Research Paper: Examining the Effective Factors on Villagers' Tendency to Retrofit Rural Housing in Iran

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ABSTRACT

Purpose: The problem of bad quality and lack of stability in rural structures, in light of the general vulnerability of the country, has made the issue of retrofitting of rural homes one of the basic programs of the government in the field of rural areas during two recent years.

Methods: This research is an applied one with a descriptive-analytic method, which was conducted in Jahrom with the objective of analyzing the effective factors on retrofitting of rural homes. Our statistical population includes 11 villages of Simekan district in the suburbs of Jahrom County. These villages have taken a loan of over 50 items from the Housing Foundation. For estimating the sample volume at the rural family level, by using the Cochran sampling method with 95 percent accuracy, 186 persons (family guardians) were questioned by the simple random sampling method. Then, the necessary information was gathered by survey and questionnaire.

Result: Based on the results of factor analysis, between the first two factors in the order of effectiveness, the first factor (satisfaction with rural housing) describes 57.455 percent of the variance by itself and the second factor (housing retrofitting) accounts for 20.835 percent of the variance. In addition, it was found that the best reason for retrofitting rural homes is the use of rural housing facilities (67%). Safety against natural disasters such as earthquakes and floods (33%) is another reason for housing retrofitting, so our main hypothesis is supported.

Conclusions: According to the results of hypothesis testing, based on the Pearson correlation coefficient and regarding variance testing and our significance number which is more than 0.05, there is not a significant difference between our independent variables (gender, age and education) and housing retrofitting.

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1. Introduction

Humans and their environment, at macro and micro levels, are interrelated. While humans are enjoying the power of adjusting to environmental circumstances, they are continuously trying to form and change their surrounding environment and this change appears in their housing (Seidaee et al., 2010: 49). Housing is one of the most important issues that humans have always dealt with and tried to solve this problem and find a reasonable and appropriate answer to it (Jamshidi et al., 2013: 70).

In international laws, particularly in the 11th article of international treaty of economic, social and cultural laws, the right to having good housing and a life with human respect is considered as one of the basic needs and a key index for each person and family (Frimpong, 2001: 1). It is related to the dwellers' life quality improvement (Young, 2007: 4; Maliene, 2008: 5). Compared with other goods, housing can be considered as the basic factor of both social inequity and cooperation (Bayesten & Darz, 1998: 296). This is due to some features such as being irreplaceable, being a capital, being durable and costly and being immovable (Gallent & Robinsin, 2011: 298).

In fact, after the occurrence of natural events (even on small scale), some issues such as attrition of rural textures, using unstandardized and unstable building materials, and failing to observe technical and engineering principles in construction and lack of adaptation to the environment are considered as the basic reasons for many human and financial casualties in rural areas (Fal Soleiman, 2012: 77). On the one hand, due to failure to observe technical and safety principles in building homes in the past and on the other hand, lack of adaptation of these homes to today's needs of our rural society, the villagers have begun to make changes in rural homes and make them similar to urban homes (Anabestani, 2014: 60). Regarding the importance of this subject, the government has been charged with implementing the plan to increase the quality of rural homes according to the law of the Fourth Development Plan and budgetary rules of Housing Foundation of Islamic Revolution.

This plan includes a series of practices in rural areas, such as developing a rural technical system, issuance of planning permission, educating rural bricklayers, renovating rural homes, rural housing bank facilities and restructuring homes damaged by natural events. Most of the works have been done as planned and with the aim of achieving quantitative objectives in retrofitting rural buildings and increasing the number of stable dwelling units in rural areas (Shakuri & Asgari, 2012: 151). In other words, finally, these problems forced the officials to consider solving them. One of these solutions is paying credit to the rural societies in the fields of skeletal development, housing patterns and housing retrofitting. In other words, one of the government-based credits that is paid to the villagers is the credit for rural housing retrofitting (Anabestani et al., 2012: 64). Given the importance of these programs in improving rural housing retrofitting, particularly in Jahrom County (Simckan District), our main research question is "what are the most effective factors on villagers' tendency to retrofit rural housing?"

Then, with the hypothesis of "it seems that using rural housing facilities has a significant effect on villagers' tendency to retrofit rural homes", we analyze the data.

