization at the societal level. One of the most significant benefits of adopting design standardizations is to conserve resources and to save energy. Four interviews (P1, P4, P7, and P10) mentioned this positive impact. P1, as a government official, feels the use of standardization promotes energy conservation and environmental protection. P1: “I personally encourage the use of design standardizations. The central government is currently advocating the green development concept as one of the 5 major development concepts. I think the use of design standardization in the built environment is a very important component of this green development concept.” P4 said the use of design standardization is good for the upstream and downstream industries’ material conservation and environment protection. P4: “Once we have formed standardized styles and confirmed the needs of corresponding materials, the material providers will concentrate on specific kinds of environmentally friendly materials. This also helps material providers to plan their works in advance in order to prevent materials’ waste.” P7 affirms the use of standardized design is good for the environment as the properties were better designed: “The standardized designs were better designs. Therefore, the occupants do not need to renovate it for every five years due to previous’ undiscovered design errors or changes of families’

needs. This will reduce carbon emissions. This will also release people's time in order to improve their productivity." P7 believes this is good for the society's resources allocation.

Interviewees (P1, P3, and P9) also believe the use of standardized design supports the construction industry, and its upstream and downstream industries' operational management, for example, the technical management, the costs and budgets management, and schedule management. P1, as a county level government official that holds primary power and responsibility, introduces that construction-related issues are his main focus. And P1 shares his observation: "It is good for the process management in construction industry. It is also good for the operational management of the design industry. The use of design standardization promotes all of these related industries' development." And P1 emphasizes the use of design standardization had promoted these related industries to grow together, as: "The contents of standardized designs are transparent and have been shared among different involved parties. The designs are even available online. This reduces the communication costs and transactional costs among different industries, and in order to reduce waste of resources."

In earlier section 6.2.1.1, the research reported P2's understandings on the current efficacy-based social operating mechanism in China. P2 feels: "It is very likely the current use of design standardization conforms to the current operations." Both P2 and P8 mention the use of design standardization supports the huge housing demand in the current urbanization process in

China. P8: “For the current situation in China, a large amount of population is moving into the cities in this rapid urbanization process. Everyone needs housing. The developers’ rapid and large-scale housing delivery can be realized through the use of design standardization.” P1 also shared the use of design standardization as one of his approaches in promoting smaller towns’ development. “We have hired a local design firm to create six sets of housing designs. To build their houses, local villagers can use the designs they prefer for free. This was in 2005 and I felt that there was nothing wrong with it. My aims were to promote the intensive-based, scientific-based, and safety-based villagers’ housing construction.” (P1)

P2, P9, and P10 all suggest the use of design standardization in the current residential property development activities provide opportunities to its upstream and downstream industries. P10 believes the use of design standardization brings new technologies in order to promote related industries’ development. P11 thinks the use of design standardization brings challenges to its upstream and downstream industries. The market shares of some industries will change dramatically, for example, the construction material industry.

Besides the above benefits of the use of design standardizations, some interviewees also discussed some negative effects of the use of design standardizations. The first problem is seen in P2, P6, and P8’s comments that there are conflicts between the use of design standardizations and varieties, diversities, and local features. The second one is P2’s concern on

the reduction of construction workers: “Generally speaking, the majority of the off-farm workers in my area went to the construction industry. From government’s perspective, we have to consider the use of standardization and its effect on our laborers and off-farm laborers. From my observation, by adopting standardized designs, the number of construction workers has been reduced as the on-site works has been reduced.”

Although P4 gave a relatively good overall evaluation of the developers’ use of design standardizations and considers the use of design standardization by developers understandable, she does not fully agree with it. P4: “It is understandable that developers are maximizing their profits and to adopt design standardizations are what they should do. However, for people pursuing quality of life, there were fewer options in the market for them. In the future, there will be fewer and fewer design options in the entire industry.”

Table 29 The Pros and Cons of the Use of Standardized Designs

The Pros	The Cons
It is good for resources and energy savings and environmental protection (P1, P4, P7, and P10). It is also following the government's green development concept (P1).	There is a conflict between standardization and individualization (P2, P6, and P8).
It is beneficial to construction industry's management (P1, P3, and P9)	The reduction of construction works due to reduced on-site work opportunities (P1 and P7)
Improves transparency (P3)	There will be fewer design options in the industry (P4)
It conforms to the current social operating mechanism (P2) and supports the rapid urbanization process (P8)	
It brings opportunities to the upstream and downstream industries (P2 and P10) and brings new technologies (P10)	

6.4. Stakeholders' Estimation

6.4.1. An Overall Estimation

The results of the quantitative measurements on the degree of the use of standardized design have been reported in 0. This section will review the stakeholders' estimation on the current degree of the use of standardized design and whether there are gaps between the stakeholders' perception and the results from the empirical analysis.

Table 30 The Participants' Estimation on the Overall Degree of the Use of Design Standardization

Participant	Estimation
P1	The result is within P1's expectation
P2	The result is within P2's expectation
P3	70% to 80%
P4	60%
P5	70% to 80%
P6	> 80%
P7	As high as 90%
P8	80%
P9	60% to 70%
P10	60% to 70%
P11	75%

Among the 11 interviewees' overall estimations on the current degree of the use of standardized designs summarized in the table below, none of the 11 informants have underestimated the current situation in comparison with the empirical study's results. Among all stakeholder groups, consultants' practitioner group's estimations are the highest. The three interviews P6, P7,

and P8's estimations on the degree of the use of standardized designs in residential property development in China are higher than 80%, as high as 90%, and 80% respectively. In terms of government and education group, both P1 and P2 insist on not giving their estimations first. The researcher therefore adjusted her strategy and disclosed the result of the overall degree of the use of standardized designs of Study 1 to them. Both P1 and P2 considered the result is acceptable, reasonable, and is within the range of their own expectations. The remaining three groups of participants' (P3, P4, and P5 in developers' practitioner group, P9 and P10 in real estate finance expert group, and the real estate legal specialist P11) estimations on the overall degree of the use of design standardization are various but are within the range from 60% to 80%.

6.4.2. Estimation on Cities

In terms of the different degrees of the use of standardized design among four targeted cities summarized in Table 31, there are eight out of 11 participants who consider the city of Chengdu's degree is unique among four cities. There are five informants who believed the rate of the use of standardized designs in Chengdu is the highest among four cities, and three interviewees identified it as the lowest. Nevertheless, the rate of the use of standardization in residential property designs in Chengdu is 57.258%, which is at an intermediate level and is closest to both the average (59.474%) and median (60.649%) values. The participants also expect the city of Beijing's standardized design adoption rate to be unique. Among 11 interviewees, five believed Beijing adopted either the most (four interviewees) or the least (one interviewee) standardized designs. The rate of floor plans that have adopted

standardized designs in the city of Beijing is 49.744%, and that indeed is the lowest among four cities.

