A Comparative Study of the Level of Residential Satisfaction of Residential Complexes with Post Occupancy Evaluation Dimensions (A Case study: Shiraz)*

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Abstract
The performance of the building has been noticed in recent years, especially in the field of residential buildings. However, it is obvious that the evaluation systems are only in the design stage, and there is no important indicator to evaluate the real performance of the building quantitatively and qualitatively. Therefore, post-occupancy evaluation (POE) is an essential tool to measure whether buildings are designed to meet the needs of residents or not. Becasuse of this importance, the current study looks at which short-term, medium-term, and long-term residential complexes have the most satisfied residents based on POE components. Then, it looks at the overall satisfaction level of residential complexes with POE components. Additionally, it discusses which aspect of the POE is most significant to residents after residing in each of the time groups of residential complexes. This research is a variable-oriented comparative study. The size of the study sample in this research is 379 residents and the statistical population of the study was selected using the random cluster sampling method. The statistical method used in this research are regression model and confirmatory factor analysis. The result of the analysis showed that the overall satisfaction of all residents is equal to 0.41, which is equivalent to 41%. Also, the findings of the research indicate that the residents of short-term residential complexes have a higher level of residential satisfaction compared to long-term residential complexes. Meanwhile, the residential satisfaction of the residents of medium-term residential complexes was lower compared to the residents of long-term residential complexes. In other words, the residents of medium-term residential complexes had the lowest level of satisfaction compared to the two short-term and long-term groups.

Keywords: *Residential Satisfaction, Post Occupancy Evaluation, Residential Complexes, Shiraz, Regression Model*

1. Introduction

Over the past decades, excessive growth of urbanization along with the formation of novel scales of cities [1] with residential complexes have encountered the phenomenon of urbanization with new challenges such as residential dissatisfaction. Meanwhile, housing as a platform for the human's life is related to and interacts with other aspects of his life. Each residential area should provide a unique environment for the residents by taking into account different family and cultural structures, different spatial and social needs, as well as spatial and social characteristics. Due to Iran's rising housing needs since the second part of the 1990s, numerous initiatives have been taken to meet these needs. However, what is

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generally overlooked is measuring satisfaction in terms of the quality of the building along with their quantity. In other words, some of the constructions were carried out without taking into account the socio-cultural conditions of the community or the requirements of the local indigenous population, which has led to dissatisfaction among the residents. Residential satisfaction, however, has been utilized as one of the fundamental components of quality of life in recent decades and has been used as a technique on a case-by-case basis to assess residential projects [2]. While in order to achieve socially sustainable growth, assessing residents' satisfaction is a crucial quality of life (QoL) measure [3].

Post-occupancy evaluation (POE) is one of the tools used to gauge residents' satisfaction. It was originated in the UK in the 1960s by social scientists, architects, and planners. Then, it was expanded to a number of developed nations, including the United States, Australia, New Zealand, and others [4,7]. Significant advancements in POE theory, methods, strategies, and applications by the 1980s served as the foundation for in-depth research into a variety of buildings [7,8]. POE is both a research study and professional practice analyze the functional, behavioral, and technical performance of buildings [9]. This involves systematically and rigorously evaluating buildings after they have been constructed and occupied for a while.

Although previous studies have given Iranian researchers valuable insights into the study of residential satisfaction and POE, they have not thoroughly investigated this topic in the context of Iran. Hence, there are three reasons why evaluating the level of residential satisfaction in a residential complex in this study is crucial. It first aids in researchers' comprehension of the elements that influence residents' dissatisfaction with their living conditions. Second, it enhances the planning and administration of housing developments and provides information for housing policies. Additionally, knowing how satisfied inhabitants are with their living conditions might aid researchers in identifying problem areas and formulating solutions. Therefore, due to this importance, the present study will do a comparative study of the satisfaction level of residential complexes in three time periods in order to be able to find more comprehensive

findings than other studies that have generally dealt with this measure.

For this purpose, the city of Shiraz was chosen as the study site of this study. The reason for this choice is that the city of Shiraz is one of the few cities in Iran that has experienced tremendous expansion in a short period of time and has become one of the mother cities of Iran, however, considering that the physical development of this city is always faced with obstacles. For example, a) elevations, b) underground water problems, and c) destruction of gardens and farms, two solutions have always been considered for development. The first solution is the construction of residential complexes, which have become very popular in recent years, and every year a large number of single family houses and gardens were destroyed to build residential complexes. On the other hand, because urban development takes place only in exchange for the destruction of the best agricultural lands, the establishment of new cities and towns such as Golestan and Sadra has been placed on the agenda of the government as a solution to the aforementioned problems [10]. Considering these things, this city was chosen as a great case study for the present study.

Consequently, in order to fill this knowledge gap, the present study first examines the overall satisfaction level of the residents of residential complexes with POE components. Then, it examines that in the three time groups of short-term, medium-term and long-term residential complexes, whose residents have the highest level of residential satisfaction. In addition, it addresses which component of the post-occupancy evaluation after living in each of the time groups of residential complexes is the most important for the residents. In order to give residents of residential complexes a fulfilling existence, this study aims to develop significant practical implications for architects. These implications will help architects discover significant characteristics of POE by residents and apply them in the design of residential complexes.