2. Literature Review

Rural housing

In the real world, the village is a unified phenomenon in which we cannot separate cultural, economic, social and environmental components and factors from each other (Anabestani, 2014: 58). Housing in the villages not only is a dwelling but also is important for rural families in terms of production and employment (Anabestani, 2011: 101). It should be noted that Iran is prone to having earthquakes and from time to time, severe earthquakes occur in this country. In recent decades, earthquakes have led to heavy damages and disasters. In the past decade, eight major earthquakes in Iran have left thousands of people homeless (Amirahmadi, 1992). One of the important domains vulnerable to earthquakes is rural buildings. Most of them lack minimum retrofitting standards and so, housing renovation and retrofitting are considered in the countries' macro-plans.

According to Housing Foundation statistics and data, about 1,700,000 rural residential units were renovated and reconstructed with the government support by late 2008 (Housing Foundation of Islamic Revolution, 2008). In most developing countries, planners have not paid enough attention to skeletal development and retrofitting of rural housing that has led to paying insufficient attention by rural home builders to the formal structural codes in the regions prone to earthquakes due to economic and financial reasons and poor control by local associations (Lewis, 2003: 34). Besides, these regions are highly vulnerable to earthquakes due to insufficiency of

necessary infrastructure (Young, 2007: 4). Thus, the first step in the revival of the country's villages is the renovation of rural housing (Ghadiri Masoum & Akbarpur SaraKanrud, 2011: 74).

Rural housing credits

Since the beginning of rural life, financial credits have been in the rural society. Rural families have used credits for their production, agricultural and consumption needs (Taleb, 1993: 54). Providing micro-loans to rural families with various income levels is based on a vast range of building activities and housing procurement such as house repairs, restructuring and renovating of the present physical structure, acquisition of land, building a new house and even improving the present sub-structural facilities like sewage system (Kumar & Newport, 2007: 2). Mostly, according to the process of "step-by-step building" which means accepting local officials and engineers' supervision by the owners, these credits are put at their disposal. So, providing the necessary credits for retrofitting rural housing in developing countries typically includes part of rural credits which are mostly paid by finance companies such as banks, local credit unions, cooperatives, etc. (Einali et al., 2014: 79 from Douglas, 2003; Khan et al., 2009: 2; Grameen Bank, 2011). In Iran, credits for retrofitting rural housing have been paid under government's support and by commercial banks since 2005 and following "rural housing renovation" plan which started in 1995 by the Housing Foundation of Islamic Revolution in order to promote safety, health and welfare of villagers. Due to the mentioned features, rural housing loan has positive and negative outcomes, in terms of different economic, social, skeletal and environmental aspects, and effects on villagers' life and their environment (Ghasemi Aerahaee & Rostamalizedeh, 2012: 69). Despite all the mentioned shortcomings of the rural housing sector, focusing on rural housing has been disregarded and few credits have been allocated to this sector. Rural housing credits were organized and presented in the Fourth Development Plan, but they were not acceptably implemented due to banks' unwillingness to loan villagers or villagers' inability to introduce a guarantor to the bank. Due to their economic conditions, most villagers face difficulties in securing this cost. Regarding poor economic conditions of villagers in building a stable house, the necessity of investment and giving credits for rural housing by the government is felt. Economic conditions in the country's villages do not allow villagers to build a house according to standard principles and so, the government's financial policies in the housing sector should be focused on this issue. In our country, land acquisition policies for building, financial securing, creating cooperatives and supporting housing should be considered as some strategies for housing procurement for the needy (Motiee Langerudi & Bakhshi, 2005: 36).

Rural housing retrofitting

Rural development and rural housing retrofitting are always considered as two most important concerns of governors and rural planners (Beiti, 2012: 115). One of the plans for rural development in the Fourth Development Plan is the national plan of rural housing retrofitting which has already been started. Housing retrofitting credits are paid to the villagers in order to achieve some goals such as building stable houses, providing houses proportionate to the villagers' needs, preserving the identity and public appearance of villages and the like.

