Review Paper

A Methodological Assessment of the Significance of diverse Variables in Housing Framework of Iranian and International Scientific Journals

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Abstract

Housing has always been studied due to its role in the daily lives of humans. This significant issue is a main subject of architectural research. Yet, each study investigates a limited number of factors effecting houses. The main aim of this study is to comprehensively investigate different subjects about housing determined by researchers and experts in Iran and other countries. Having an explicit list of important housing variables can help study the work in this scientific area to a high context and provide researchers with new ideas as well. Heading forward, 187 articles published in 15 Iranian scientific-research journals, along with 276 international papers from 15 Q1 and Q2 journals published in 2013-2017 were investigated. To find out the importance and ranking of each variable, this study, as a systematic literature review, implements Shannon's entropy method. This methodology is a weighting tool to indicate the amount of uncertainty and challenge of components in a continuous probability distribution. All the factors measured, described or presented are extracted from Iranian and international papers which were respectively 264 and 281 in number. Based on resemblance of the concepts, they were classified in different categories of environmental factors, architectural elements, geometry and proportions, fundamental concepts of architecture, standards and codes, psychological and social concepts. Among these categories, the tangible physical areas including environmental factors and standards and codes have been considered in international papers in a quantitative perspective which should be further explored in Iranian studies. In contrast, qualitative and intangible factors such as the fundamental concepts of architecture and psychological and social concepts, which include variables that require more time to be understood, have been more challenged in Iranian articles. With the use of SPSS and 0.771 Cohen Kappa agreement coefficient and Shannon Entropy tool, in Iranian studies, the components of privacy, culture, area, lifestyle, mental and emotional comfort, satisfaction, security, identity, territory and meaning have been more important, attracted the highest attention, and can be recommended to be addressed in international papers. Whereas, light, ventilation, sustainability, climate, sunlight, temperature, green space, energy consumption, thermal comfort and wind are the most debated factors in international journals and can be focused more in Iranian articles.

Keywords: Housing variables, Dwelling, Systematic review.

1. INTRODUCTION

The subject of housing in architecture is one of the issues that has always been considered qualitatively and quantitatively in various studies due to its close association with daily lives of humans. Iran is a country with thousands of years of civilization having residential buildings from different historical periods as unique examples of human residence meeting the needs of their inhabitants at different levels [1]. These buildings have been investigated from different perspectives and researchers have been trying to discover the principles hidden within them from different viewpoints. On the one hand, today's housing construction has been accelerated by the use of technology, and although the quantity is increasing, human needs have been less widely considered

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in these new houses [2]. With regard to this, there has been much research to find the shortcomings of contemporary housing and the ways to compensate for it. Along with these studies in Iran, housing has been studied in other countries.

This study tries to compare the differences in the perception towards housing in Iran and other countries; explore the weaknesses and strengths of each perspective and analyse them to find the gaps in housing research in Iran and other countries. Various components and variables have been studied in the field of housing in recent years. Some of these components have been challenged while the others have been ignored to some extent. But in general, each study has taken a specific approach to housing and considered one or more variables and their relationships. The comparison of components to find their significance is one of the issues that have not been dealt with in housing studies.

Various sources such as books, journals, etc. may have addressed a number of variables, but the best way to fully comprehend a subject is through evidence-based study and archival analysis of information [3]. However, due to the increasing speed of publications in the present day, it is not possible to review the articles in all fields on a particular subject, such as housing, which is itself a widespread subject [4]. To satisfy this need and also recognize the importance of housing subsection values, "review articles" are considered an implement to evaluate the latest scientific evidence. They are in fact a review of the studies published on a particular subject and show how much progress has been made in recent years on that specific subject [5]. There are different categories of review articles. From a methodological point of view, these articles are written in three ways: narrative, evidence-based and systematic [6].