Table 31 The Participants' Estimation on the Degree of the Use of Design Standardization among Four Cities

Participant	Estimation
P1	Beijing > Shanghai > Guangzhou = Chengdu
P2	Beijing = Shanghai = Guangzhou = Chengdu
P3	Shanghai is higher than P3’s expectation
P4	Chengdu > Shanghai = Guangzhou > Beijing
P5	Chengdu / Guangzhou > other cities > Shanghai
P6	Shanghai / Beijing > other cities > Chengdu
P7	Not related to cities
P8	Shanghai > other cities > Chengdu
P9	Chengdu > Beijing = Guangzhou > Shanghai
P10	Beijing > other cities
P11	Guangzhou > Chengdu

Table 32 The Participants' Rationales of the Different Degree of the Use of Design Standardization among Cities

	Positive-Correlated	Negative-Correlated
Population	Greater mobility of population (P4) Larger amount of permanent and migrant populations (P5)	Larger amount of migrant population (P9)
Development	More advanced tiers of cities (P1) Faster development speed (P5) Better governance in urban planning and better city management (P2)	Better economically developed cities (P9)
Real Estate Market	Higher land price (P6) Tighter housing supply (P10)	Higher property price (P3) Resident's stronger purchase power (P4)
Design Industry	Better development of design industry (P2)	Better development of design industry (P8)

The researcher asked the participants to clarify the rationales behind their answers. Interviewees explained their logic and raised some possible correlated aspects, for example, the city management and urban governance levels, some population related factors, development levels, real estate market related factors, and design industry's development level. P2 suggests: "The practices of design standardizations will be more mature if the local authorities' management levels are higher. A higher management level means more efficient. It is not necessary and meaningless to make every single residential project's design unique." P4 and P5 both feel the degrees of the use of design standardization are related to population. P4 believes the developers are more likely to adopt standardized designs if there is greater population mobility in the concerned areas and cities as discussed in section 6.2.3. P5 also suggests the degree of the use of design standardization is positively correlated to the amount of populations, permanent populations, and migrant populations. P1, P5, and P9 infer that the degree of the use of design standardizations is related to the levels of city's development. P1 believes the first-tier cities' adoption of design standardization is higher, and P1 took the city of Beijing as an example: "Beijing's adoption of standardized designs will be relatively higher. Beijing is the political center and is quickly responding to government's policies on green development. There is also an urgency to protect Beijing's environment." P5 believes the cities with faster development speed were adopting more standardized designs and P5's rational is similar to the population related aspect discussed earlier in this paragraph. In terms of the real estate markets, P6 considers the land prices are related to the degree of

the use of design standardization positively, and P6 thinks “if the designs’ similarity is not high, the costs will be high. Consequently, the degree of the adoption of design standardization will be higher if the land prices are higher.” P10 thinks there will be a higher degree of the use of design standardization if the areas or cities’ housing supply is tight, and P10 explains: “Overall speaking, if the housing supplies are tight, many people’s wish is to own a property, rather than to own a property that satisfies their own personalities.” P2 mentions another aspect, that the degree of the use of design standardization is positively related to the development of local design industry. “I think every province’s and city’s standardization research institutions, local design firms, and related authorities were all involved into the design standardization research. But every city’s research outcomes and research personnel’s qualities are different. The city of Beijing, Shanghai, and Guangzhou’s design industry are relatively developed, and there are a lot of national leading or event world-leading design organizations in these three cities. The design firms in Chengdu are relatively weaker.”

In this paragraph, it is interesting to see some participants mentioned some similar or even the same factors as in the last paragraph, nevertheless the participants’ judgments on these factors’ effects to the degree of the use of design standardization are contradictory, for example, the level of economic development, the development of design industry, and the amount of migrant population. P3’s view is there will be less use of design standardization in the real estate markets with higher property prices. P3 believes: “the unique designs support properties’ high price. If our properties are expensive,

besides the land prices are high, we need to have some individualized design highlights to convince our customers." With similar rationales, P4 feels the degree of use of design standardization will be reduced if the local residential and property buyers' purchasing power is stronger. P9 feels Study 1's results on the four cities' degrees of use of standardize designs are a little bit incomprehensible. P9's understanding is that "the degree of designs' similarities will be reduced, and the use of personalized designs will be increased in better economical developed areas." In terms of the development of design industry, both P2 and P8 speculate that the level of local design industry's development is related to the degree of the use of design standardization. P8's idea is different from P2's, and P8 says: "I think the degree of the use of standardized designs in residential development in the city of Shanghai is relatively lower, there should be more innovative designs in Shanghai. There will be more applications of design standardizations in Chengdu." P8 explains he has not investigated this issue, but according to his working experience "there are many relatively good design firms and institutions, I think cities like Shanghai with better development of design industry will create more creative designs." Regarding the amount of migrant population, P9 suggests the researcher test the correlation of the use of design standardization and the amount of migrant population. P9's guess is different from P5's and P9 infers: "The city with more migrant population's degree of the use of design standardization will be low as immigrants may have different habits and preferences." The seven population and economic related factors that are listed in Section 5.1 have been tested in Study 2, and the results have been discussed in Section 5.2.3.

6.4.3. Estimation on Developers

Table 33 The Participants' Estimation on the Degree of the Use of Design Standardization among 5 Developers

Participant	Estimation
P1	A = E > other developers
P2	E > other developers
P3	A = E > other developers
P4	B > C = D = E > A
P5	E > A > D > C (P5 is not familiar with B)
P6	E / A > other developers > C
P7	Larger scale > smaller scale
P8	D = E > other developers > A
P9	D = E > A = C > B
P10	Larger scale > smaller scale
P11	E = A > other developers

In terms of the five developers' degrees of adoption of standardized designs, eight out of 11 participants believe developer E's degree of the adoption of standardized designs is the biggest or is among the biggest group. Among these eight participants, four think either developer E or A has adopted the most standardized floor plan designs. According to the result of developers' degree of use of design standardization presented in 4.2.1, the percentage of standardized-design floor plan of developer E is 71.875% and is the highest among the five developers. And developer E's rate of the use of design standardization is considerably larger than both the average (58.547%) and the median (58.046%) values. The participants' estimations on the five developers' use of design standardization seems to be consistent with the empirical study. It is also interesting and understandable to see that

the stakeholders' estimations on the developers' use of standardized designs seem to be more consistent with the results of empirical studies.

Table 34 The Participants' Rationales of the Different Degree of the Use of Design Standardization among Developers

Positive-Correlated	Negative-Correlated
Bigger scale developer (P2 and P7) Greater volume of productions and sales developer (P3 and P5) Better level of brand development (P2)	-

Regarding participants' rationales behind their estimations on the different degree of the use of design standardization among developers, 4 interviewees think developers' degree of the use of design standardization is positively related to developers' scale (P2 and P7), developers' volume of production (P5), and developers' volume of sales (P3). Both P5 and P7 suggest the developers bigger scale and developers' use of design standardization are interrelated and mutually reinforcing. P5 describes: "I believe the degree of the use of design standardization is related to the scale of developer. I remember developer E's production was the biggest, therefore developer E's degree of the use of design standardization must be the highest. And the relationship between the developers' scale and developers' use of design standardization is like the chicken or the egg dilemma." P2 mentions the level of brand development is also positively related to the degree of the use of design standardization. P2 took developer E as example: "I personally think the degree of the use of design standardization is related to the level of developers' brand development.

Among these five developers, developer E's degree of the use of design standardization is the highest. Developer E has built its brand through the adoption of design standardization, in order to compete with other developers." The researcher tested three factors of the amount of developers' work and developers' numbers of architectural consultant partners in Study 2, and the results have been presented in Section 5.2.2. The researcher also tested the correlations of several project-related factors and the degree of the use of design standardizations. The project-related factors were partially recommended by participants of Study 3 and other factors were suggested though the review of previous literature. The results have been discussed in Section 5.2.1.