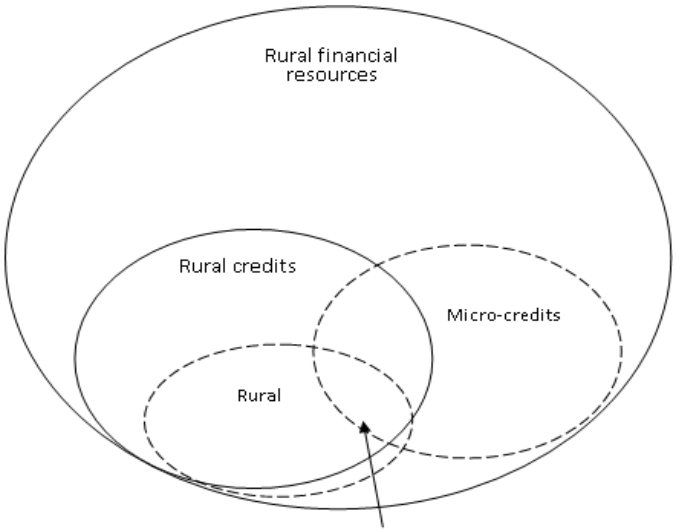

Figure 1. The status of rural housing credits within the rural financial resources system. Source: GGAP, 2003

Unacceptable quality and high vulnerability of rural houses due to using low-quality materials, unsuitable location and other factors annually impose large disbursements on rural families and society (Motiee Langerudi & Bakhshi, 2010: 37). Housing retrofitting is one of the important preventive measures within the crisis management cycle. Prevention is the process of programming and performing such measures which reduce natural disaster-based risks (Dehghan Faruji, 2010: 2). Rural housing retrofitting is one of the important issues in improving the life quality of villagers and preventing possible damages at the time of natural disasters. So, rural housing retrofitting is considered as one of the main bases of the Housing agenda (Mahdavinezhad, 2014: 39). Although Housing Foundation of Islamic Revolution has strongly focused on rural housing retrofitting since 2005, most rural areas lack appropriate and quality housing (Anabestani et al., 2012: 63). Lack of retrofitting of rural houses against natural disasters such as earthquakes, floods and storms is very important. Using low-quality materials and failing to observe technical regulations in the building has an effective role (Rezvani, 2011: 143). Most villages are more vulnerable than cities because of infrastructural reasons such as low knowledge, economic and cultural poverty and lack of supervision over rural building. Rural housing retrofitting is a method for reducing the rate of human casualties and economic damages in rural regions (Dehghan Faruji, 2010: 4).

Background Review

In the field of rural housing retrofitting, there are many important projects. We mention the following cases (Table 1).

Research conducted so far has been focused on the use of housing credits and its impact on the development of rural settlements and especially on its physical fabric. However, so far, no studies have been conducted on the tendency of villagers to use rural housing credits. Therefore, the present study can offer a new perspective in this area.

3. Methodology

Our research method is descriptive-analytic, and it is of applied-development type. The research area, Simekan district in Jahrom County, has 39 villages with a population of 17241 persons. Our statistical population includes 11 villages of Simekan District in the suburbs of Jahrom County. These villages have taken a loan of over 50 items from the Housing Foundation (Table 2). For estimating the sample population at the rural family level, by using the Cochran sampling method with 95 percent accuracy, 186 persons (Family guardian) were questioned by simple random sampling method. We used a questionnaire for gathering information which was then analyzed with SPSS and Excel software. In addition, we used the explorative-factorial analysis method for analyzing the effective factors on rural housing retrofitting. Therefore, the result was reducing 7 initial factors into 2 superior factors by Varimax Rotation.

