

Analysis on The Influencing Factors of The Average Service Life of Urban Housing in China

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Abstract: At present, China's residential average life is less than 30 years, far below the standard design life of 50 years, and the residential life in developed countries generally up to 80 years. Our residential life is so short that gives our country's construction and economic development a lot of negative factors. This paper focuses on the average service life of existing housing, using questionnaires survey and principal component analysis analyzes the factors that affect the average life.

1. Introduction

In recent years, according to the relevant laws of our country, the endurance life of the high-rise building and the major structure of the important buildings is 100 years, the general building is 50 - 100 years. However, in real life, there is a considerable gap between the actual life of many buildings and the legal requirements. The average service life of the existing residential buildings is only 30 years [1]. In 2013, the housing construction area of real estate development enterprises has reached 6656000000 square meters, but the process of urbanization Chinese will also continue to maintain rapid development. At the same time, a large number of urban construction in the use of less than 50 years will be removed. According to the relevant data statistics, China's housing has been dismantled 120000000 square meters in 2002, a total of about 161000000 square meters of in 2003, the use of these residential life is far from reaching the design life [2]. The construction of short-lived problems caused by the model of this large-scale demolition and construction has attracted more and more attention, the research on the service life of buildings is also increasing. According to this phenomenon, this paper intends to study the factors affecting the average service life of existing residential buildings in China by questionnaire survey method and principal component analysis.

2. Research methods

2.1 Research hypothesis

Because the development of the existing residential area is a wide range, there are so many relevant variables that impact the existing residential average life, the link between the variables is very complex. In a different environment and perspective, the influence of variables on the average service life will be different. Therefore, it is necessary to put forward the research hypothesis research.

The research hypothesis is the hypothesis that the characteristics of the investigation object and the relation between the phenomenon and the related phenomena, it is the attempt to solve the problem.

Hypothesis one: the development of the average service life of residential is affected by 37 variables, and in this paper is being exhausted. Because in the process of the study we can't guarantee the integrity and the representative of the literature, and the previous research environment and the present stage may be different, so the research will have an impact [3].

Hypothesis two: these 37 variables can be integrated into a number of factors, including a number of key factors play a decisive role.

F.H.Mustapha research found that, in the field of management, the impact of many factors can be integrated into a number of factors, and these factors are not equally important, only a few of them play a key role, including professional ability and working conditions is one of the key factors [4]. And so on, we believe that there are several key factors in the development of the existing residential average service life.

2.2 Preparation of questionnaire

On the basis of the 37 variables listed, by referring to a variety of documents, according to the classification of the 5 elements of the problem, the variables will be quantified. Here we use Likert self rating scale method of 5, from the "not important" to "very important" are recorded as 1 points, 2 points, 3 points, 4 points, 5 points, higher scores indicate that the research described the more close to the actual situation [5]. The value of this method is to distinguish the difference between the object and the intensity of the object in a certain logical order. However, this method is lack of a complete set of axioms and theorems, In the course of the study, we should pay attention to the reliability and validity of the measurement.

3. Questionnaire survey method

The questionnaire survey method is applicable to a wide range of research issues. Adopting questionnaire survey method, the questionnaire survey method can reflect the user's problems in a comprehensive and timely manner, provide more accurate information and can get the background information of the survey object and the original data that is not easy to get [6]. The investigation lasted from late April 2015 to late May 2015. Due to the limitation of time, manpower and capital, the questionnaire was sent to the Gansu Province for facilitate the research, personally sent to the survey units and individuals, a total of 120 copies. Questionnaires are as follows:

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1. Basic data of the respondents

- (1) Gender: A. Male ☐ B. Female ☐
- (2) Age: A. Under the age of 25 ☐ B. 25~35 years old ☐ C. 36~44 years old ☐ D. Over 45 years old ☐
- (3) Education: A. College Specialty ☐ B. University degree ☐ C. Graduate student ☐ D. Other ☐
- (4) Employment unit: A. Government Departments ☐ B. Real Estate Company ☐ C. Construction unit ☐ D. Government-affiliated institutions ☐ E. Other ☐
- (5) Cumulative time: A. 1~2 ☐ B. 2~5 ☐ C. 5~10 ☐ D. Over 10 years ☐

2. Overall survey (Please think of the correct option before you draw "tick")

- (1) Do you know the average service life of the house?
A. Very understanding ☐ B. Comparative understanding ☐ C. General understanding ☐ D. Not quite understand ☐ E. Completely without understanding ☐
- (2) Are you satisfied with the status of the average service life of urban residential buildings in China?
A. Not satisfied ☐ B. Less satisfactory ☐ C. General ☐ D. Comparatively satisfied ☐ E. Very satisfied ☐
- (3) In the process of the development of urban residential average service life in our country, do you think the cooperation of various departments is high?
A. Very high ☐ B. Relatively high ☐ C. General ☐ D. Less high ☐ E. Very not high ☐
- (4) Please rank the following factors influencing the average service life of urban residential buildings in China
A. Policy specification B. Market environment C. Management organization D. Economic cost E. Technical standard F. Other

3. Key factors questionnaire

Please rate the following factors——the higher the probability, the higher the score. a “√” tick below what you think that is the correct answer.