2. Literature Review
2.1. Post Occupancy Evaluation and Its Dimensions
For more than three decades, post-occupancy evaluation (POE) has been a topic in the world of professional architecture. Informally assessing a building's performance from a

historical perspective allows for the application of the lessons discovered to following building cycles for structures that are similar to the one being evaluated [5]. While such informal and subjective assessments of the built environment have been made in the past, systematic assessments that use the performance criteria that are expressly specified and to which the performance measurements of the buildings are compared are a recent research trend [17].

POE is a broad technique for gathering input from a building in use. As a result, there is no one definition for this phrase, and academics have utilized a variety of notions to characterize it. According to a group of researchers, it is a process of routinely assessing buildings after they have been built and occupied, with a focus on factors like health, safety, and security as well as functionalism and efficiency, psychological comfort, and the aesthetic quality of the structure [5]. Another definition of POE states that it is an assessment of a building's effectiveness, performance, and expectations based on the preferences, experiences, and expectations of its users [18]. Sanoff [19], on the other hand, views POE as a procedure that can be applied to any environment with facilities of any scale. However, it also pursues a promotional purpose, taking into account the growing sensitivity and understanding of society toward creating an artificial environment, in addition to satisfying the needs of the employers.

In fact, POE is distinct from previous building evaluations in four respects and focuses on evaluation while residing in a building. The first goal is to assess the building's effectiveness from the perspective of the residents. Second, a criterion for evaluation that was created using well-known design criteria is employed. Third, if the created environment improves performance and the comprehension and satisfaction of inhabitants are its primary criteria. The fourth is whether post-occupancy evaluation may take into account numerous elements that have an impact on how well the environment functions as well as the satisfaction of residents in light of their psychological and social demands [5,6]. Four dimensions can be given to the research on POE evaluation in the fields of architecture and especially housing: the indoor environment dimension, the social dimension, the functional dimension, and aesthetic one. Residents of the building are a rich source of information about the quality of the indoor environment and its impact on comfort and efficiency [20]. A large number of research studies have evaluated responses to the dimension of the indoor environment; they have focused on such components as the natural and artificial lightning quality, thermal comfort and air quality, as well as acoustic features [16].

The first dimension of POE is called indoor environment which is involved several components. The natural and artificial lighting that is present in each of the places are referred to as lighting [21]. Thermal comfort, on the other hand, is simply a mental response where one is content with the thermal environment. Even though this component may be somewhat influenced by other environmental and cultural influences, the sensation of thermal comfort is essentially the result of the exchange of body heat with the surroundings [13]. In addition, air quality refers to the indoor air quality of the living environment to which occupants are regularly exposed [16]. Finally, it can be said that acoustics is a significant component of residential complexes. In this respect, noise is perhaps the most frequent source of irritation that might make residents more stressed. In every instance, it has been believed that locals can judge the environments' adequacy or habitability of their surroundings based on high set standards.

Additionally, a significant amount of research has concentrated on evaluating the functional dimension using the user's functional quality assessment; this includes spatial layout, the placement of rooms, the amount of space, accessibility, construction quality, as well as the placement of windows. The functional dimension's components can provide a connection between occupant activities and the built/physical environment [17]. In this dimension, spatial layout in this dimension refers to the physical space's arrangement in a way that influences occupants' behavior and satisfaction while also boosting productivity. Room location describes where a certain workspace or living space is located [22]. The availability and sufficiency of space in relation to the building's size, on the other hand, refers to the amount of space so that they can work together to offer inhabitants the greatest services. Access also includes homeowners' capacity to go freely and without any barriers from the parking lot to their residence [23]. Additionally, the placement of the window

reveal if an exterior window is present in each room and how it influences the tenants' productivity and mood [16]. Last but not least, the quality of construction refers to how residents view the quality of their residential building [4].

Numerous studies have been conducted in the housing setting with the aim of analyzing the social dimension by focusing on elements like the simplicity of neighbor interaction and visual and audio privacy. In fact, according to Shahriari et al. [10], social indicators show how well a residential structure has tended to the social needs of its occupants. In earlier investigations, this factor was divided into three components. First, "ease of interaction with neighbors" refers to a design feature that enables a building's inhabitants to engage with one another in a way that allows them to benefit from one another without causing any disruption [11]. According to Jacob and Chander [2], visual privacy also refers to a resident's ability to feel as though they have enough personal space to be alone without feeling crowded or lonely. The topic of how effectively a residential unit creates sound privacy is finally addressed by audio privacy. Naturally, it appears that in residential buildings, visual privacy is more significant than sound privacy [12].