Table 1. Some studies on our research topic

Researcher	Results
Sartippipour (2005)	Based on examining the sampling plan data of rural housing features of 2003, he firstly evaluated the province's rural housing status in 4 fields, including strength conditions (safety), enjoyment (comfort), economic conditions (livelihood function and economic role) and environment and damages resulting from the housing. Then he proposed some suggestions for policy – making in order to solve the current problems.
Rahmani Fazli & Kavyani (2009)	In terms of "Effectiveness of micro-credits in rural housing renovation of Saghez County" , they found that credits for renovating rural housing in the studied area were effective and studied the most effective credits in the field of housing retrofitting within the studied area.
Karimi Azar & Shamsi Yousefi (2009)	For constructing in a rural context, the best options are using new materials in combination with the available useful and acceptable materials within the area and using new technologies.
Seidaee et al. (2010)	The central district of Buyerahmad is at one level, and Pataveh , central Gachsaran and central Kohgiluyeh are at the other level and Kabgian, central Bahmaee, Landeh, Central Dena, Sarfaryab, Cheram, Basht, Lodab, Dishmun, Charusa, tropical Bahmaee and Margun are at the next homogenous level.
Motiee Langerudi & Bakshi (2010)	Paying housing credits both increases villagers' ability and satisfaction in the field of housing and is effective in keeping the population in the villages.
Saeedi & Amini (2010)	Economic-social changes and human mobility have led to stability/instability trends and spatial-skeletal changes in rural housing. Thus, rural-urban movement and leaving some buildings in villages have led to a functional change in using internal spaces of houses.
Shamsoddini & Rostami (2011)	In 24 villages of Mamsani County, apart from comfort, safety and good appearance, rural housing renovation showed a negative effect on villagers' living economy.
Ghasemi Ardahaee & Rostamalizadeh (2011)	The results show that rural housing loan has some positive and negative outcomes and a series of skeletal, social, economic and cultural effects on villagers' lifestyles.

Table 1. Some studies on our research topic

Researcher	Results
Afrakhteh & Havasi (2011)	Rural housing loan policy has not resulted in full success, because it has not been presented in a comprehensive systematic rural development plan which is matched with strengthening objectives.
Anabestani et al. (2012)	In terms of housing pattern changes in the area, some strategies for retrofitting rural housing are suggested by using local architectural patterns, appropriate floor area for the renovated dwelling units and paying attention to rural building patterns for achieving appropriate and quality housing.
Mohammadi Yeganeh et al. (2013)	Although family education does not show a high success at first, it has a higher success at the end and after some time.
Anabestani (2014)	Some strategies were suggested, such as focusing on villagers' social interactions in building new houses, relying on local and racial culture, reducing the dependence on the towns surroundings in building rural houses.
Einal et al. (2014)	The results show a significant difference in the effectiveness of skeletal components in reducing housing damages between, before and after using housing credits.
Azimi et al. (2014)	The results show an improvement in the physical quality of buildings and reflect some changes in rural lifestyles in recent years.
Rezvani et al. (2014)	The results show that there is a difference in the villagers' need for the housing loan and their demand for receiving the loan between central and suburban dwellings, such that about 80 percent of applicants for rural housing loans belonged to two dwellings of " Varavi " (center of district) and " Khuzi " (center of rural district).
Boshagh et al. (2014)	The results show that there is a difference between rural types in dimensions and indices of housing stability.
Farhadi Quliyanlou (2016)	Studies show that the implementation of this special plan to improve rural housing has disrupted the texture and architecture of villages.
Mohammadi Yeganeh et al. (2017)	Findings show that there is a significant relationship between the sense of security of rural households and its dimensions before and after receiving the house strengthening credits.
Rabet et al. (2017)	The results of this study indicate that the financial facilities for rural housing have played an important role in creating physical changes in rural housing of rural settlements that have used these facilities.
Riahi et al. (2017)	According to data, one can suggest that housing bank facilities have had an effective role in the social dimension of rural development. Because the overall weight for this dimension and profile was %75 and all indexes in this aspect had a high percentage.
Faezi et al. (2018)	The results of the first test showed that some of the criteria related to performance indicators and aesthetics are zoning height, the proportion in the building, compliance with the settled units, compliance with the structure and the executive management and oversight of the village, in the 99% of variables, and appearance of the furniture, flexibility and readability of buildings, spatial unity and consistency of building styles, harmony between form, at 95%, which indicates that the strengthening effect is significant.
Ghadiri Masoum et al. (2021)	The results of the t-test on the hypothesis indicate its significance and the negative effect of housing renovation on the participation rate of women in economic activities so that with a significant level of 0.000, the coefficient of the t-test is equal to 9.742- that confirms the hypothesis of the effect of housing renovation, and changing the functions of rural housing emphasizes the level of women's participation in economic activities.

Table 2. The number of loan taker families and performance of technical supervisors and distribution of planning permission issuance in our sample villages during 2005-2016.