Narrative review generally summarizes and quantitatively evaluates limited resources on a general topic. These studies are usually conducted with the aim of updating readers' information by reviewing new research in a specific field [4]. Evidence-based review is based on the study of the research methods and the results of a number of articles [6]. Systematic reviews and meta-analysis are articles that search for the sources through a structured search method, analyse the results, and have high value and credibility because of their reliability and repeatability [7]. This study is a systematic review article that reviews all the papers in the field of housing in all Iranian scientific-research journals as well as all articles in international journals on the issue of housing published in the last five years (2013-2017). Investigating the results of this article will lead to the organization of future research on housing by indicating a clear research direction. Comparing Iranian articles with international studies, the points that have been forgotten in the field of housing in each of the two statistical populations will be discovered. On the one hand, comparing the traditional and contemporary Iranian housing will make it possible to discover the weaknesses of the contemporary housing, and, by modelling the strengths of the traditional housing, take a step towards eliminating the weaknesses and improving the condition of today's houses.

2. STUDY QUESTIONS

Based on the points mentioned above, this paper answers three questions:

What factors have international articles considered in the field of housing?

How challenging are the variables of housing in Iran's scientific publications?

How different is the perspective on housing in Iranian studies and international research?

3. METHODOLOGY

Based on the list of prestigious scientific journals published by the Research and Technology Deputy of the Ministry of Science, Research and Technology of Iran, 16 scientific-research journals in the field of architecture are being published in Iran: Bagh-e Nazar, Islamic Architectural Researches, Soffeh, Urban Management, Maremat & Memari-e Iran, Journal of Housing and Rural Environment, Journal of Studies on Iranian-Islamic City, Urban Studies, Iranian Architectural Studies, Architecture and Urbanism, Armanshahr Architecture & Urban Development, Iranian Architecture and Urbanism, Journal of Architecture and Urban Planning, Naghsh-e Jahan, Hoviatshahr, and International Journal of Architectural Engineering and Urban Planning [8]. In this study, all these journals are reviewed as the first statistical population. Among the above journals, "Iranian Architectural Studies" had not published any papers on housing and was thus excluded from the statistical population. Non-probability sampling was used to specify papers. To reach a more reliable conclusion, all the articles published in other 15 journals from 2013 to 2017 in the field of housing were comprehensively considered as the statistical sample. They were selected exerting judgemental sampling based on the usage of any words related to "housing" in the titles, abstracts and keywords of papers. It should be noted that the number of reviewed articles, i.e. the sample size, was 187.

In order to compare the issues of housing in Iran and other countries, 15 international journals should be considered as the second statistical population. The international publications are very extensive. Therefore, we referred to the Scientific Journal Ranking (SJR) system to limit the number of journals (Figure 1). SJR is a public-access portal in which the journals are ranked based on articles published. Journals' ranking was observed in the subject area of engineering and the category of architecture in all regions and countries in 2017.

Among the publications, the first 15 cases that had published at least one paper on housing and, on this basis, had had research activities in the field of housing, were selected as the second statistical population, named respectively Journal of Building Performance Simulation, Architectural Science Review, Journal of Building Engineering, Construction Innovation, International

Journal of Architectural Heritage, Facilities, Frontiers of Architectural Research, Architectural Engineering and Design Management, Co Design, International Journal of Low Carbon Technologies, Journal of Asian Architecture and Building Engineering, Journal of Architectural Engineering, Journal of Civil, Architectural and Environmental Engineering, Architectural Design and Spatium. Using the same sampling method previously mentioned, all the articles which referred to "housing" in titles, abstracts and keywords in these journals published in the five years period from 2013 to 2017 were added to the second statistical sample of the study with a size of 276. This makes the total of 463 Iranian and International articles.