Examining the structure from an aesthetic standpoint is another useful component of evaluations. Some researchers from a different group, however, think that this characteristic is related to interior environments and functional aspects. This dimension has been taken into account as a separate one and more thoroughly looked at in the investigations conducted by Hong et al. [13] and Ikediashi et al. [14]. Three aesthetic elements are evaluated from the standpoint of the researchers. One is the building's facade, which describes how a structure appears lovely to occupants when they first see it. Beauty, however, is a relative term that differs from place to place and depends on culture and geographical location. Additionally, fixed furniture describes the standard of build, style, appearance, and general feeling of the furniture in a residential unit's common areas, such as the lobby. The existence of green space in various forms, such as yards, terraces, and green roofs, has been recognized as the green space factor in numerous research that have examined this topic. According to these research, this aspect may increase residents' productivity by fostering a sense of psychological comfort among them [15]. Figure 1 shows the dimensions and sub-components identified in POE articles by other researchers.
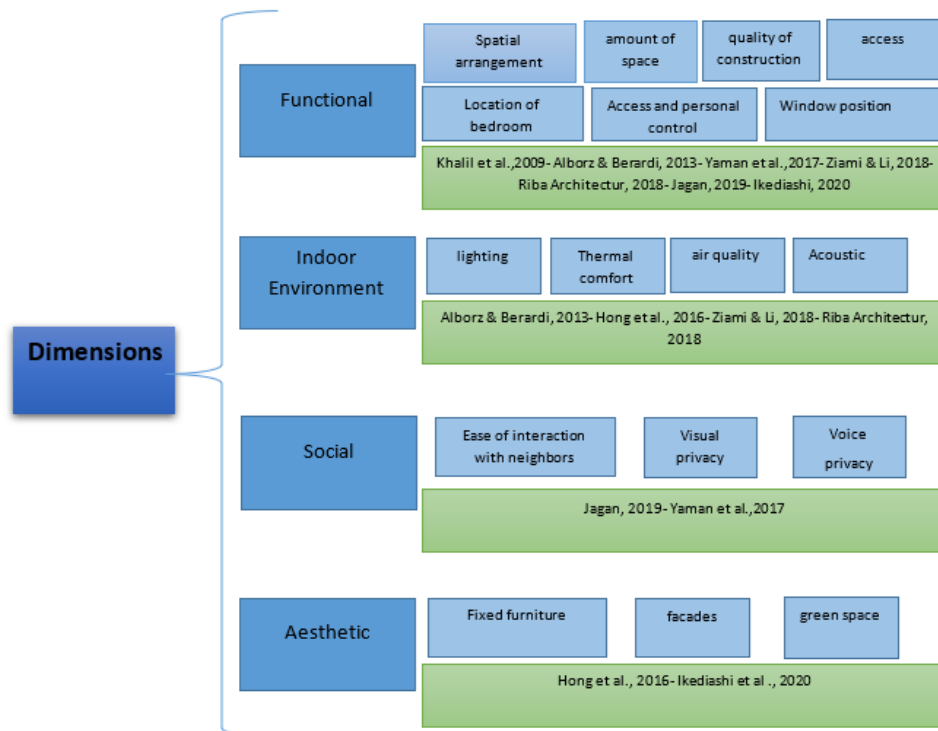

Figure 1. The dimensions and sub-components of POE

2.1. Residential Satisfaction

The topic of residential satisfaction, which has been shown to be a component of the scope of life satisfaction [24], is one of the most researched themes in the field of residential environment. a person's or a family member's level of contentment with their current living situation is the same as their level of satisfaction with the residential environment. Residential satisfaction studies have been conducted for a variety of purposes, including determining the success or failure of housing projects [25], determining the needs and preferences of users [26], and acting as a gauge of life quality [27]. housing satisfaction is the perceived discrepancy between a respondent's requirements and aspirations and the actuality of their current living situation. According to Ibem et al. [26], housing satisfaction is also taken into account as a result of the gap between users' expectations and the built environment's actual performance.

Since each person's perception of satisfaction in various personal, social, economic, physical, and cultural circumstances varies, there is actually no consensus on how to evaluate the satisfaction of residents and users [28, 29]. Researchers have looked at the meaning of this phrase using two main approaches as a consequence of investigations done in recent decades. Residential satisfaction is linked to people's behavior and has a greater mental component, which some research have believed to be a predictor of behavioral. In these studies, it has been postulated that residents' behavior in making modifications or opting to move is influenced by their level of residential satisfaction. Yet another set of research have considered it as a gauge of life quality by focusing more on the physical components of it. According to studies that looked at residential satisfaction using this approach, the characteristics, services, and facilities offered by the neighborhood and residential environment can play a significant role in determining how satisfied a person is with their current living situation The second approach is taken into consideration in the current study, which views satisfaction as a gauge of life quality.

3. Case Study

Our study data were collected from the residents of some residential complexes located in Shiraz city, Fars province, Iran. Shiraz is one of the few cities in Iran that has experienced a tremendous expansion in a short period of time and has become one of the metropolises of Iran. However, the physical development of this city is always faced with obstacles such as heights, groundwater problems and destruction of gardens and farms; this has been such that urban development has been done only at the expense of the destruction and degradation of the best agricultural land. Therefore, due to the large number of immigrants in this city, the construction of residential complexes has been considered as a solution to these problems since 1979 [10]. Currently, the city of Shiraz consists of eleven districts; in each of these, a significant number of residential complexes have been built over the past several decades. Figure 1 shows the location of them relative to the city of Shiraz.