Row	Village Name	Distance of the nearest town	Number of buildings being constructed since 2005				Number of buildings with supervisor	Number of loan taker families
1	Arjuyeh	20	278	47	14	339	325	300
2	Shaghun	15	101	23	19	143	124	113
3	Mazcan	17	59	4	3	66	63	62
4	Kushcar	2	47	6	6	59	53	53
5	Behjan	30	82	-	16	98	82	85
6	Kalakeli	13	41	10	3	54	51	47
7	Jarmasht Bala	40	121	34	4	159	155	130
8	Esfanjan	37	80	-	4	84	80	93
9	Dashtdal	30	56	5	2	63	61	62
10	Chartagh	33	49	7	1	57	56	53
11	Gudzaa	3	63	5	4	72	68	68
Total	-		977	141	76	1194	1118	1066

Source: Housing Foundation of Islamic Revolution of Jahrom County, 2019, and authors' calculations.

In the present research, we used the content validity method for increasing the research validity (Hooman, 1997: 228). Accordingly, the questionnaire was presented to authorities, experts and university professors and after collecting their views, the necessary corrections were made. We used the Cronbach alpha coefficient for determining research reliability. The calculated alpha was 0.782, which is an acceptable value; thus, we can say that we used the necessary precision for ensuring the reliability of structures in the questionnaire and the designed items for assessing the variables are internally correlated (Table 3).

Our under study area, Simekan District, Jahrom County in Fars province, has 40 villages, 3741 families with a population of 17241 persons, and agriculture is considered as the most important activity of this area. This district is limited to the north by Khafar, to the east by central district, and to the west by Firuzabad County and to the south by Ghirocarzin County. Its area is 942.5 km2, which equals 16.5 percent of the total area of Jahrom County (Simekan District, 2010; Anabestani & Rusta, 2012: 68).

4. Findings

Respondents' individual characteristics

In terms of gender identity, 133 persons (71%) are male and 53 (29%) are female. In terms of education, 28/4 percent of subjects have elementary education, 13 percent of them have middle education, 42.6% have secondary education and 16 percent of them have an associate degree or higher.

Furthermore, in terms of ownership type, 10.2 percent of houses have formal ownership documents, 84.2 percent of them have a preliminary agreement and 5.6 percent of them are rental. In terms of respondents' jobs, 47.3 percent of them are farmers, 29.03 percent of them are workers and others have other jobs. 83 percent of buildings are 1-5 years old and 17 percent of them are 6-10 years old. In terms of quality, 92 percent of houses are new and 83 percent of them belong to a single family (Table 4).

In terms of the area of residential units, about 80 percent of them are 100 m^2. In terms of the area of the total foundation, nearly 80 percent of houses are 100 m^2, 10 percent of them are over 100 m^2 and 10 percent of them are less than 100 m^2. 95 percent of residential units are villas and 5 percent of them have two floors. 80 percent of houses have two bedrooms, 13 percent of them have one bedroom and 7 percent of them have more than two bedrooms.

Housing plan: 93 percent of houses do not have a guest room. 21 percent of houses have two yards and all of them have an open kitchen, an indoor lavatory and a bathroom (Table 5).

Identifying the effective factors on rural housing retrofitting

Table 8 shows the effective factors on villagers' tendency towards retrofitting rural housing. As can be seen, the mean of all items is more than 4 except the item of "the extent of education in order to promote villagers' technical knowledge" which its mean is less than 4 (3.73%). The highest mean relates to the item of "the extent of focusing on the bed and kind of soil at the time of building the house" (4.86%) and the second place is that of the item of "the extent of supervisors' control over building new houses and/or renovating old ones"(4.81%).

Table 3. Validity and reliability of the variables based on Cronbach alpha

Index	Items	Number of items	Cronbach alpha
Housing retrofitting	The extent of education in order to promote villagers' technical knowledge about building houses, the extent of supervisors' control on building the new houses and/or renovating the old ones	2	0.89
Satisfaction with rural housing	The extent of families' satisfaction with new patterns of housing architecture, the extent of families' feeling of safety against the natural events, the extent of satisfaction with the location of the house, the extent of satisfaction with the house area and the number of rooms	4	0.82
Housing plan	Having a guest room, separate bedrooms, two yards, an open kitchen, having a lavatory inside the house and a bathroom.	6	0.68
Independent variables	Age, gender, education		