Content analysis was used to review the value of the data from these articles. Content analysis is a method to study and investigate communications in a systematic, objective and quantitative manner with the aim of measuring variables [9]. As a method, content analysis is unique because it involves both quantitative and qualitative methodologies and can be used in deductive and inductive methods [10]. This method is applicable to three areas of research. Firstly, when the required data is limited to documentary evidence and there is only direct access to the subject matter, researchers can gather information through content analysis. Also, if the aim is to find recurring criteria, values and subjects at a certain time, and some reasons like the impact of continuous mutual interaction between the analyst and the subject matter on the nature of the responses are substantial, content analysis will be a useful way to collect data. In the third area, this method can be a suitable tool for completing the data, so that researchers can study the results of the data collected in various ways such as questionnaires or interviews by comparing them through the content analysis of studied sources [11]. In this research, content analysis is used to collect, analyse and evaluate data obtained from articles in the field of housing.

Entropy, as an essential concept in physical science, social science and systems, was used in the second part of the study. Entropy as a weighting method represents the level of uncertainty resulting from the content of a message. It can show the randomness of attributes [12]. The greater the measure of entropy corresponding to an attribute, the smaller the attribute weight. In other words,

in information theory, entropy is an index for measuring uncertainty expressed through a probability distribution [13]. In this research, the entropy statistical tool based on the systems theory is used to analyse the content of the data and process the results. It is also known as Shannon's entropy which provides a new perspective based on which data analysis will be far stronger and reliable. In this tool, entropy is an index for measuring uncertainty, which is described by a probability distribution. The extracted and studied components are counted in terms of frequency and put into a matrix [14]. In the first step, based on the data in frequency tables, the decision matrix would be normalized using the equation below, Where, X_{ij} denotes the measure assigned to a value in an alternative, P_{ij} is a normalized measure of X, "i" the number of value and "j" the number of each alternative.

$$P_{ij} = \frac{X_{ij}}{\sum j = 1m X_{ij}}, J = 1, \ldots, m, \; i = 1, \ldots, n$$

In the next step, entropy of each value is calculated using the equation below, where hi denotes the entropy of a given value and *ho* is entropy constant. If P_{ij} is equal to 0, then ln P_{ij} can be set to 0.

$$h_i = -h_0 \sum_{j=1}^{m} P_{ij}.\ln P_{ij}, \; i = 1, \ldots, n, \; h_0 = (\ln m)^{-1}$$

In the third step, *di* that denotes the degree of diversification has to be calculated using the equation below:

$$d_i = 1 - h_i, \; i = 1, \ldots, n$$

To end, in the last step, *wi* as the weight of value, can be calculated using the equation below:

$$w_i = \frac{d_i}{\sum_{s=1}^{n} d_s}, \; i = 1, \ldots, n$$

At last, a chart can be made out of the frequency of each component and their calculated significance. The conclusion derived from these calculations obtains the acceptability constant coefficient. The information load of each category is computed and the coefficient of significance of each category is considered. Each category with more information load is more significant [15].

Fig 1. Domain of studies in Iranian and International journals

4. DISCUSSION

As mentioned earlier, 16 scientific-research journals are being published in Iran in the field of architecture. Among these, 15 journals have addressed housing with at least one article. On the other hand, 15 international journals in the field of architecture which had published articles on housing were also selected using the SJR system. Initially, all articles in these journals published in the last five years (2013-2017) were investigated and categorized in terms of content. And the articles on housing or referring to housing were selected to be studied. In the mentioned period, a total of 187 articles were published in Iranian journals and 276 articles were published in international journals. As shown in Figure 2, the number of articles published in Persian grew over the past five years, reaching 52 articles in 2017 from 27 articles in 2013. This upward trend is also observed in international journals, except for a slight decline in 2015. In any case, international journals have always been more concerned with housing than Iranian journals.

Figure 3 shows the number of papers in the field of housing in each journal over the past 5 years. As outlined in the figure, in Iran, the Journal of Housing and Rural Environment, Hoviatshahr, Architecture and Urbanism, Bagh-e Nazar and Urban Management are the first five journals with most published articles in the field of housing in the last five years. The Journal of Asian Architecture and Building Engineering, Architectural Science Review, Frontiers of Architectural Research, Facilities, and Journal of Architectural Engineering are the 5 international journals with most published articles in the field of housing in the last five years. The most published articles in these journals are from Japan, the UK, Netherlands, and the US, respectively. All the 5 cases are Q1 journals. It is obvious that other journals in other areas of architecture have published more articles.