Residents of a few residential complexes in Shiraz city, Fars province, Iran, provided the data for our study. Shiraz is one of the few Iranian cities to have grown significantly over a short period of time, making it one of the country's metropolises. As a result, urban development in this city has only been accomplished at the expense of the deterioration and destruction of the best agricultural land. Obstacles to urban development in this city have included heights, groundwater issues, and the destruction of gardens and farms. Building residential complexes has thus been deemed a solution to these issues since 1979 due to the high number of immigrants in this city Shiraz currently has eleven districts, and during the past few decades, a sizable number of residential complexes have been constructed in each of these. The location of them in relation to Shiraz is depicted in Figure 2.
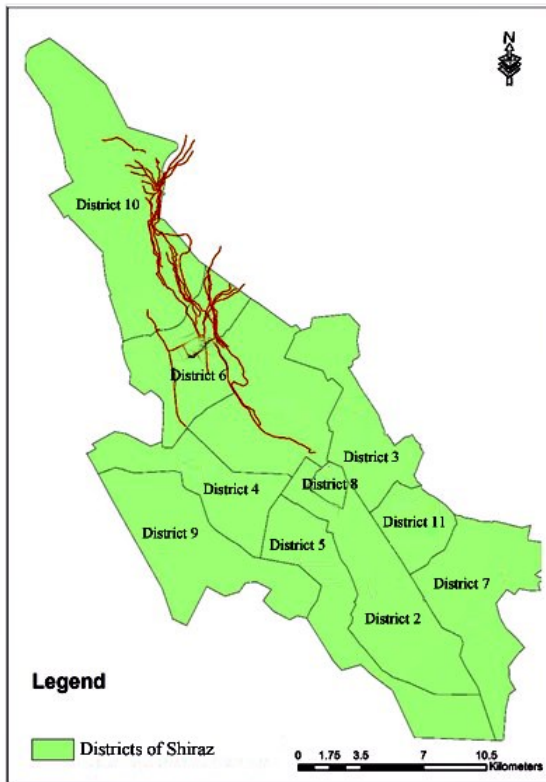
Fig. 2 Location of the study area

4. Methodology

In this study, a comparative study with a variable-oriented approach was used. In the variable-oriented approach, samples that have different nature and structure (quantitative-oriented variable) would be discussed. Also, in this approach, the researchers usually test their own hypotheses from the theory [30]. The statistical population under study includes the residents of residential complexes in Shiraz city, and due to the size of the statistical population, the random multistage cluster sampling method was used in this research. In the current research process, a multi-stage cluster sampling method has been used, which is similar to the cluster sampling method, but the difference with this method is that the unit of measurement is not an individual, but a group of people. There are those who formed naturally and formed their own group. Cluster sampling method is used when selecting a group of people is possible and easier than selecting people in a community. The basis of this method is that choosing the right sample size and number in each cluster is very important and the members of each cluster are close to each other in terms of characteristics and as a result tend to have similar characteristics [30]. Therefore, considering that

there are different residential complexes in 11 different districts of Shiraz city and it was very difficult to compile a comprehensive list of them. In her study, Hosseini [31] used three short-term, medium-term and long-term time frames to classify residential complexes complex. From her point of view, seven-year periods should be used to divide residential complexes into these three periods. In other words, if the year of construction of residential complexes is between 1 and 7, they are in the short term, if it is between 8 and 14 years, they are in the medium term, and 15 to 21 years are in the long term. Therefore, firstly, the residential complexes of Shiraz, which have a common feature, are identified in three categories or triple clusters based on the years of construction in three short-term, medium-term and long-term periods. This means that firstly, residential complexes were classified in three time frames: 1-7 years of construction, 8-14 years of construction, and 15-21 years of construction in the first stage. In the selection of residential complexes, care was taken to have a homogenous characteristic. Then, in the next step, they have been measured and analyzed by random cluster method. The basis of this method was that choosing the right sample size and number in each cluster is very important and the members of each cluster are close to each other in terms of characteristics and as a result tend to have similar characteristics. In this research, the three main clusters are the complexes built in three time periods. Therefore, this method can save time and money while providing the best statistical population. Residential complexes in Shiraz city were selected by multi-stage cluster method, 4 were in the age range of 1-7 years, 3 were in the age range of 8-14 and finally 4 residential complexes were in the age range of 15-21 years. In the selection of residential complexes, it was tried to select complexes that have common characteristics in terms of construction quality. In order to check the quality of construction of residential complexes, the checklist for checking the quality of construction of HEFCE study was used. This checklist has items that the researcher should give each item from one to six points. These items include materials, facade, renovation, movement in the building, checking the quality of walls, etc. The total score of this questionnaire is 48. Then, by adding up the total points in each building, the

quality of the building can be divided into three categories: weak, medium and high. This means that if a building got a score of 1-20, it has poor construction quality. Also, if a building scores 40-21 and 60-41, it had medium and high construction qualities, respectively [32]. In order to measure the quality of the construction, the researcher along with two experts in this field went to each of the buildings and while visiting the common space and at least one of

the units of the residential complex, they gave them points and finally by summing up the total points, we selected 11 complexes. Table 1 shows the clusters based on the region, the name of the residential complex and the number of received questionnaires from each residential complex.