6.5. Stakeholders' Evaluation and Expectation

6.5.1. Evaluation

To evaluate the previous use of standardized design is one of the major aims of this study. After discussions of the pros and cons of the use of design standardization, each interviewee was asked to quantitatively evaluate the use of design standardization within a scale from 1 to 10. The participants had no hesitations in discussing the strengths and weaknesses of the use of design standardization. However, the researcher realizes some interviews have expressed their struggles and uncertainties in scoring the use of design standardization. Some of participants' struggles are based on the conflict among pros and cons of the use of design standardization at different levels. Other interviewees described how they have some mixed feelings and unclear ideas on the use of design standardization. It seems stakeholders'

expectations of the future use of standardized designs are not associated with their evaluations of the previous use of design standardization. These participants' expectations will be discussed in the next Section 6.5.2.

Table 35 A Summary of Stakeholders' Evaluation

Stakeholder	Participant	Quantitative Evaluation[c]	Affective-Based Attitude
Government and Education	P1	8	Without hesitation
	P2	6	Without hesitation
Developers' Practitioner	P3	9	With reservation
	P4	7	With reservation
	P5	8	With reservation
Consultants' Practitioner	P6	6	With struggles
	P7	10	Without hesitation
	P8	7	Without hesitation
Real Estate Finance Specialist	P9	6	With reservation
	P10	9	Without hesitation
Real Estate Legal Specialist	P11	6	With reservation

[c] The researcher provided interviewee a 10-point scales to evaluate design standardization, where 1 is the lowest evaluation (maximum cons and minimum pros) and 10 is the best evaluation (maximum pros and minimum cons) on the scale on design standardization.

Regarding the overall evaluation of the use of design standardization, none of the interviewees hold full negative attitude towards the use of standardized designs. One interviewee P7 holds a complete positive view on the use of design standardization without hesitation, the other ten interviewees all proposed and discussed various advantages and disadvantages of the use of design standardization. Their arguments have been summarized and reported in depth in the previous section 6.3. Apparently, the weights of each point presented earlier are different in each participant's perspective. Although quantitative measurements are not commonly used in qualitative research study, the researcher added this question after the pilot study in order to assist each participant to comprehensively organize their thoughts. The follow-up question has been set for question two. The initially designed question two asks the interviewees to discuss the pros and cons of the use of standardized designs, and the follow-up question asks each interviewee to evaluate the use of design standardization from a scale from 1 to 10. The proposed interview questions in both Chinese and English are included in the Appendices. The content raised by interviewees at this section are expected to be the most significant contents in participants' thoughts.

In terms of the participants' certainty, there are three groups of interviewees. The first group of interviewees is positive and clear about their evaluations on the use of design standardizations; this group of interviewees adopted words and phrases with certainty, for example, "I am positive" and "this is without doubt." This group of five interviewees and their assessments of the

use of standardized designs within the scale from 1 to 10 are P7 (10), P10 (9), P1 (8), and P2 (6). The second group of informants seems to be not fully clear about the use of design standardization and interviewees adopted words, for example, “it is hard to say” and “I don’t know.” The second group of four participants and their evaluations of the use of design standardization are P3 (9), P5 (8), P4 (7), P9 (6), and P11 (6). P6 stopped several times and directly expressed her struggles on the use of design standardization. It is not surprising to see some of the interviewees are not clear about the use of design standardization.

Among the five interviewees of the first group of participants, P7 marks the use of standardized design unhesitatingly: “I will score it 10. The use of standardized designs is a must. The society needs it. This is also good for designers and good for developers.” P10 scores the past use of standardized design nine points. P10 says: “This is an inevitable result from the industry’s development. I’ve mentioned a lot of advantages of the use of design standardization. I will need to deduct one point because the current standardized designs are still not personalized enough. But I believe this will be improved in the future. Nine points is already very good.” P1 gave the use of design standardization eight of out 10 points. P1: “Overall speaking, the advantages of the use of design standardization are definitely more than the disadvantages.” P8 marked the use of standardized design seven out of 10 points and P8: “The advantages of the use of standardized design is obvious to real estate developers. But the use of standardization has obstructed design innovations and has resulted in similar cityscapes. From my personal

point of view, as an architect, I believe this is the current industry's atmosphere and these problems were not only created by the use of standardized designs." P2 gave the use of standardized design six out of 10 points and P2 believes: "I shall give six points. It is possible to operate residential projects within an efficiency framework by adopting standardized designs. However, I can't give a high score as we all have our personalized needs, and the use of design standardizations is contradictory in accommodating our personalized needs. This is also what we need to fulfill in the future." According to this paragraph, six interviews (P10, P8, and P2) have deducted their quantitative evaluation marks on the use of standardizing designs because the current standardized designs are not personalized-based enough.

The second group of five interviewees' evaluations include, P3 says: "From project management's point of view, I will give nine points or 10 points. From my own perspective, the more use of design standardization the better. However, the degree of the use of standardized designs was not decided based on my own preferences." P3's describes his employee developer's use of design standardization: "Our head office has been promoting the use of standardized designs several times. We will take to use standardized designs as priority." P5 outlines her evaluation on the use of design standardization: "I will give 8 points when I am standing as a project's design manager. My personal feelings are I don't like the use of design standardization in long term. I like designs that with personalized features and identities. But I also feel I, with these needs, am the small group of the

society.” P5 shares her personal feelings on the use of design standardization: “I used to be emotional on this, and I used to feel I want to quit my job and don’t want to do this in here anymore. Now I don’t have it, and I have made myself to think this does not relate to me anymore.” And P4 considers: “I will mark the use of design standardization 7 points. Generally speaking, I think there are more advantages than disadvantages on the use of design standardizations. There are some disappointments and upsets about the use of design standardizations, but, of course, not too many.” And P9 says: “I will give 6 points. It is still slightly better to have standardized designs.” P11 also gave the use of design standardization 6 points and considers: “I will give 6 points. There are no changes to the amount of my work. It has probably helped me to understand a project better within certain frameworks.” It is interesting to see there are 2 completely different directions’ concerns on the use of design standardizations. It seems P3 is keen on the use of design standardization in the process of residential property development and expects to adopt more standardized designs in his work. In terms of the situation of the use of design standardization of the developer that P3 works for, according to P3: “We don’t have anything like the design databases. We are one of the state-owned developers, and there are some differences between the stat-owned developers and private developers. We have some weaknesses, but we also have some strength. We relatively don’t have a strong standardized control over our projects. This is bad to the developer itself. But this is good for our customers. For example, we want to present better materials.” P3 emphasizes that “every project manager will definitely try to present the best designs to our customers. We are all

responsible. There are also some internal procedures to control the designs, and to avoid design mistakes. Nevertheless, there are limitations in anyone's understanding. There is another problem which is we can't accurately position our projects." P3 further describes the business style of the developer he works for, and P3 believes the business style of the developer P3 works for is different from other developers: "We have relatively stronger social responsibilities. For example, we have started to advocate the green building concepts many years ago. It is also not mandatory for our projects to make a lot of money." It seems the previous use of design standardization is not mature. However, there are some participants that have been frequently adopting standardized designs in their works. These participants, for example P5, have expressed their dissatisfactions and negative emotions against the use of standardized designs as discussed earlier in this paragraph. In earlier section 6.3.1.1, the researcher also reviewed P5's views on the pros and cons of the use of design standardization from a project manager's perspective. P5 compared two of her working experiences in terms of the use of design standardizations, and she prefers to work with her second employer that adopts smaller portions of design standardization in her work.