After recording the specifications of each article and its printing information, the key words that the authors themselves mentioned at the end of the abstract of the paper were extracted, and the entire text of the all articles was carefully read and the variables which were measured, addressed or referred to in each article were extracted. These components were directly written in the body of paper or were understood from the context of a specific sentence or paragraph derived by this paper's authors.

Also, some descriptions of the case study in each research are presented in the comments section. All components extracted from 187 Persian and 276 English articles were respectively 264 and 281. According to resemblance of the concept, meaning, function, etc. all the components were put together in different sectors. These categories then were named environmental factors, architectural elements, geometry and proportions, fundamental architectural concepts, standards, and psychological and social codes and concepts by authors based on their sub-components which are presented in Tables 1 and 2.

With regard to the studied variables, it is observed that psychological and social concepts, fundamental concepts of architecture and environmental factors with respectively 36.88, 25.03 and 13.84 percent include three quarters of subjects which are studied in Persian articles. Thus, these areas consist of the most important factors about Iranian houses. Geometry and proportions, architectural elements, and standards and codes have been challenged after the above variables (Figure 4). In contrast, in international papers, environmental factors, standards and codes, and psychological and social concepts with 85.46% have been more emphasized while geometry and proportions, architectural elements, and fundamental architectural concepts have been addressed almost equally after the first three variables (Figure 5). Iranian articles have been mostly concentrated on conceptual variables such as privacy, territory, unity, sign, and meaning, which are the fundamental perceptions in architecture, as well as factors such as satisfaction, adaptability, identity, place attachment, quality of life, lifestyle, and social relationships. (This part moved to conclusion via recommendation of editor). The most challenging topics in international papers are sustainability, energy saving, in particular cooling and heating, as well as construction and design regulations. In other words, due to statistics at hand, the global view puts more emphasis on sustainability and energy in houses whilst the main issue of Iranian studies seem to be around psychological variables of housing. Based on this comparison, energy related subjects are carried out in Iran. On the other hand, as houses are a place of people's living and tranquillity, and a purely quantitative view of housing pushes its architecture towards constructing a mechanical space. Therefore, the review of qualitative variables is also inadequate in international studies.
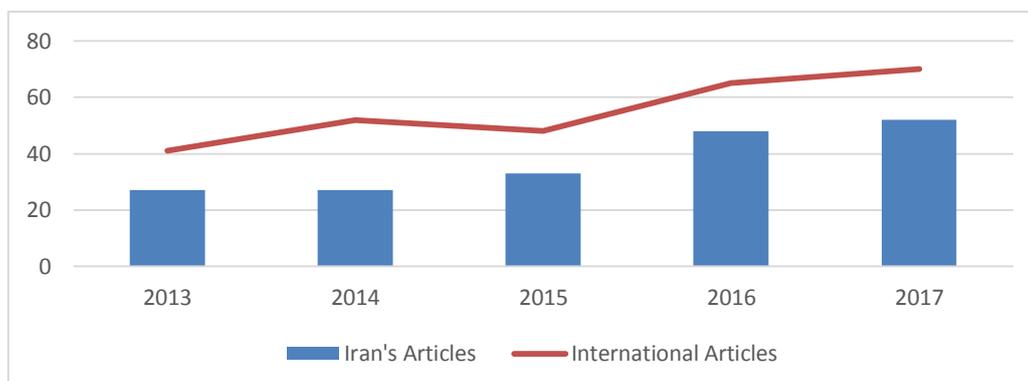