Table 1. Research sampling

District	Residential Complex	Received Survey	District	Residential Complex	Received Survey
District 1	Mohandesin	38	District 7	BouAli	34
District 2	Shahid Doran	35	District 8	Astaneh	33
District 3	Silou	32	District 9	Ghazal	39
District 4	Amir Kabir	29	District 10	Afarinesh	38
District 5	Shahrdari	37	District 11	Maryam	29
District 6	EPS	35			

One of the most important things in any research is determining the minimum sample size required for the study. Based on the studies of Klein [33], in order to determine the sample size in statistical studies, the method of multiplying the number of questionnaire questions by a number of at least three and at most seven is announced, which is also used in this study [28]. For this purpose, the number of questions in the initial questionnaire was multiplied by the maximum threshold (seven) to avoid type 1 error [33]. Therefore, considering that the initial questionnaire has 46 items, the number was multiplied by seven and the number was 322 for the statistical population of this research. Because the researchers anticipated that some questionnaires would be incompletely completed, they distributed 40 questionnaires and a total of 440 in each of the eleven selected residential complexes. Finally, a total of 379 questionnaires were collected from the residents of all residential complexes and used by the researchers. The standard questionnaire created by Hosseini et al. [16] was used by the researchers to build the items addressing the POE aspects. This questionnaire has 13 items that analyze functional dimension, 16 that evaluate the indoor environment, 7 that address the aesthetic dimension, and then 6 that assess the social dimension. Additionally, Hesari et al.

[10] satisfaction survey questions in Farsi were employed to gauge residential satisfaction. A Likert scale with a five-point scale from 1 to 5 was used to rate the items; on this scale, 5 is considered "strongly agree," while 1 is considered "strongly disagree."

Reliability and validity of the questionnaire

Cronbach's alpha was used to determine the validity of the questionnaire. The reliability of the questionnaire is 0.933, considering that the quorum and acceptance base of the reliability coefficient is 0.813 (Sarmed et al., 1401), the achieved number of 0.933 is an acceptable coefficient that indicates the validity of the present research questionnaire. In the next step, the Kaiser-Meyer-Olkin (KMO) sampling adequacy test was used to determine the validity of the questionnaire [34]. Also, Bartlett's test was used to prove the existence of correlation between test materials. The value of KMO must always be between 0 and 1. If this value is less than 0.50, the data will not be suitable for factor analysis, and if its value is between 0.50 and 0.69, factor analysis can be done with more caution, but if this value is more than 0.70%, the existing correlation between the data will be suitable for analysis [34]. Finally, the KMO calculated in this research was equal to 0.769, which is an acceptable and suitable level. The results of KMO test and Bartlett's test are reported in Table 2.

Table 2. The results of the measures related to KMO and Bartlett's test

KMO	Chi-square, Bartlett's test of sphericity	Degree of freedom,	Level of significance
0.769	842,877	190	**0.99**

5. Results

Considering that the first goal of the research is to measure the level of satisfaction of residents of residential complexes in Shiraz with common attributes based on POE components, the regression method was used. In order to compare residential complexes, various physical components can be evaluated, but due to the lack of access to the plan and information of other residential complexes in Shiraz city, "year of construction" was considered as the evaluation criterion. This component has been used in other researches as a criterion component for the classification of residential complexes. Therefore, based on the seven-year period, the residential complexes were divided into three short-term (1-7 years), medium-term (8-14 years) and long-term (15-21 years) categories. Therefore, in the first place, in the selection of residential complexes, it was tried that all of them would be the same in terms of construction characteristics and have similar construction quality. In order to check the construction quality, after selecting the residential complexes, the researcher along with two experts visited each of the residential complexes and evaluated their construction quality using a checklist.

In the next step, STATA software was used to perform regression. The point in the regression analysis is that in the categories of residential complexes, one of the three short-term, medium-term and long-term categories should be considered as the control group. Hence, in the research data, the group of long-term residential complexes were considered as the control group in the statistical software and the analysis was done based on it. In choosing the control group, the noteworthy point is that the control group is removed by STATA from the regression table and the regression results of the other two groups are compared with the control group. Therefore, the regression model of the present study was defined as follows:

$$Y = a + b_1X_1 + b_2X_2 + b_3 X_3 + b_4 C_1 + b_5 C_2 + b_6 C_3 + b_7 C_4 + \varepsilon$$

Where:
- Y indicates the assessment after settlement
- X1 indicates satisfaction with short-term residential complexes
- X2 indicates satisfaction with medium-term residential complexes
- X3 indicates satisfaction with long-term residential complexes
- C1 indicates the gender of the respondent
- C2 indicates being the owner of the house
- C3 indicates the age of the respondent
- C4 indicates the marital status of the respondent

The purpose of this regression analysis is to determine the extent of satisfaction with the dimensions of POE in each type of residential complex. Table 3 describes the regression analysis of this study.