P6 is struggling on the evaluation of the use of design standardization. When the researcher asked P6 to assess the use of standardized design, P6 responded: "I can maximum give 3 points to the use of design standardization from cities' point of view. From developers' perspectives, I will give at least 8 or 9 points if not 10 points. From occupants' angle, I will

stand in the middle, I am not sure if the occupants or developers will get more benefit from using design standardizations, probably still the developers." The researcher repeated the designed question, and asked P6 to evaluate the use of design standardization from P6's own standpoints, P6 stopped and thought carefully for a quite a long period of time and said: "It is very complicated from my own perspectives. My mixed feelings are based on two considerations. The first one is this is my work, I am getting paid, and I make a living on my work. These are associated with the pros of the use of design standardizations. My second consideration is I am an architect. I am not expecting to design big projects, but I hope I can design something based on my own design values and talents." P6 finally made her decision and gave the score: "Fine, I will give 6. I was struggling between giving 6 points or 5 points. I can give the score that is slightly closer to the beneficial direction instead of the negative direction. This is only because I am getting paid, and I am a real person in the real life. This is also because I can't change the scenario of the whole industry or the whole county. I am so angry."

It is also interesting to see there are two groups of participants that are holding different opinions on the degree of the use of design standardization in different projects. Some participants believe the standardized designs' quality is better than project-based designs. For example, P7 considers: "The standardized designs were usually developed by the developers' headquarters. The standardized design research outcomes are better, as it was developed by a group of developers' head offices' people with higher

capabilities. This group of headquarter people's capabilities are definitely better than developers' project personnel. I am positive about it." Nevertheless, some participants feel the standardized designs can't be applied to high-end projects. For example, P3 reviews his previous project experience and shares: "In my previous work, there are more creative works than standardized works. This is because I was always working in relatively higher-end projects. There is no way to adopt standardized designs to high-end projects." The researcher has collected several factors related to projects' positioning, conducted the correlational study, and reported the results in detail in section 5.2.1.

6.5.2. Expectation

Regarding the participants' predictions on the future use of design standardization, we find three groups of interviewees that are holding different perspectives. The majority of interviewees expect the standardized designs will be further promoted and developed long term, and this group of participants is also confident about the future development of the real estate industry in China. The second group of interviewees also believes the standardized designs will be further advanced, however this, they believe, is only in the short term while the property industry in China is still developing prosperously. P3 assumes the future use of standardized design will be limited. In terms of different stakeholder groups' perspectives, it seems all 3 consultants' practitioner interviewees are positive and optimistic on the future use of standardized designs.

It is interesting to see participants' expectations of the future use of design standardizations does not fully correspond with their quantitative evaluations on the past use of design standardizations. For example, both P6 and P10 gave relatively low grades to the use of standardized designs; they both graded the use of standardized designs nine out of 10 points as the lowest among all interviewees' evaluations. Meanwhile, P6 and P10 are both optimistic about the future use of standardized designs. And P3 gave nine out of 10 points on the use of design standardizations, which is a relatively good review; however, P3 discourages the future use of standardized designs.

Table 36 Participants' Expectation on the Future Use of Standardized Designs

Stakeholder Group	Participant	Evaluation	Expectations
Government and Education	P1	8	Positive
	P2	6	Positive for short term
Developers' Practitioner	P3	9	With reservation
	P4	7	Positive
	P5	8	Positive for short term
Consultants' Practitioner	P6	6	Positive
	P7	10	Positive
	P8	7	Positive
Real Estate Finance Specialist	P9	6	Positive for short term
	P10	9	Positive
Real Estate Legal Specialist	P11	6	Positive

In the first group of interviewees, P1 is positive regarding the future development of standardized designs. P1 says: “The use of design standardized as a new concept and as the latest needs from the industry’s development will have a prospective future.” The researcher asked a hypothetical follow-up question, and invited P1 to estimate the results of Study 1 to be conducted in 10 years. The researcher also disclosed the standardized floor plans to the interviewees. This will not be discussed in this research as the why and how the standardized floor plans were formed is not within this research’s scope. P1 responds: “The overall degree of the use of design standardizations will be getting higher. But the design’s varieties and classifications within the standardization framework will increase.” Nevertheless, although P1 is positive on the future use of design standardization, P1 also emphasizes the necessity to pay attention to several things in managing the future use of design standardization. P1: “The first thing to pay attention is to keep balance between designs’ commonality and individuality. In other words, there should still have room for specialized designs in the future development of standardization.” P1 considers:

> The use of design standardization is a prioritized option, but it is definitely not a mandatory requirement. We can’t blindly promote the use of design standardization.

P1 took the government officials’ appointment as an example: “We are now advocating to appointing younger officials. This doesn’t mean every single official must be young. There are definitely more criteria to look into.” The second thing is to promote the use of design standardizations in higher-end

projects because the current design standardizations were likely to have been applied only to general residential developments. Thirdly, it is necessary to mobilize the roles and responsibilities of the both government and private developers. P1 thinks it is important for the government and developers to join hands in order to promote the use of design standardization to the public.

P4 is also positive on the future use of design standardizations, and P4's evaluation of the use of design standardization is seven points. P4 thinks: "There will be more and more use of design standardizations, and the developer will update designs within shorter and shorter time frameworks. For example, we have standardized a design, and we may update this design within one year. There will be standardized designs version 1.0, 1.2, and 1.3. The frequencies of the use of design standardizations will be higher." P4's justifications are: "The future market will push the developers to update their standardized designs. In the past, there were huge demands in the market, and developers might be able to easily sell out all of their properties. However, when the industry is falling, customers will carefully assess the projects' designs." P4 also believes there will be an increasing proportion of the use of design standardization in the industry, and the varieties of designs will be improved in responding to the researcher's question on P4's estimation on the results to conduct Study 1 again in 10 years.

All three interviewees in the consultants' practitioner group are confident about the future use of design standardizations. The three interviewees and

their evaluations on the use of design standardizations are P6 (6), P7 (10), and P8 (7). P6 feels that “there will be more and more use of standardized designs according to the current trends. It is because the use of standardized designs simplified matters as I emphasized in our previous communications, and everyone likes to do things in the easy way. The problems of the similar cityscapes will be relying on the real capable designers. I am not kidding. The real estate developers will never consider this issue.” And P7 says: “in fact, this question has always had answer. The degree of the use of design standardizations in the future will be higher, and this is an inevitable trend. There will be more designs’ varieties, and there will always be updates to the designs.” P8 thinks: “the developers’ application of standardized designs is unavoidable, as the developers are always aiming at increasing interest, to shortening time, and reducing costs.” P8 hopes: “Developers should follow developer A’s model in the future in terms of the use of design standardization. I mean, to apply standardized designs and at the same time to apply some creative contents into the designs, in order to maintain and improve developers’ competitiveness.” P8’s prediction of future’s real estate industry in China is “the whole industry is redistributing. Therefore, many smaller developers without competitiveness will gradually collapse, and at the same time many real estate giants will be formed. These giant developers must have obtained strong competitiveness, and consequently they will need to adopt standardized designs to maximize their profits. To maximize developers’ profit is the aim behind everything I’ve mentioned earlier about the use of design standardization.” Based on P8’s predictions about the future use of design standardization and the future development of

the real estate industry, P8 also expressed his own expectations about developers' attitude towards project design. P8 sincerely hopes: "In the future developers will be able to find a balance between the use of design standardizations and creative designs. In other words, developers can apply some creative designs while pursing maximum profits by adopting design standardizations. I hope some local contexts and circumstances can be considered in the design processes based on different projects in different cities. The real estate development giants need to concentrate on the good use of design standardization and to apply creative designs." Another participant P10 also mentions the future real estate industry's redistribution. P10 is a real estate analyst who works for one of the biggest securities companies. P10 is optimistic about the future use of design standardization, and P10: "I believe there will be much wider use of design standardizations. I am very optimistic about it. The industry is becoming more and more concentrated. This is actually good for the development and application of design standardizations." The reason why the industry is becoming concentrated is due to the need of personalization compared with our last generation. Only bigger developers will be able to develop enough number of personalized standardized designs. And this will in return benefit the developers. Further, these benefited developers will grow bigger and bigger.