Fig 2. Publication of Iran and international articles in the last five years
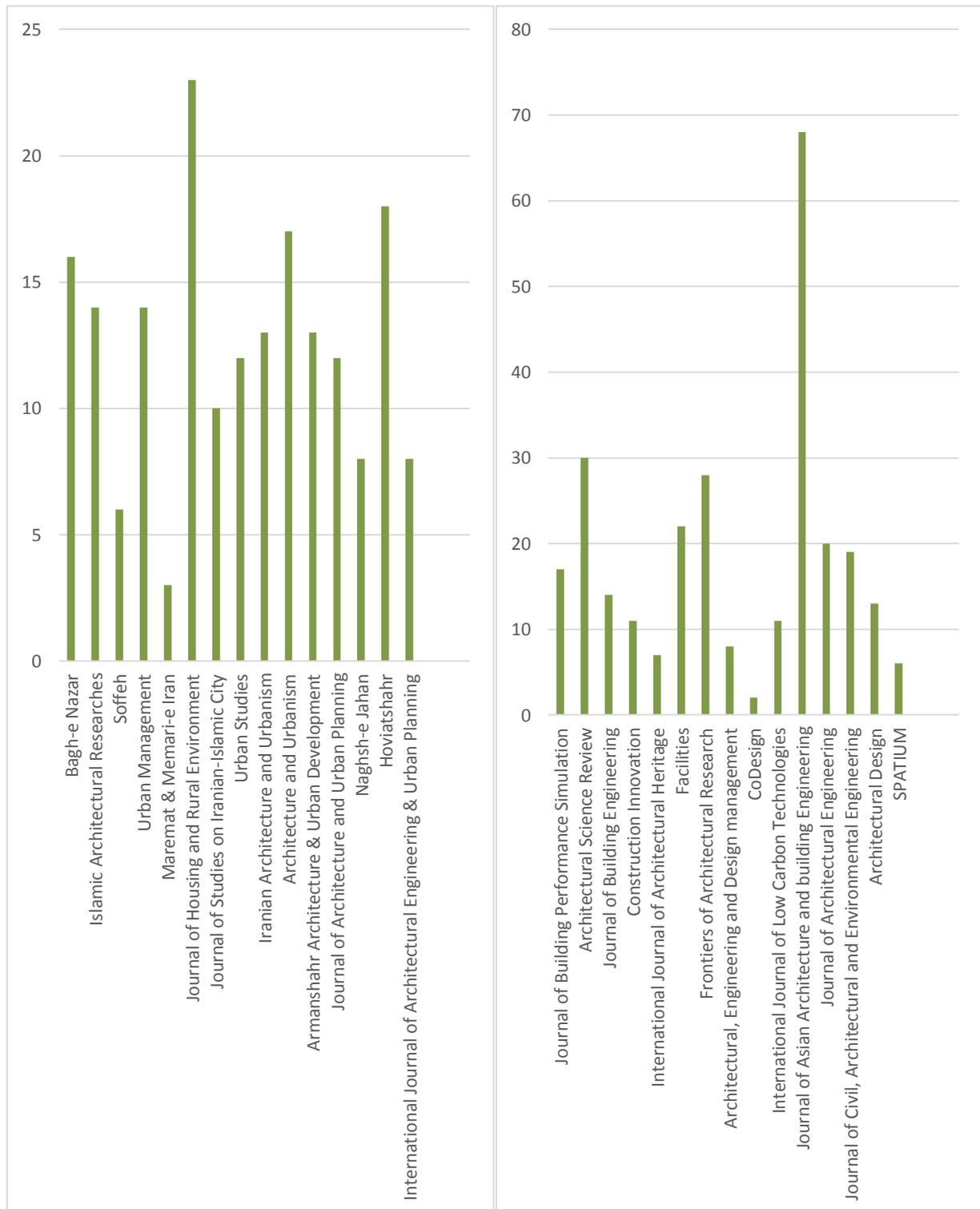
Fig 3. Reviewed Iran and international Journals and their publication in 2013-2017