Table 3. Regression Analysis Based on the Construction Year Y= Post Occupancy Evaluation

Variable	Model 2
Residential Satisfaction Short term	**0.15*** (0.025)
Residential Satisfaction Midterm	**-0.13*** (0.017)
Age	**0.01*** (0.004)
Age-Squared	**-0.00**** (0.000)
Women	**-0.13*** (0.017)
Married	**-0.05*** (0.019)
Owner	**0.19*** (0.007)
Constant	**6.04*** (0.154)

Standard Error *** P<0.01; ** P<0.05

As shown in Table 3, residential satisfaction in long-term complexes was erased by the software as a control group. According to the data obtained from short-term residential complexes, it can be concluded that compared to long-term residential complexes, residents of the short-term residential complexes have more residential satisfaction after measuring POE components. According to the coefficient value of 0.15, this number represents that by considering age, gender, being married and being the owner of the residential unit as constant, on average, in short-term residential

complexes, the level of satisfaction of residents with the dimensions of POE is 15% higher than in long-term residential complexes. On the other hand, the findings indicate that in medium-term residential complexes, the level of residential satisfaction with POE dimensions is lower compared to long-term residential complexes. In other words, as seen in the Table 3, this coefficient was -0.13. This finding suggests that considering age, gender, married and being the owner of the residential unit as constant, on average, in medium-term residential complexes, the level of satisfaction of residents with the dimensions of POE is 13% lower than in long-term residential complexes. Also, as shown in the model in Table 3, according to the data obtained from the age as control variable, it can be generally stated that for every one-year increase in the age of the respondents, the level of satisfaction of the residents with the POE components increases by 0.01 units, holding all else constant. On the other hand, considering the gender as another control variable, it can be stated that compared to men, female respondents were less satisfied with POE components by 0.13 units, keeping all else constant. In addition, taking into account the property ownership as control variable, it can be stated that compared to tenant residents, the respondents who owned residential units have a 0.19 higher level of residents' satisfaction with POE components, holding all else constant. Finally, considering the married as control variable, it can be stated that compared to singles, the respondents who were married have a 0.05-unit lower level of satisfaction with the components of POE, holding all else constant.

In the next step, the second objective of the research was investigated, which was to measure the overall satisfaction level of residential complexes from the dimensions of POE. In the second goal of the research, it has been proposed that assessing the level of satisfaction of residents with the dimensions of POE in residential complexes in Shiraz. To analyze it, another regression model was investigated. In this model, due to the fact that residential complexes have fixed characteristics in terms of quality of construction, they were examined in general regardless of the year of their construction. The results are shown in Table 4.

Table 4. Assessing Overall Satisfaction of Residents Y= Post Occupancy Evaluation

Variable	Model 1
Residential Satisfaction	0.41*** (0.019)
Age	0.02*** (0.003)
Age-Squared	-0.00*** (0.000)
Women	-0.12*** (0.023)
Married	-0.16*** (0.018)
Owner	0.20*** (0.007)
Constant	8.16*** (0.079)

Standard Error *** P<0.01; ** P<0.05

As can be seen in Table 4, the overall level of satisfaction of the residents with the dimensions of POE in the residential complexes of Shiraz was measured. The findings indicate that the residents' satisfaction is equal to 0.41, which is equivalent to 41%. In other words, by considering age, gender, married people and ownership of the residential unit as constant, on average, the satisfaction level of the residents of Shiraz residential complexes was 41%. This finding is in line with the results of Şentop Dümen [35]. Also, as shown in the general model in Table 4, according to the data obtained from the control variables in the model, it can be analyzed that in the age as control variable, for each one-year increase in the age of the respondents, the level of satisfaction of the residents with the POE components increases by 0.02 units while keeping other variables constant. On the other hand, considering the gender as control variable, it can be stated that compared to men, female respondents have a 0.12-unit lower level of residents' satisfaction with POE components, with other variables held constant. In addition, taking into account the ownership of the apartment as another control variable, it can be stated that compared to tenants, the respondents who owned residential units have a 0.20-unit higher level of satisfaction with the components of POE, keeping other variables constant. Finally, considering the married as control variable, it can be stated that compared to singles, respondents who were married have a 0.16-unit lower level of residents' satisfaction with the components of POE, while holding other variables constant.

In the next stage, given that compared to long-term residential complexes, short-term residential complexes have more residential satisfaction after measuring POE components. On the other hand, considering that the findings indicate that in medium-term residential complexes, the level of residential satisfaction with POE dimensions is lower compared to long-term residential complexes, it was decided for the third goal of this research that each of the four components in each complex Residential buildings should be evaluated to determine which of the evaluation components will be more important for the residents according to the year of construction.

Table 5. Psychometric properties of the confirmatory factor model

Year of Construction	Dimensions			
	Functional	Indoor Environment	Aesthetic	Social
Short-term	0.788	0.717	**0.812**	0.725
Medium-term	**0.723**	0.654	0.661	0.676
Long-term	0.731	0.650	0.691	**0.759**

As is shown in Table 5, aesthetic component was identified as the most important factor among the residents of short-term complexes. Meanwhile, among the residents of medium-term and long-term complexes, functional and social factors were identified as the most important factors, respectively.

6. Findings

Buildings are built to meet the needs and desires of the residents. The purpose of a building is defeated if its occupants are not satisfied with the performance of the building. Therefore, it is very important to evaluate the building performance in residential complexes. In other words, residential complexes are designed and built to meet the specific needs of groups of people. Actually, the ability of a successful building to respond to the purpose for which it was designed. In this context, residential complexes are built to facilitate the quality of life. Therefore, evaluating the level of the satisfaction of the building can help the designers. By understanding how existing building performance affects occupants, designers can minimize problems in future projects and invest in successful design features that improve system performance. The present study examines three general objectives. First of all, the level of satisfaction of the residents of Shiraz residential complexes was investigated based on the time of construction.