Source: Research Findings, 2019

Table 4. Respondents' descriptive characteristics

Characteristics		Number	Percent
Gender	Men	133	71
	Women	53	29
Education	Elementary	53	28.4
	Middle	25	13
	Secondary	79	42.6
	Associate degree or higher	29	16
Ownership type	Formal document	18	10.2
	Preliminary agreement	157	84.2
	Rental	11	5.6
Occupation	Farmer	88	47.3
	Worker	54	29.03
	Housewife	15	8
	Others	29	16
Building age	1-5 years	155	83
	6-10 years	31	17
Building quality	In-building	15	8
	New	171	92
Number of family in a residential unit	Single-family	155	83
	Two-family	31	17

Source: Research Findings, 2019

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Table 5. Housing plan in studied villages

Items	Yes	No
Having a guest room	7	93
Having separate rooms as bedrooms	100	-
Having two yards	21	79
Having an open kitchen	100	-
Having an indoor lavatory	100	-
Having a bathroom	100	-

Source: Research Findings, 2019

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Table 6. Paid facilities statistics (in Rials) in terms of the stage of facilities in Jahrom County during 2005-2011

Total	Third stage	Second stage	First stage	Year
20930000000	3894000000	10592000000	6444000000	2005
28625700000	4016580000	15697720000	8911400000	2006
46517000000	6189000000	21209000000	19119000000	2007
54348000000	7689000000	33113000000	13546000000	2008
76866000000	29688000000	23868000000	23310000000	2009
149039000000	55840000000	45990000000	47209000000	2010
16340000000	2940000000	5610000000	7790000000	2011

Source: Islamic Republic Housing Association of Jahrom County, 2018.

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Table 7. Collective statistics of building units' number in terms of the stage of records in Jahrom County during 2005-2011

Total	Completion	Third stage	Second stage	First stage	Conclusion	Presentation	Registration	Year
3133	412	412	418	423	440	511	517	2005
3737	497	497	504	511	526	576	626	2006
5405	712	712	715	717	740	892	917	2007
5370	721	722	726	727	757	851	866	2008
5470	739	776	776	784	784	795	816	2009
10832	1291	1459	1533	1594	1632	1641	1682	2010
1806	33	85	147	203	257	522	559	2011

Source: Islamic Republic Housing Association of Jahrom County, 2018.

Table 8. The effective factors on villagers' tendency to retrofitting rural housing

Items	Frequency and significance level			
	Mean	Standard deviation	Chi-Square	Sig. level
The extent of families' satisfaction with new patterns of housing architecture	4	0.519	132.484	0.000
The extent of families' feeling of safety against natural events	4.59	1.214	117.763	0.000
The extent of satisfaction with the location of the house	4.59	1.214	117.763	0.000
The extent of satisfaction with the area and number of rooms	4.596	0.715	132.484	0.000
The extent of consulting with engineers at the time of building	4.655	0.756	80.022	0.000
The extent of education in order to promote villagers' technical knowledge	3.73	0.444	39.763	0.000
The extent of considering the bed and kind of soil at the time of building	4.86	0.511	137.634	0.000
The extent of supervisors' control over building a new house and/or renovating old ones	4.81	0.577	124.215	0.000

Source: Research Findings, 2019

The most important reasons for the tendency to retrofitting housing

According to respondents, the most important reason for the tendency to retrofitting housing in the studied villages is the use of rural housing facilities (67%), while 37 percent of respondents reported that they retrofitted their homes because of safety against natural disasters such as floods and earthquakes (Table 9).

According to Table 11, we can say that since the highest frequency relates to "receiving facilities" and its significance level is less than 0.05, thus, the above hypothesis is confirmed.

Independent variables and tendency to retrofitting

Gender and tendency to housing retrofitting- We used a t-test for examining this hypothesis. The results of Table 12 show that based on our means (4.3 and 4.5) and significance level, there is not any difference between men and women in the tendency towards retrofitting housing.