P11 is a real estate legal specialist, and P11 is also positive about the future's promotion of standardized designs. Although P11's quantitative evaluation about the use of standardized design is 6 out of 10 points, and this is one of the lowest evaluations among all participants'. P11 says: "The

use of design standardizations will be further promoted, as the competitions within the industry is intensifying. The developers' logic is to shorten the development cycle in order to gain returns from circulated funds as fast as it could be. This is how developers play the game. In this process, the use of design standardizations serves as a significant supporting role. In the future, the developers will pay further attentions to apply standardized designs."

The interviewees in the second participant group are also supportive in terms of the future use of design standardizations, but only in the short term. Both P5 and P9 in this group believe the existence of the wide adoption of standardized designs is due to the past's unique period in time. P2 thinks there might be a totally new direction of the future development of the application of design standardizations, and it is hard to predict. P2 is a professor in the field of urban planning in one of the top ranked universities in China and has served as the deputy country secretary for two years. P2 assumes the use of standardized designs is the current trend, and the designs degree of the use of design standardizations will be getting higher and higher. P2 believes: "The degree of the use of design standardizations are already relatively high compared to the previous situations. Our living standards have been improved and there are generally more demands on the living environments. This is an inventible trend." P2 is not sure about the future directions of the application of the use of standardizations' development and proposes it might be similar to the United States' model in the future.

P5 is an interior architect with about ten years of industry experience at two developers, and P9 is a chief real estate industry analyst. Both P5 and P9 are confident about the future use of standardized designs, but only in the short term while the real estate industry is still booming within a limited period of time. P5 says: “I think the use of standardized design will definitely continue to develop for a period of time. According to the current situation in China, the developers are certainly getting benefits from the use of design standardization. Consequently, I feel all major developers will keep promoting the use of design standardization in the future 10 or 20 years.” P5 predicts: “If we slow down the pace of real estate development, there will be no more use of design standardization.” P9 feels “the design standardizations might only be able to continue to develop for about 10 years while the real estate industry is still the leading economic industry in China by the end of 2030. The urbanization processes have not yet been completed. Therefore, there is still an increasing need to the real estate industry. However, if there is no more room for any further urbanization in the future, there will be no more need for the development of new real estate properties. Under these situations, the needs for personalized and individualized designs will be released, and the use of design standardizations will be reduced.” P8 also mentions the future’s technology development, and P8: “From another perspective, it is hard to predict the future development of sciences and technologies. In the future, it is possible to have technological replacements and alternations to replace the use of design standardization, for example, the technologies of housing industrialization.”

P3 is negative toward the future use of design standardization. Although P3's evaluation on the use of design standardization is relatively good, and P3 personally expects to adopt more design standardizations in his work, P3 still thinks: "There will be more and more restrictions to developers' applications of standardized designs. For example, it is getting harder for developers to acquire relatively bigger pieces of lands. This is also because competitions among developers in the industry is getting more and more fierce. Therefore, the developers should be more careful in adopting standardized designs in the future."

Chapter 7 Insights and Inferences

7.1. Introduction

This chapter will present researcher's insights and inferences generated on her journey to conduct this research project. Some researcher's general understandings on design standardization was strengthened and these will be discussed in this section. In later sections of this chapter, inferences on specific area of design standardization will be presented. First, it is clear and obvious that there are both pros and cons to use of design standardization in residential property development. Overall speaking, the use of design standardization has supported the development of the whole real estate industry, promoted the operational efficiency of the society, and shortened the housing supply cycle. However, design standardization has also created constrains on individuals' home environment and has indeed resulted communities that are of the same scale and appear undistinguishable.

In this research, it is evident to see how developers' use of design standardization under this unique framework in the past decade has contributed to the fastest development period of the real estate industry. However, it seems the use of design standardization is developer-initiated, developer-driven, and most importantly developer-centered during the last 10 to twenty years. In the future, it is hoped that more stakeholders, especially the end users, will involve in the use of design standardization, especially the preparation process and the later evaluation and adaptation stage. The involvement of end users as an additional key stakeholder can contribute to

a more comprehensive approach to the development and application of design standardization that not only better satisfy themselves but also the developers and other parties. Another noteworthy point based on the aforementioned aims of the use of design standardization in section 2.3.1 and 6.2 are the aims of the use of design standardization seem to be generally project-management-success-based. The research believes that it is necessary for the developers to orient their aims of the use of design standardization towards project-success-based and design-quality-based, in order to be prepared and to be more competitive for the more discerning end users in the future.

7.2. Controlling and Guiding Design Standardizations

In terms of the types of standardization, Druffel and Garfield (2010) identified two types of standardizations the explicating and evaluating standardizations, and Long (2012) believes standardization can be divided into technical or management standardizations. These definitions that have been introduced in earlier sections are valuable, however there is a lack of specified identification of design standardization in the residential property development process. In terms of the examination and evaluation of developers' use of design standardization, the researcher believes there are two types of design standardizations: the controlling design standardization and the guiding design standardization. The controlling design standardization is a framework to provide developers a tool in achieving a set of measurements in order to assess their designs. The use of controlling design standardization is often through a codified document, for example, a checklist. A controlling design standardization can be applied at any time

during an existing design whereas a guiding design standardization can be both from concept to existing design. The use of guiding design standardization set precedent to assist the development of design. The use of guiding design standardization is often through architectural works, for example, drawings, which provides developers a foundation to start a design. Both controlling design standardization and guiding design standardization support de-skilling. However, a point to take note of is that the guiding design standardization is more efficient in supporting less experienced design managers and designers with a precedent or template to work with.

7.3. Cityscape Issue and More Social and Environmental Concerns

The use of design standardization supports the development of the real estate industry, and the industry contributes the urbanization process and the economic growth in China within the past two decades. Nevertheless, the rapid development of the Industry has also raised environmental and social concerns. For example, prior research has thoroughly investigated the construction industry and its whole life cycle high-energy consumption and carbon emission, and the illegal construction and demolition issues. Social conflicts arise, leading to societal instability and tension. Among all the concerns, the cityscape issues have captured the attention of the central government, researchers, the media, and the general population in China recently. Some participants have also mentioned this issue during the interviews of Study 3 as discussed in Chapter 6.

7.4. Re-Orientation of Design Process and Schedule

The developers' application of design standardization has re-oriented the traditional residential design processes in the past 10 years. The design processes generally include four stages; they are the conceptual design, schematic design, design development, and construction documents. According to the Ministry of Housing and Urban-Rural Development of China (MoHURD, formerly known as the Ministry of Construction) recommended design schedule framework for residential building design, each design stage among the above four processes takes minimum two to three weeks, and the entire design process takes minimum 10 weeks (MoHURD, 2016a). However, the current design schedule has been further shortened in the industry practice. For example, one of the largest-scale property developers in China has shortened its design schedule framework in its internal project operation processes. In the early 2018, a leaked developer's internal document from head office exposed to the public shows how significant the design schedule is. The document revealed:

> All projects at third-tier, fourth-tier, and fifth-tier cities are required to adopt standardized designs. The design function is required to complete designs on the same day (to work overnight) from receiving confirmed design tasks.