In order to investigate this goal, multivariate regression method was used in Table 3 and 4. In this way, firstly, the residential complexes that had common characteristics in terms of construction period and construction quality were divided into three categories: short-term, medium-term and long-term. Then, the level of satisfaction in each one was checked and compared with each other. The results in Table 3 indicated that compared to long-term residential complexes, which were considered as the control group of the present study, residents of short-term residential complexes had 15% more residential satisfaction. However, compared to the control group, residents of medium-term residential complexes had 13% less residential satisfaction.

In addition, for the second goal of this research, in another regression model, all residential complexes were evaluated in a single group and the overall satisfaction was evaluated. The results in Table 4 indicated that the level of residential satisfaction of the residents is 41%, which is almost at an average level. This research showed that social, aesthetic, functional and indoor environment are the dimensions of design and constant evaluation of residents and designers and architects should not neglect it in the design, planning, and construction stages of residential buildings and they should always measure them systematically so that they can provide the basis for residents' satisfaction, because these factors can directly and indirectly affect the level of residential satisfaction of residents. Therefore, according to the results of this research, it is expected that paying attention to these dimensions and their systematic measurement can improve the design of future residential buildings and, as a result, increase the level of satisfaction of residents from the average to the high in the coming years. In fact, in the design of new residential complexes in Shiraz, by considering continuous feedbacks and paying attention to people's wishes and expectations by

using POE, mistakes can be avoided in future projects and successful design factors can be maintained in future projects [30]. This can, in turn, leads to providing the well-being and comfort of the residents in the long term. These findings create a platform so that the performance of the buildings can be continuously assessed by evaluating them after occupancy and provide greater satisfaction in residential complexes. Although Table 4 showed that the level of residential satisfaction is generally moderate, but it is worth mentioning that the level of satisfaction of people is strongly influenced by their individual characteristics and it can be argued that satisfaction with the residential environment is largely related to expectations. Also, the real experience of the residents of their living space is different, according to the differences of their various social and physical components in their current place of residence. In other words, the overall satisfaction level of residents of a residential complex should be high when they see that environment as supportive, reliable and friendly. On the other hand, the findings of the research indicate that the residents' satisfaction with their residential environment is also influenced by the physical factor of the residential environment (consisting of functional, aesthetic and indoor environment components). In fact, if the quality of the man-made environment is favorable, this can strongly influence the judgment of another group about the satisfaction of the residential environment. Therefore, although the overall satisfaction level of the residents of 11 residential complexes was obtained at an average rate of 41%, but determining the greater importance and evaluating each of these four components, social, indoor environment, aesthetic and functional is possible only by being in each of the residential complexes and observing the behavior of the residents and systematically evaluating their satisfaction after a period of their residence.

From this, in order to identify the level of satisfaction of each group (from the perspective of time), a factor analysis was conducted to determine the level of residential satisfaction of each of the short-term, medium-term and long-term wedges from which component of the POE is higher. As can be seen in Table 5, considering the year of construction, each of the four dimensions was investigated after occupancy. Among the residents of short-term

residential complexes, the aesthetic dimension had the highest factor load. Factors such as the features of the facade and green space of the residential complex, special features of the building such as cleanliness and transparent places have a great impact on the way residents feel satisfied in their evaluations in residential complexes in short time complexes. The reason for this finding can be because the presence of green space on the one hand makes a person more dependent on the residential environment. On the other hand, the cleanliness of the residential environment and the presence of furniture in lobby and a suitable facade of the residential buildings are more and more noticed by the residents of the newly constructed complexes. So far, different studies have shown that the same result that architectural aesthetic quality of today's buildings, such as space design and configuration, landscape architecture, general aesthetic appearance, furniture arrangement in a building is of great importance for residential satisfaction [36, 2]. These studies have shown that the spatial characteristics, sequence, location, relationships, shape, size and details of the spaces affect the behavior of the residents and can be the basis for the satisfaction of the residents as much as possible.

Among long-term residents, the social factor was identified as the strongest dimension. This finding is similar to one of the recently published researches by Ahmadi et al. [25], who suggested that during the long period of residence in an environment, social relations become more important in the satisfaction of the residential environment than physical factors. The reason for this can be that the provision of neighbors' social relations and ties, as well as social support and interactions, compensate for the any physical issues in residential complexes in the long term and are considered as a potential factor for residents' satisfaction. To clarify, people have an inherent need to establish social relations, and for this reason, they provide situations so that they can experience social relations. In fact, people form social relationships based on their interests and deal with them based on their expectations, norms and specific roles. Therefore, this factor can be the strongest and most positive variable in the level of satisfaction and dissatisfaction of residents with their residential environment in the long term [37]. This finding is consistent with the results of Habiba Islam's [38] study,