Table 9. The most important reasons for the tendency to retrofitting housing

Most important reasons	Percentage
Use of rural housing facilities	67
Safety against natural disasters	33

Source: Research Findings, 2019

Table 10. The observed and expected frequencies

Explanation	Observed frequency	Expected frequency	Result
Use of rural housing facilities	130	93	37
Safety against natural disasters	56	93	-37
Total	186		

Source: Research Findings, 2019

Table 11. Chi-square testing

Facilities	
Chi-square	29.441
Degree of freedom	1
significance	0.000

Source: Research Findings, 2019

Table 12. Number, mean and standard deviation of research sample volume

Explain	Gender	Number	Mean	Standard deviation	Mean deviation error
Housing retrofitting	Men	130	4.3077	1.07000	0.09385
	Women	50	4.5200	0.95276	0.13474

Source: Research Findings, 2019

Table 13. Mean difference testing

Explanation	t-test for testing quality of variances		t-test for Equality of Means						
	f- statistics	Significance level	t-statistics	Degree of freedom	Sig. (2-taile)	Mean Difference	Std. Error Difference	95% confidence Interval of difference	
								Lower	Higher
Equal variance is given	3.364	0.068	-1.228	178	0.221	-0.2123	0.17291	-0.55352	0.12891
Equal variance is not given	--	--	-1.293	99.203	0.199	-0.2123	0.16420	-0.53811	0.11349

Source: Research Findings, 2019

Age and tendency to housing retrofitting- We used the Pearson test for examining this hypothesis. According to Table 14, since the significance level is more than 0.05 (Sig = 0.252), the relation between the variable "age" and housing retrofitting is not supported.

Education and tendency to housing retrofitting- We used the Pearson test for examining this hypothesis. Since our significance level is more than 0.05 (Sig=0.085), the relation between education and housing retrofitting is not supported (Table 15).

Analyzing the effective factors on rural housing retrofitting from the viewpoint of villagers by using Factor Analysis

We factorized the research variables by using SPSS software and a developed statistical method: Factor Analysis. Accordingly, those indices which are internally related prefer to group around an axis or factor; so, indices with a negative correlation cannot make a group with the indices form another factor. Thus, our factors are extracted from the correlation matrix. In this research, we studied the effective factors on rural housing retrofitting with seven initial items, and reduced these indices

to two factors by the "Varimax" rotation method. The sum of four factors cover 78.289 percent of the variance. Thiswas presented combined with significant factors and the percentage of each factor was determined in housing status. In this calculation, all values less than 0.5, which are coded in Matrix F, were omitted. Since the special value of the standardized variance is a mean of 0 and a standard deviation of 1, if the variance of a standardized index which leads to extract the main components equals 1, it is a component with a special value less than 1 which its significance is less than the observed index. Therefore, we can neglect it. Thus, we omitted all factors with a special value less than 1.

Since the results of the KMO test are more than 0.5 (Table 16) and the significance level (0.00) with the probability of over 99 percent supports that there is a correlation between variables, this matrix is appropriate for the next analyses.

Factors Naming- As seen in Table 17, the result of factor analysis was reducing of the seven initial variables to 2 superior factors by Varimax rotation. The variance of 78.289 percent shows that the results of factor analysis are satisfactory and this matrix is appropriate for the next analyses. Regarding the extent of correlation of each index, we can select appropriate names for them.

The first factor- The special value of this factor is 4.5, which can calculate and determine 57.45 percent of the variance. In this factor, four variables were coded which have the most effect between the two factors: the extent of satisfaction with the new pattern of housing architecture, the extent of familis' feeling of safety against natural events, the extent of satisfaction with the location of the house, and the extent of satisfaction with the area and number of rooms. Grouping of these variables in one factor shows a high correlation between them. Therefore, based on the grouped variables, we can name this factor "satisfaction with rural housing" (Table 18).