Far from being an isolated incident, the Internet users and the media have dug out more information, and shed more light on developers who have adopted similar design schedule frameworks. The leaked document went viral on social media; for example, on Zhihu, a Chinese question-and-answer knowledge-sharing site, there were 35 million clicks on this hot topic within

one day. In the Study 3, some interviewees also mentioned this phenomenon and shared their observations on the current problematic design schedule frameworks. With design standardization, both design managers' and designers' project workload and stress should be reduced, and project productivity should be increased. However, the demands placed on project designers are overwhelming in that project designers are now expected to deliver a project design within an unreasonable framework. Furthermore, any time saved is now allocated for more projects that adversely impact project designers who have to deliver even more projects in an even shorter time. It is hoped that the design schedule frameworks will be improved in the future. It is hoped that the future development design standardization can provide designers with more reasonable time to learn about the project, and to deliver a higher project-specified design solution. In the hoped-for way, designers would feel that they could apply some degree of creativity; the end users will feel that they have received value because of personalized elements in the standardized design, and the developer gains resident confidence in their project.

7.5. Practitioners' Struggling

It is interesting to see the counter approach of standardized design that has been adopted by interviewees of Study 3 and even some prior researchers include, for example, creative design, innovative design, and design with varieties, instead of non-standardized design and project-specified design. It is unfortunate to see many practitioners currently struggling with the use of design standardization in their work. While the design managers are trying to do their best to implement design standardization imposed by the developer,

they have started to realize that promoting and adopting the use of design standardization often conflicts with their own aesthetic values and personal desires for innovation as explained in detail in 6.3.1.1 and 6.3.1.2. This researcher believes the situation will be improved in the future with a gradual slowing-down of the rate of development as stated in the beginning section 1.4.1. The developers are suggested to adopt an integrated design talent management strategy based on the use of design standardization, and this will be discussed in section 8.2.3.

7.5.1. Updates on Informants Status of Study 3

The researcher and the interviewees of Study 3 kept in regular contact over the past year. The majority of interviewees shared with the researcher their development and progress in their career paths. For example, some interviewees were promoted, and some interviewees obtained higher levels of professional qualifications. In addition to the above updates on the majority of participants, it is also important to see one of the interviewees who expressed her disappointments on the use of design standardization was disillusioned with the real estate industry and decided to leave the industry.

Chapter 8 Conclusions and Recommendations

8.1. Policy Implications

For developers, the use of design standardization is an internal disciplinary tool for market competition. Within the existing social and legal frameworks, the developers' adoption of design standardization should be encouraged. To fulfill the need of satisfying the demand for housing in a better time and costs framework, the developers have the incentive to adopt design standardization. It seems the government does not need to spend too much effort to encourage developers to apply design standardization. The government is then suggested to play a supporting role in two important aspects as detailed in Sections 8.1.1 and 8.1.2.

8.1.1. Architectural Copyright Protection

Architectural design work and standardized architectural design work are intellectual properties, and architectural works are statutorily protected in many countries. For example, architectural works are protected under the Copyright, Designs and Patents Act 1988 (CDPA 1988) in the United Kingdom and Architectural Works Copyright Protection Act (AWCPA) of the United States passed in 1990. There is a common understanding that both the published or unpublished original expressions of tangible architectural works are protected. According to Bowser's (2017) summary, "The design of a building as embodied in any tangible medium of expression, including a building, architectural plans or drawings" and "includes the overall form as well as the arrangement and composition of spaces and elements in the design" are the protected architectural works under AWCPA. Under CDPA,

the protected architectural works include architectural plans, drawings and buildings (Mann & Denoncourt, 2009). In terms of the architectural copyright registration procedures, there are designed architectural copyright registration procedures under AWCPA in the United States (Bowser, 2017) and there is no official copyright claim requirement in the United Kingdom (Mann & Denoncourt, 2009).

Many Chinese developers have already invested resources into design standardization research and development. However, it seems the design standardization outcomes are not well protected as architectural copyright. According to the findings of Study 3 discussed in Section 6.2.1.3, many developers have been infringing on architectural copyright of other developers, and have their own architectural copyright infringed upon. It is suspected the copyright infringement is common and currently accepted in the industry. In Study 3, interviewees revealed that they have not heard of legal cases regarding infringement of architectural copyright, and there are relatively few architectural copyright disputes reported. It is expected the developers will invest even more resources into design standardization research and development in an even more competitive market, and their future intellectual properties need to be protected. Consequently, it is hoped that specified architectural work legislation could be established to protect architectural copyright, in order to promote and maintain a positive competition atmosphere among developers and architectural firms in the industry.

8.1.2. Preservation of Local Identity

In 2016, the State Council of PRC released a guideline to regulate urban planning related activities and construction sector in China. This is after 37 years that national priorities for urban planning related issues and construction sector were reiterated (MoHURD, 2016b). In the guideline, to preserve the local identities (for example, the climate, natural geological feature, and culture and ethnicity identities) of cityscape was introduced (Article 6 to 8, Chapter 3). It seems the higher authorities have noticed the cityscape issues, and some well recognized researchers have also highlighted this issue in academic journals. However, it seems some local government officials are less concerned about preservation of local identity because that would slow down the development according to the findings of Study 3 presented in earlier section 6.2.1.1.

While some local government officials have not yet become aware of the importance of the cityscape issues, it is also not easy to quantify the measurements of cityscape. In the future policy development, to preserve the local identities, the corresponding incentive and evaluation measures must be taken into consideration, in order to encourage future developers to preserve local identities in residential property design and other development processes. Furthermore, there are no existing guidelines or frameworks in China on how to quantify the measurements of cityscape and local identity. In the future, to preserve local identity, to establish corresponding incentives, and to develop evaluation measurements must be taken into consideration by relevant government departments at multi-level, in order to encourage

developers to preserve local identities in future residential property design and other property development processes to embrace each area's unique cultural, distinct architectural style, and topographical features.

8.2. Practical Implications

8.2.1. Improvement of Design Quality

As the real estate industry's development slows down, the developers' aim of the use of design standardization is expected to shift from project-management-success-based to design-quality-based and project-success-based. Therefore, the quality of design will be playing an even more critical role in the developers' use of design standardization. To employ design standardization that can also deliver relatively more variety efficiently in a cost effective and timely manner, it is also important for the developers to start to develop more varieties of designs within the current design standardization framework. The use of variety should not disrupt the time schedule of design standardization. Regarding the analytical results of Study 1 reported in earlier Section 4.2.2.2, it is predicted that developer A's design standardization framework which incorporates more design varieties will be more sustainable than those adopting design standardization framework of fewer design varieties, for example developer E. According to the results of Study 1 presented in 4.2.2 and the researcher's insight reached through Study 1's implementation processes, the design variety and design quality in developer E's (and developer D's) design standardization framework is below the average. In terms of the design quality and design variety,

developer E is in an extremely vulnerable position in the future market competition.

8.2.2. Focus on Smaller Room Types

According to the China Family Development Report (2016), there are two trends of the future size of Chinese families. Firstly, the current family size in China is getting smaller, the average family size in China has fallen from 4.43 in 1982 to 3.03 in 2017 (CEIC Data, 2018). The majority of current Chinese family consists of two to three people of two generations. Another trend of Chinese household is the number of single-person family is increasing. There are about 14.1% of single-person family in China in 2016, and the percentages of single-person families in first-tier cities are even higher; for example, the rate of single-person household is about 20.8% in Beijing and 22.5% in Shanghai (NBS, 2017a). Some developers in the industry have also noticed these trends, for example, Vanke (China Vanke, 2005). The current concentration of the research and application of design standardization is mid-size (90-square-meter-size) flats. It is anticipated that developers will allocate resources to the research and application of design standardization for one-person households and smaller size households in the future, which will provide scope to accommodate the predicted individualized needs. For example, the new graduate and the single across-city employer who seek compact studios; and the elderly would require compact flats designed to provide accessibility.