which examined the impact of social relationships as a component of residential satisfaction after settlement. This study reported that the ease of interactions with neighbors while enjoying many benefits can increase comfort for residents and provide them with more satisfaction. On the other hand, visual privacy, which is one of the factors of Iranian architecture among residents, is of great importance, this can be another reason for the importance of this factor in long-term residents. Finally, in medium-term buildings, the functional factor was identified as the most important factor by their residents. In fact, spatial arrangement is one of the important factors in space design, not only this factor provides more satisfaction to the residents for the placement of spaces in the residential unit, but also indirectly, the correct placement of spaces in the plan can provide human peace of mind. In fact, the spatial arrangement, the location of rooms and windows and the quality of construction are definitely considered in this study as an important potential for the residents, which can have a positive effect on their psychological and physical performance in life and ultimately their satisfaction. In other words, satisfaction with the spatial layout and location of each room and their lighting can keep people of different cultures and age groups in their residential complexes for a long time and increase their quality of life. This finding is similar to the results of Gupta and Chandiwala [39]. They suggested that residents of residential buildings over time evaluate the performance of the built environment with realistic views and/or feelings. In other words, due to living in buildings and experiencing and interacting with them, it will be much more realistic compared to the views of experts who design and build buildings and never use them [40]. These researchers proved that, therefore, the functional aspect can affect the loss of these residents and this will eventually increase the level of satisfaction of the residents, leading to a reduction in the costs of leaving the place for a better place due to the shortage and increasing the loyalty of the users [41]. Among the three construction periods, the factor of indoor environment among the residents of all three residential complexes was identified as the least important factor among other dimensions of the POE, including aesthetic, social and functional.

7. Conclusion

Although the discussion of POE in order to measure the satisfaction of residents after living in a residential complex is of great importance in all parts of the world and so far many studies have been conducted in many countries in this area, but unfortunately, a systematic and targeted research in the context of Iran so far It has not been done that it can be provided as a resource to the architects to pay attention to the satisfaction of the residents as much as possible. Therefore, the innovative aspect of the current research was to examine and compile the components of this important to improve the level of satisfaction of residents of residential complexes for the first time in Iran. Hence, the present study investigated three main objectives by using the statistical population of residents of short-term, medium-term and long-term residential complexes in Shiraz city. First, the overall level of satisfaction of the residents with the dimensions of POE in residential complexes of Shiraz was measured to determine the level of satisfaction of the residents. The result of the analysis showed that the satisfaction of the residents is equal to 0.41, equivalent to 41%, which is in an average level. Then, the level of satisfaction of the residents was investigated considering the year of construction. The results showed that compared to long-term residential complexes, residents of short-term residential complexes showed more residential satisfaction. Meanwhile, residents of medium-term residential complexes showed less residential satisfaction than long-term residential complexes. Also, among the four factors identified among the residents of all three residential complexes, aesthetic, functional and social factors were identified as the most important factors among three short-term, medium-term and long-term groups. These findings indicate that the residents' satisfaction with their residential environment is also influenced by the physical factor of the residential environment (consisting of functional, aesthetic and indoor environment components). In fact, if the quality of the built environment is favorable, this strongly affects the judgment of satisfaction with the residential environment. In other words, according to the findings of this research, the characteristics derived from the physical environment can be even more related to the level of satisfaction of the residents than the social component. However, it is possible to determine the greater

importance and evaluate each of these four social components, indoor environment, aesthetic and functionality only by being in the space, observing the behavior of the residents and systematically evaluating their satisfaction after a period of their residence. In general, this research showed that the social, aesthetic, functional and indoor environment dimensions were effective factors on the level of satisfaction of residents in all three time periods of residential complexes. Therefore, designers and architects should not neglect them in the design, planning, and construction stages of residential buildings, and they should always systematically evaluate them in order to provide a basis for residents' satisfaction, because these factors directly can affect the level of residential satisfaction of residents. But as the findings of this research showed, the impact of each of the components can be different in the time frame of the construction of residential complexes. Therefore, according to the results of this research, it is expected that paying attention to these components and their systematic measurement can improve the design of future residential buildings and, as a result, increase the level of satisfaction of residents from the average to the high in the coming years. In fact, in the design of new residential complexes, by taking into account continuous feedback and paying attention to people's wishes and expectations, by using POE, mistakes can be avoided in future projects and successful design factors can be maintained in future projects. It provided the well-being and comfort of the residents, especially in the medium-term residential areas, which had the lowest level of satisfaction among the three types, in the long term. These findings created a platform in the context of Iran and especially in the city of Shiraz, so that it can be remembered that the performance of buildings must be continuously measured with evaluation components after occupancy and as a result help to increase the level of residents' satisfaction more and more in the complexes.

Limitations and research implications

Although the current study offers authors and researchers a foundation, there were a number of drawbacks that had to be taken into account in subsequent research. There was no issue with social desirability because the researchers had no connection to the questionnaire respondents, therefore they made no changes to the outcomes. Consequently, the study's data were not contaminated. Nevertheless, despite the study's robustness and accuracy, there were some limitations that might have a big impact on how the results are interpreted. First off, the statistical population in the current study had a limitation that could be important in interpreting the results despite the robustness and correctness of the research methodology. 370 respondents made up the study's statistical population. Better findings from the model might be gained in upcoming experiments with an increase in the statistical population. As a result, it would be best to test this approach later on with a bigger sample size. Additionally, it is advised that this model be extended to other cities and larger complexes because the results may vary depending on the setting owing to cultural, racial, and socioeconomic differences. This could improve the current study's validity and generalizability. We advise researchers to carry out longitudinal studies to strengthen the POE dimension and include the environmental dimension as another crucial factor in establishing POE dimensions. Future research may also expand on this model to incorporate additional variables.

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