Table 1. Variables in the field of housing in Iranian articles and their general areas

Areas studied in Iranian housing	Environmental factors	Climate, habitat, nature, plants, green space, trees, light, radiation angle, lighting, glare, air, ventilation, sky, landscape, aspect, perspective, vision, home orientation, orientation, position, space direction, location, energy efficiency, energy, thermal comfort, climate comfort, thermal performance, physical comfort, acoustic comfort, materials, local materials, technology, durability, strength, resistance, construct, structure, usage, neighborhood, surrounding environment, access, environmental coordination
	Architectural elements	open space, closed space, exterior space, interior space, intermediate and communication space, semi-private open space, guest space, distinct space, open and semi-open space interaction, court communication, spatial relationships, relationship between spaces, interconnection of spaces, joint space, courtyard, central courtyard, rooftop, louvre, wind tower, wind catcher, atrium, parlor, shading elements, porch, room, light well, window, terrace, bedchamber, furniture, solar chimney, chiasm, behavioral center, sash, sash window
	Geometry and proportions	Proportions, niyaresh[1] modulus, module, gaz[2], human scale, Iranian golden rectangle, geometry, dimensions, size, height, area, centrality, geometric composition, composition, spatial order, motion, symmetry, balance, principle of composition, proximity, weight, functional centrality, form, shape, decoration, color, skyline, detail, image, motif, statuesque building, hierarchy, spatial hierarchy, access hierarchy, access gradation, inviting quality, barrier, climate design, mass and space system, shape grammar, parametric grammar, spatial arrangement, spatial deployment, spatial distribution, space layout, space syntax, spatial separation, space organization, spatial opening, home functional model
	Fundamental concepts of architecture	Privacy, territory, nobility, visibility control, visual communication, visual space, transparency, visual field, visual compatibility, visual attraction, visual focus, visual diversity, visual comfort, visual effect, visual order, quietness, realm, territory, territoriality, personal space, personalization, security, psychological security, order, simplicity unity, reflection, centralism, differentiation, diversity, perfection, sign, meaning, symbol, code, allegory, thinking possibility, content, abstraction
	Standards and codes	Household density, surplus density, household size, per capita infrastructure, occupancy level, population density, construction density, housing density, infrastructure, housing capacity, building age, ownership, ownership type, multi-family housing, construction participation, crisis management, intelligent growth of the city, value added, municipality tax, housing prices, housing market, economic value, no damage rule, installations, facilities, public services, welfare, sound and noise insulation, safety, implementation manner, light working, manufacturing technology, continuity and durability
	Psychological and social concepts	Place attachment, the sense of place, the spirit of place, sense of belonging, attachment, feeling rooted, recollection, memorization, fixation, experience, self-expression, intimacy, satisfaction, compatibility, adaptability, readability, flexibility, permeability, place desirability, functionality, identity, spatial identity, Islamic identity, culture, introversion, simultaneous introversion and extroversion, quality of life, lifestyle, mental relaxation, psychological well-being, mental comfort, emotional assessment, mental health, modesty, aesthetics, spirituality, sacramental principles, humanism, avoidance of frivolity, self-sufficiency, social interaction, hospitality, family interaction, social interest, neighborhood relationships, social solidarity, liking people, collective feeling, family relationships, social respect and affirmation, socialization, interactivity, family orientation, creativity, vitality, efficiency

[1] Iranian golden proportion
[2] Iranian unit of measurement

Table 2. Variables in the field of housing in international articles and their general areas