8.2.3. Talent and Technology Strategies

Regarding the future research and development of design standardization, the developers need to rethink their talent and technology strategies. In the current industry practice, it is widely recognized that it is necessary to appoint talent with relatively rich project experience to work on the research and development of design standardization. However, this researcher believes specialized talents with research capabilities are also needed to work on the research and development of design standardization, in order to conduct more systematic and scientific research on design standardization application. Furthermore, more appropriate research methods and technologies are also needed. It is important for developers to encourage the employees to contribute to design standardization research and development, for example, to share project experiences, to allocate time and efforts to knowledge sharing (appropriate studies need to be designed and conducted). More technologies, especially some of the new technologies, for example, VR/AR, eye tracking, and neurosciences, are encouraged to employ in the developers' future research and development of design standardization. To adopt new technologies is also a direction of suggested future studies in academic community, and this will be discussed in later Section 8.5.4.The developers are suggested to intentionally employ talents with mixed skills and backgrounds, and to allow or to create possibilities for people talented with different skills and backgrounds to work together.

8.3. Methodological Implications

8.3.1. Development of Design Standardization Measurement

The floor plan analysis approach has been developed and adopted as the measurement of the use of design standardization in this research. The measurement development and study design has been explained in detail in earlier Section 3.4.1. According to the research design, there are in total 824, and 284 floor plans were analyzed in Studies 1 and 2 respectively. Based on the designed scope and aim of this research, the findings of Studies 1 and 2 were presented and discussed primarily in earlier Chapter 4 andChapter 5. In the future, further floor plan analysis (FPA) based studies can be conducted as a good way to code image data to text data. The floor plan analysis can be conducted based on different combination of aims and measurement of study.

8.4. Limitations of Research

This research is focus on the developers' project level implementation of design standardization in residential property development in China. This research reveals the degree and the situation of the use of design standardization quantitatively, the developers' strategies in adopting design standardization, and different stakeholders' perspectives upon the use of design standardizations. These are some of the answered fundamental questions of the use of design standardization. Nevertheless, there are also some limitations of this research. The researcher will propose a recommended possible future study based on each limits of this research.

8.4.1. Failure of Engaging Two Participant Groups

As explained earlier, the current use of design standardization in the real estate industry seems to be developer-driven and developer-centered. The attitudes of other parties toward the use of design standardization also seem to be supportive and cooperative, and other stakeholders seem to have found the use of design standardization as generally beneficial to them too. In fact, the researcher intended to conduct interviews with more groups of stakeholders, for example, architecture and design majored students, and residential furniture designers. Although the researcher believes data saturation has been reached, it is still unfortunate that the researcher found it was impossible to build the foundation of the dialogue and to continue the dialogue with these proposed interviewees due to lack of insights and first-hand experiences of design standardization. It seems theses proposed interviewees did not hold “deep” (Johnson, 2001) enough information to be studied. Also, the occupants’ perspectives were not designed into this study, as the main lens of this research focuses on the developers’ implementation mechanism of design standardization.

8.5. Recommendations for Future Studies

8.5.1. Measurement Development

In earlier section 3.4.1.1, the development and adoption of floor plan analysis as an approach to measure the use of design standardization was explained. In fact, there are more design standardization elements that can be developed and adopted to measure the degree of the use of design standardization. For example, an elevation design analysis can be developed

and adopted to measure the degree of the use of design standardization in future studies that focus on the cityscape issue of the use of design standardization.

8.5.2. Data Sample of this Research

The samples of Studies 1 and 2 are five first-tier and largest-scale developers in China. It is worthy to investigate the use of design standardization of these five developers. According to the latest The Third National Economic Censes (NBS, 2014b), there are in total 132,105 registered property developers in China, and 2,064 developers are highest-level qualified. The market shares of the five sample developers in this research are among the highest within the real estate industry in China. Although the market shares of larger scale developers are growing significantly, the larger scale developers' market shares are still relatively small compared with the market in matured economies. It is predictable that there will be a transformation within the Industry in the near future, for example large-scale reconstructs, merges, and closedowns. In the future transformations, the five selected sample developers are likely to survive in a relatively long term due to the scale and market share. Therefore, it will be interesting to adopt the research design of Study 1 again to conduct another study in five and 10 years, in order to see and to compare the results of Study 1. In addition, it will be interesting to adopt the research designs of Studies 1 and 2 and to conduct another study with additional data sets from the second tier and local-based or regional-based developers, in order to compare the results of Studies 1 and 2 respectively.

8.5.3. Sustainability Impact Assessment of Design Standardization

According to the current research design, this research tends to examine the developers' implementation mechanism of the use of design standardization and its social impact. Helping to meet the general sustainability goals and the Five Developer Concepts while China's economy is in historic transition, it will be valuable to further investigate the use of design standardization's environmental and economic impacts. As mentioned in earlier sections, consultancies have quantitatively measured the developers' economical values in adopting design standardization. The environmental and economic impacts of the use of design standardization at a societal level can be measured in future studies. For example, adopting a fully interior-decorated apartment in property development in China is a future trend and a government advocated direction. Additionally, some participants of Study 3 have mentioned that adopting design standardization is a required prior condition of the adoption and promotion of fully interior decorated apartment. Currently, there is no correlation of the use of design standardization and the adoption of fully interior-decorated apartment that can be found in Study 2. It will be interesting to conduct a study to compare property's delivery situations and occupants' move-in situations, in order to further understand the occupants' perspectives on the current standardized designs, and to estimate the general wastes from the current standardized designs. Moreover, to compare the delivery-and-move-in differences between the fully interior-decorated apartment and rough-casted in order to support further

policy developments on the property's full interior decoration and its related issues.

8.5.4. Technology Integration

As mentioned in earlier Section 8.2.3, developers are suggested to employ the latest technologies into the design standardization research and development. The new technologies can also be implicated in future research of design standardization and residential design related topics. As design standardization and residential design research are both real-world and industry-oriented topic, the developers in China and the academic communities are expected to join hands, in order to improve the understandings of the field. For example, in order to further evaluate the current residential designs, virtual reality (VR) and augmented reality (AR) technologies and eye tracking technologies and neuroscience theories can be applied to conduct in-depth research with end-users and other stakeholders. From end-user's perspective, artificial intelligence (AI) methodology can be adopted to establish a decision-making system for potential property buyers in China.