Table 14. Relation between age and housing retrofitting

Explanation	Age	Retrofitting
Pearson correlation	1	-0.050
Significance level Age	0	0.252
Number	186	186
Pearson correlation Retrofitting	-0.050	1
Significance level	0.252	0
Number	186	186

Source: Research Findings, 2019

Table 15. Relation between education and housing retrofitting

Explanation	Education	Retrofitting
Pearson correlation Education	1	0.129
Significance level	0	0.085
Number	186	186
Pearson correlation Retrofitting	0.129	1
Significance level	0.085	0
Number	186	186

Source: Research Findings, 2019

Table 16. KMO and Bartlett Tests

Bartlett Test	KMO	0.627
	Chi-square	481.659
	Degree of freedom	45
	Significance	0.000

Source: Research Findings, 2019

Table 17. The final extracted factors and related values

Factor	Special value	Variance percentage	Collective variance percentage
1	4.596	57.455	57.455
2	1.667	20.835	78.289

Source: Research Findings, 2019

JSRD

Table 18. The coded indices in the first factor

	Index	Correlation	Factor's Name
1	The extent of satisfaction with the new pattern of housing architecture	0.815	Satisfaction with Rural Housing
2	The extent of families' feeling of safety against natural events	0.724	
3	The extent of satisfaction with the location of the house	0.712	
4	The extent of satisfaction with the area and number of rooms	0.689	

Source: Research Findings, 2019

JSRD

The second factor- According to Table 19, the special value of this factor is 1.66 which can calculate 20.83 percent of variance. In this factor, three variables were coded: the extent of education in order to promote villagers' technical knowledge about building the house, the extent of focusing on the bed and kind of soil at the time of building, and the extent of supervisors' control over building the new houses or renovating the old ones. Based on the coded variables, we can name this factor "housing stability".

5. Discussion

One of the most important rural needs is rural housing. Rural housing procurement is usually one of the important elements of different development plans. Housing as a necessary need and one of the major elements of skeletal context of houses has a main role in forming rural spatial structure and the most important criterion for satisfaction with housing relates to its stability. Given the instability of the country's' geographical scene in terms of earthquakes, rural homes are more vulnerable to earthquakes due to some reasons such as non-observance of technical regulations, use of traditional building materials and instability of houses. In recent years, rural housing loan policy has been done and the government has tried to support rural housing renovation by paying housing loans. In other words, rural housing retrofitting is a strategy for reducing human casualties and economic damages in rural regions.

Table 19. The coded variables in the second factor

	Index	Correlation	Factor's Name
1	The extent of education in order to promote villagers' technical knowledge about building the house	0.683	Housing Stability
2	The extent of focusing on the bed and kind of soil at the time of building	0.632	
3	The extent of supervisors' control over building the new houses or renovating the old ones	0.626	

Source: Research Findings, 2019

JSRD

Figure 2. Examining the effects of factors on rural housing retrofitting with the percentage of each factor

JSRD

Thus, we examined the effective factors on villagers' tendency to rural housing retrofitting in Simekan District, Jahrom County, and the following results were obtained:

We factorized the research variables by using SPSS software and a developed statistical method, factor analysis. In the present research, we studied the effective factors on rural housing retrofitting with seven initial items, and reduced these indices to two factors by the "Varimax rotation" method.

The sum of two factors covers 78.23 percent of the variance. It was also found that the first factor (satisfaction with rural housing) accounts for 57.45 percent of the variance and the second factor (housing stability) accounts for 20.84 percent of the variance. It was also found that the most important reason for retrofitting rural housing is the use of rural housing facilities (67%), while safety against natural disasters such as floods and earthquakes (33%) is another reason for retrofitting housing. Therefore, the main hypothesis is supported. According to the results of hypothesis testing, Pearson correlation coefficient, variance testing and significance value which is more than 0.05, there is no significant difference between independent variables (gender, age, education) and housing retrofitting.

The results of this paper support the results of previous studies, including Anabestani et.al. (2012), Rahmani Fazli and Kavyani (2009), Karimi Azar and Shamsi Yousefi (2009), Motiee Langerudi and Bakhshi (2010) and Azimi et.al. (2014). In addition, the results are consistent with the results of the studies conducted by Mohammadi Yeganeh et al. (2017), Rabet et al. (2017) and Riahi et al. (2016).

Reducing the problems and impediments for loan applicants, especially economic and financial problems and reducing installments for all villagers, supporting and encouraging the companies responsible for providing and distributing building materials in rural regions, finding the correct location for renovation and adapting materials to the environment, developing infrastructure, developmental foundations, providing services and facilities and reducing poverty in rural areas, detailed explanation of technical regulations for villagers, and focusing on qualitative objectives of retrofitting plans are some strategies for retrofitting rural housing.

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Conflict of Interest

The authors declared no conflicts of interest.

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