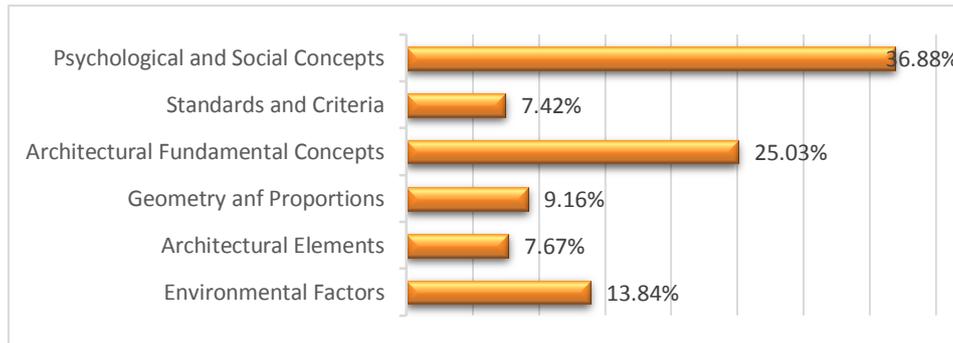|		
Areas studied in international housing	Environmental factors	Environmental factors, weather, soil, water, wind, rain, humidity, moisture, climate, geography, ecology, orientation, topography, nature, material, shading, lighting, ventilation, air quality, HVAC, indoor air quality, infiltration, cooling, airflow, air velocity, airtightness, air leakage, air conditioning, solar energy, day lighting, sunlight, thermal comfort, thermal performance, temperature, heating, sustainability, sustainable development, global warming, energy consumption, energy efficiency, energy reduction strategies, renewable energy, greenhouse gas, green building, low carbon buildings, zero energy building, photovoltaic panels, photovoltaic, electricity use
	Architectural elements	Elements, appliance, equipment, building façade, roof, balconies, window, window wall, courtyard, floor, furniture, garden, landscape, patio, skylight, building envelope, elevator, lift, utilities, space, open spaces, exterior space, shared outdoor space, communal space, Interior space, green outdoor space, public spaces
	Geometry and proportions	Size, dimension, measurement, height, area, density, extension, geometry, proportion, composition, form, rotation angle, typology, plan type, module, pattern, prototype, color, brightness, diffusion, usability, reliability, reproducibility, variability, accessibility, availabilities, room connectivity, connectivity, visibility, circulation, space syntax
	Fundamental concepts of architecture	Boundary, territory, privacy, place, security, safety, crime prevent, amenity, sense of home, place making, place attachment, aging in place, caregiving, locality, distance between building, habitability, perception, experience, comfort, signage, minimalism, phenomenology, openness, robustness, robustness, thingness, capacity
	Standards and codes	Sound level, acoustic insulation, insulation, noise, Indoor noise, acoustic performance, time use data, management, facility management, planning, production strategies, distributed control, assessment, optimization, decision making, monitoring, construction, standardization, automation, industrialization, technology, restoration, renovate, revitalization, conservation, renewal, production, prefabrication, costs, economics, performance evaluation, post occupancy evaluation, sensitivity evaluation, structure, structural performance, load matching, seismic vulnerability, building system, turbulence, earthquake engineering, earthquake damage, no engineered house, seismic design, seismicity, modelling, simulation, design, engineering design (AD), GIS, AHP, space spatial configuration, spatial configuration, coding system, traditional architecture, vernacular architecture, domestic building, indigenous buildings, archetype, modernity, apartment complex, apartment house, apartment building, apartment unit, townhouse, informal settlements, container housing, multifamily housing, isolated family house, individual housing units, core housing, public housing, house sharing, minimum habitable dwelling, multi dwelling system, courtyard house, townhouse, townscape, high rise building, midrise buildings, low rise building, high density housing, urban housing, suburbanization, small scale settlement, smart home, smart building, intelligent environment, responsive architecture, tourism, migration, nationalism
	Psychological and social concepts	Activity, behavior, habit, inhabitant characteristics, needs and expectation, social interaction, social relationships, social structure, participation, family interaction, social network, communication, sense of place, hospitality, lifestyle, life cycle, future living, quality of life (QOL), mental health, health promoting environment, creativity, innovation, identity, built environment, physical environment, living environment, neighborhood environment, home environment, flexibility, uniformity, compliance, compatibility, adaptation, affordability, satisfaction, user convenience, functionality, performance, aesthetic, transparency, quality, house-values, culture, socio-cultural factors, socio-economic, heritage, history, locality, arena, tradition