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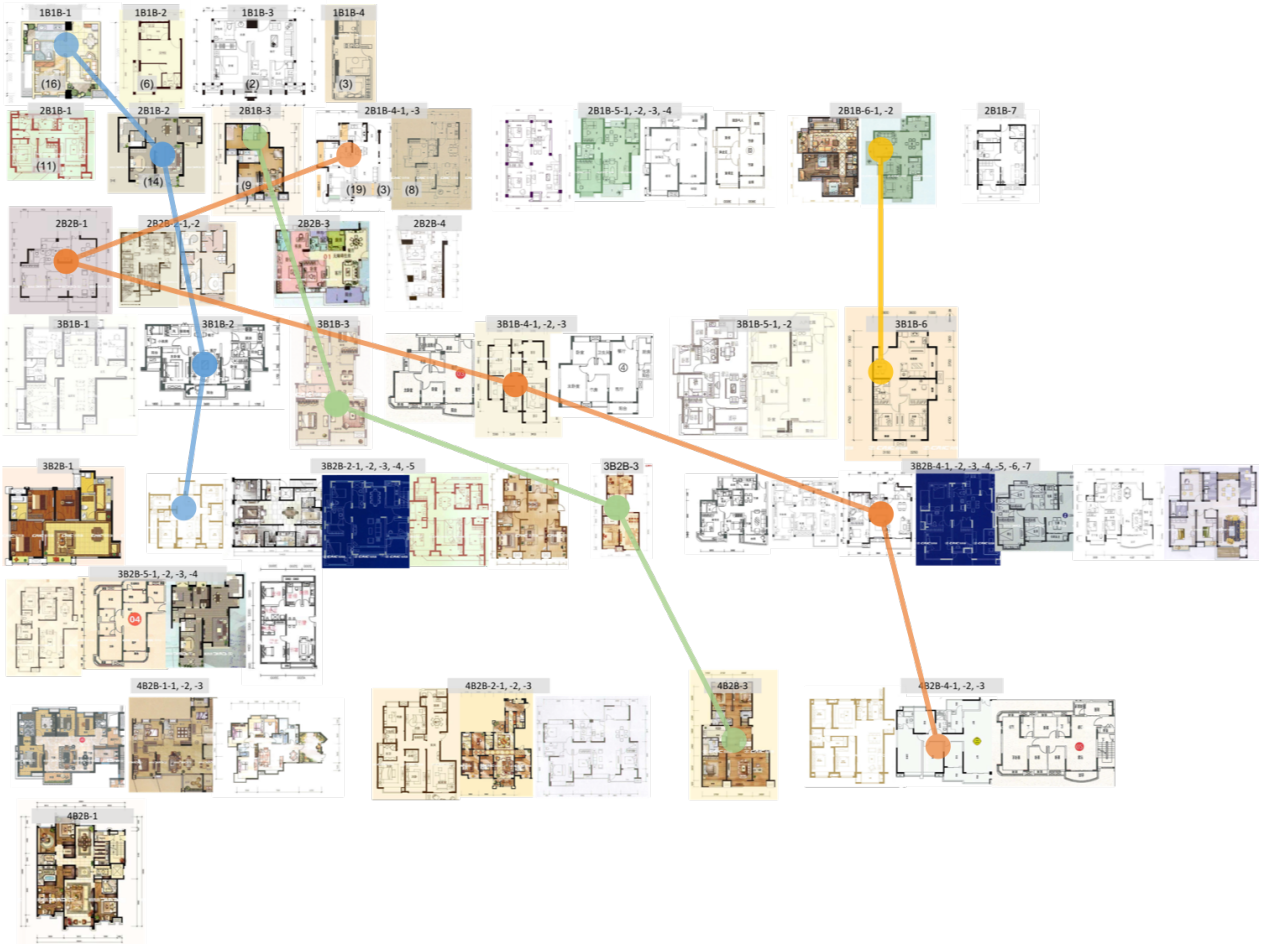
Appendices

Appendix A: Map of Standardized Floor Plan



Appendix B: Interview Procedure and Proposed Interview Questions (in Chinese)

第一部分：研究介绍及范围

感谢您参加我们的访谈，此次访谈是香港理工大学建筑与房地产学系在 Hong Kong PhD Fellowship (PF13-10360) 支持下培养的博士研究生方舟（导师：Patrick S. W. Fong 博士）的研究课题：标准化居住建筑设计 的一部分。在这一部分研究中我们邀请了与运用设计标准化相关的持份者进行半结构化的深度访谈。访谈的内容主要集中在不同持份者对在住宅地产开发中运用设计标准化的个人经历、看法和态度等。

根据每位受访者的不同情况此次访谈会持续约 75 至 90 分钟。我们将在访谈过程中进行录音，但是访谈的录音内容将会保密，且仅会被使用在这一个研究项目中。如果有需要，此次项目研究成果可以在完成前送至贵处确认。

第二部分: 访谈主要问题

1. 请您简单聊聊您在过去的工作中涉及到设计标准化相关的专业经验。
2. 从您的专业角度，在房地产开发过程中运用设计标准化的益处和问题分别有哪些（如果请您从 10-1 进行评分，10 代表益处绝对大于问题，1 代表问题绝对大于益处，您认为在房地产开发过程中运用标准化的分数是多少，为什么）。
3. 您认为在过去运用标准化设计的时间里，运用设计标准化对房地产行业有什么影响，您认为它对更多的行业，甚至城市化全球化的进程带来了什么影响。
4. 我们在前一阶段的研究中获得了一些统计数据，根据您的经验和感觉
    1) 您估计现在的市场上运用了设计标准化的住宅地产发开的产品有多少，为什么（我们调查的结果是 56.124%，这个结果符合您的估计吗？为什么？），

2) 您估计在以下四个城市里运用设计标准化的比例最高的是哪一个最低，为什么（北京 49.744%、成都 57.258%、上海 64.039%、广州 66.584%），
3) 您估计在以下五个开发商开发的住宅中哪一个运用设计标准化的比例最高哪一个最低，为什么（碧桂园 71.875%、恒大 56.944%、华润 46.897%、万科 58.046%、中海 58.974%）。

5. 您预计未来的房地产开发活动中设计标准化的使用趋势或前景如何。
6. 您是否有其他建议和需要说明的观点。

第三部分: 结束

感谢，最后希望能请您配合我们完成受访者信息名单，我们可根据您的要求对相关信息进行匿名处理。

Appendix C: Interview Procedure and Proposed Interview Questions (in English)

Part 1: Introduction of the Research Project and Consent for Participation in Interview

Thank you for your voluntary participation as an informant of this research project conducted by Miss Zhou Fang, under the supervision of Dr. Patrick S. W. Fong, of the Department of Building and Real Estate, The Hong Kong Polytechnic University under the Hong Kong PhD Fellowship Scheme (PF13-10360). This project is designed to understand the perspectives of multiple stakeholders on the use of standardized design in residential property development in China.

The interview will take approximately 75 to 90 minutes and Part 2 will be fully audio-recorded. The interview record will be kept confidential. The names of any organization or person will be anonymous from the transcript upon your concern.

Part 2: Interview

1. Please briefly talk about your previous experience with design standardization.
2. What are the good and the bad of the use of design standardization to you? (Please evaluate design standardization on a scale from 1 to 10).

3. What are the effects of use of standardized design to property development industry in China, are there any effects to the up and down stream industries, are there any other effects?
4. According to previous stages of research, we measured the degree of the use of standardized design in the industry,
   a) What is your estimation of the proportion of the use of standardized design? (The result is 56.124%. Does this rate sound acceptable, how do you feel your estimation compared with this result and why?)
   b) What is your estimation of the proportion of the use of standardized design in different cities? (The results are: Beijing is 49.744%, Chengdu is 57.258%, Shanghai is 64.039% and Guangzhou is 66.584%. How do you feel about your estimation compared with this result and why?)
   c) What is your estimation of the proportion of the use of standardization of various developers? (The results are E is 71.875%, D is 56.944%, C is 46.897%, A is 58.046%, and B is 58.974%)
5. What is your expectation of the future use of standardized design in residential property development in China?
6. Are there any further suggestions or concerns?

Part 3 Conclusions

This is the end of this interview. We thank you for your participation again. Please fill in this form of your career experience for our data analysis. Please let us know if you have any other concerns.