(1: No effect 2: A bit of influence 3: General effect 4: Impact 5: Great influence)

Factor Number		Influence Variable	The Possibility (Score)				
			1	2	3	4	5
City Planning and Government Decision-making Factors	1	Poor planning quality, predictability, coordination is not strong					
	2	The current management system fragmentation					
	3	Official authorization results in planning dummy					
	4	The government moved to engage in big demolition and construction					
	5	The national level is not yet perfect system of laws or administrative regulations					
	6	The unit area is too large or too small					
	7	Lack of functional design					
	8	Sound insulation is not good					
	9	Lack of equipment and facilities					
	10	Lack of Accessibility equipment					
Residential Technical Design Factors	11	Improper layout of residential space					
	12	Insufficient ventilation and lighting					
	13	Not energy saving measures					
	14	Not enough residential building structure and foundation					
	15	No fire prevention measures					
	16	Not enough equipment safety problem					
	17	Main body structure durability					
	18	Poor retaining structure					
	19	Poor waterproof performance					
	20	Poor equipment durability					
Residential Market and Environment Factors	21	Inadequate parts durability					
	22	Residential Land Limited					
	23	Limited planning conditions					
	24	Residential surrounding environment is bad					
	25	Inadequate facilities					
	26	Dangerous construction facilities					
	27	District internal functional partition is not clear					
	28	The volume control is not proper					
	29	Landscape and green space planning is unreasonable					
	30	Rapid population growth					
The Economic Cost Factors of Residence	31	Family structure changes too fast					
	32	The life cycle cost is too high					
	33	Land value is too high					
	34	Traffic inconvenience					
	35	Each stage of construction without interlocking					
Other	36	Natural disaster					
	37	Regional					

From the results of the survey, a total of 84 questionnaires were returned. The integrity and authenticity of the questionnaire were examined. If there is a leak out of the questionnaire, the questionnaire is removed. If there are 8 questions in a row to choose the same answer or answer to some of the rules of the questionnaire, as a waste volume processing, not included in the statistical analysis of the results. Finally, a total of 72 valid questionnaires were collected. Because the number of valid questionnaires is larger than the sample size, it can be considered as effective. In this survey, the questionnaire's recovery rate was 70%, the effective rate was 60%. As shown in table 1:

Table 1 Questionnaire distribution and recovery

Issuing Unit	Distribution Number	Recycling Number	Valid Questionnaire	Invalid Questionnaire
Government Departments	30	16	15	1
Construction Unit	26	20	17	3
Residential Housing	64	48	40	8
Total	120	84	72	12

For the accuracy of the results of the questionnaire, the credibility of the questionnaire is high. In the case of high credibility, the principal component analysis is used to analyze the influence factors of the average service life of urban residential.

4. Principal components analysis

There are two ways to determine the principal components: One is determined by the size of the eight values, generally take more than 1 of the value of the characteristics. Two is based on the factor of the cumulative variance contribution rate to determine, The cumulative contribution rate of the general variance reached 70% ~ 80%[7].Using SPSS15.0 to combine data, the total variance explained in table 2 is as follows:

Table 2 Total variance explanation

Component Number	Final Result			Component Number	Final Result		
	Characteristic Value	Contribution Rate %	Cumulative Contribution Rate %		Characteristic Value	Contribution Rate %	Cumulative Contribution Rate %
1	13.028	19.763	19.763	9	2.218	3.201	80.797
2	8.501	12.616	32.379	10	1.933	2.913	83.710
3	5.684	8.714	41.093	11	1.775	2.611	86.321
4	4.862	7.355	48.448	12	1.502	2.238	88.559
5	4.301	6.461	54.909	.....	.....	.....	.....
6	3.633	5.496	60.405	21	0.000	0.000	100.000
7	3.452	5.276	65.681	.....	.....	.....	.....
8	2.318	3.388	77.596	37	.....	.....	100.000

This study uses the variance of the cumulative contribution rate reached 70% of the requirements, the extraction of eight principal components. However, because the number of variables is too much, and in order to facilitate analysis of the search key, the eight main components of the first five of the 80% main components of the first 4, that is, the threshold value of five principal components. Using the SPSS software, a negative load matrix of 37*5 can be obtained in table 3:

Table 3 Factor negative load matrix

Variable	Principal component					Variable	Principal component				
	1	2	3	4	5		1	2	3	4	5
1	0.099	-0.14 ₃	0.196	0.168	-0.12 ₆	20	-0.31 ₅	0.317	0.373	-0.15 ₇	0.254
2	-0.04 ₉	0.112	-0.07	-0.12 ₇	0.237	21	0.865	-0.11 ₄	-0.09 ₆	0.049	0.276
3	0.633	-0.21 ₅	-0.22	-0.17 ₇	0.346	22	-0.25 ₁	0.336	0.118	0.621	0.237
4	-0.06 ₇	-0.16 ₇	0.743	-0.04	-0.01 ₄	23	0.251	0.743	-0.20 ₃	0.379	-0.30 ₂
5	0.444	0.075	0.325	-0.04 ₁	-0.24 ₆	24	0.245	0.255	0.584	0.092	0.038
6	0.426	0.109	-0.46 ₂	0.007	-0.01 ₇	25	-0.10 ₂	-0.19 ₅	0.113	0.403	0.098
7	0.122	0.794	0.145	0.055	0.021	26	0.124	0.035	0.364	0.294	-0.37 ₃
8	0.708	0.143	0.301	-0.10 ₃	-0.23	27	0.257	0.393	-0.20 ₆	0.379	-0.31 ₅
9	0.813	0.467	-0.20 ₃	0.248	0.345	28	0.575	0.105	-0.10 ₇	0.095	-0.60 ₇
10	0.233	0.246	0.584	0.092	0.032	29	-0.00 ₄	0.638	0.109	0.203	-0.18 ₅
11	-0.14 ₂	0.759	0.16	-0.14 ₄	-0.19 ₈	30	0.312	0.295	-0.33	0.615	0.114
12	-0.10 ₇	-0.19 ₆	0.118	0.402	0.099	31	0.486	0.084	0.523	-0.26 ₄	0.046
13	0.245	0.260	0.564	0.092	0.037	32	0.099	-0.14 ₄	0.196	0.171	0.730
14	0.798	0.12	-0.01 ₇	-0.00 ₁	0.68	33	-0.04 ₉	0.118	-0.07	-0.12 ₇	0.723
15	-0.10 ₂	-0.19 ₆	0.127	0.698	0.458	34	0.037	0.519	0.395	-0.06 ₃	0.169
16	0.687	0.048	-0.07	0.205	0.162	35	0.141	-0.12 ₄	0.733	0.129	-0.32 ₄
17	0.468	0.084	0.526	-0.26 ₆	0.048	36	-0.03	0.483	0.099	0.428	-0.20 ₅
18	0.492	0.198	0.079	-0.08 ₅	-0.43 ₃	37	0.397	0.046	-0.05 ₉	0.245	0.454
19	-0.22 ₃	0.081	0.595	0.156	-0.08 ₆						

We can see that 9, 14, 21 variables have great influence in the first principal component, the coefficients were: 0.865, 0.813, 0.798. This mainly means that the lack of residential construction equipment, residential building structure and the foundation of the foundation has flaws, part of the durability of the product components, we can be summarized as: residential equipment parts system.

7, 11, 23 variables have great influence in the second principal component, the coefficients were: 0.794, 0.759, 0.743. This mainly means that the lack of functional design, the space layout of the house and planning conditions has flaws, we can be summarized as: residential design system.

4, 35 variables have great influence in the third principal component, the coefficients were: 0.743, 0.733. This mainly means that government said the dismantling of "construction", moved to engage in different stages of the construction without interlocking, we can be summarized as: Residential production organization system.

22, 30 variables have great influence in the forth principal component, the coefficients were: 0.621, 0.615. This mainly means that residential land is limited, the impact of rapid population growth, we can be summarized as: residential market environment system.

32, 33 variables have great influence in the forth principal component, the coefficients were: 0.730, 0.723. This mainly means that the life cycle cost of the housing itself and the land value is too high, we can be summarized as: the economic cost of housing system.

5. Conclusions and recommendations

From the previous analysis, we can see that the average service life of city residential building in China is relatively short. The influencing factors of the average service life of urban housing are complex and diverse. We analyze the influence factors of the average life of the average using the empirical research method and the following suggestions are put forward: (1) improve the administrative regulations, the rational urban planning and government decision-making, to accept social supervision; (2) to update the original technical equipment, to carry out technical training for the relevant personnel of the housing, and form the technical structure and organization structure; (3) the establishment of residential system and the Ministry of goods, the modular coordination system, to speed up the establishment of residential standards system, so that the average service life of urban residential life as far as possible[8].

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