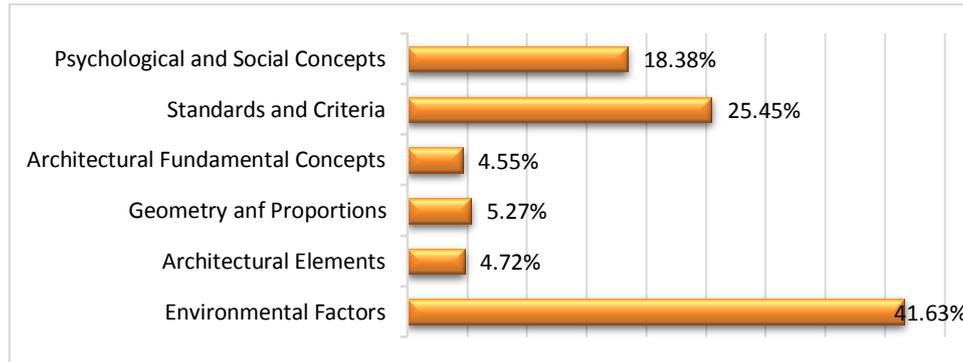**Fig 4.** Scale of areas studied in Iranian housing in 2013-2017

Fig 5. Scale of areas studied in international housing in 2013-2017

Through a closer look, it is illustrated that environmental factors with 41.63% are the most studied subject in international journals, whereas they just take 13.84% of Iranian research. Figure 6 represents that in the environmental factors Iranian have studied climate, material, light, nature and environment more than other subjects and in international papers light, sunlight, ventilation, temperature and sustainability were considered the most in various researches. It is also shown that natural elements such as sky, tree, plants, etc. and the structure of houses are just discussed in Iranian articles, while factors about ventilation and weather features like humidity, temperature, etc. are studied only in international papers. Also, climate and lighting are two subjects that are both discussed abundantly in Iranian and International research.

Different architectural elements are conferred in Iranian and international papers. As figure 7 represents, there are some specific features in Iranian vernacular architecture such as Shavadan[1], Tanabi[2], courtyard, porch, Orosi[3], a wind tower called "Badgir", etc. that researchers studied greatly in papers. However international articles reckon quite dissimilar factors important in housing like building envelope and façade along with outdoor spaces. Open and semi open spaces are mentioned in both fields abundantly.

As can be seen in figure 8, form, motif, hierarchy access, color, dimension, proportion and spatial arrangement on spaces and furniture are by far more argued than other subjects in geometry and proportion categorize this study. On the other hand, geometry, size, height, accessibility and connectivity are discussed in great quantity as opposed to other factors. Figure 8 also reveals that subjects like geometry, form, shape, color and proportion are studied with close frequency in Iranian and international papers which shows the significance of these factors in housing architecture worldwide.

The chart in figure 9 which focuses on architectural concepts indicates that privacy, arena, territory, security, meaning and order were contributed the most in Iranian research. It also refers that with a great variance these components are not discussed in reviewed English journals and security, privacy, territory and comfort with frequency of less than 20 were mentioned and studied.

In terms of standards and criteria, figure 10 shows that international journals have studied this area more than Iranian. The factors such as technology, acoustic insulation, economics, construction methods and planning are considered more than other elements of this group in international journals. While Iranian studies have not focused on these subjects, they mentioned tax, technology, acoustic insulation and ownership merely in some articles. Iranian papers were mostly about psychological and social concepts (Figure 11) precisely with subjects as culture, psychological comfort, lifestyle, satisfaction and identity. The same topics were discussed in international articles yet by a great reduction.

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[1] A deep cellar in houses of southern Iranian houses which provides ventilation and helps cooling the building.
[2] A chamber used by families in summer for residency
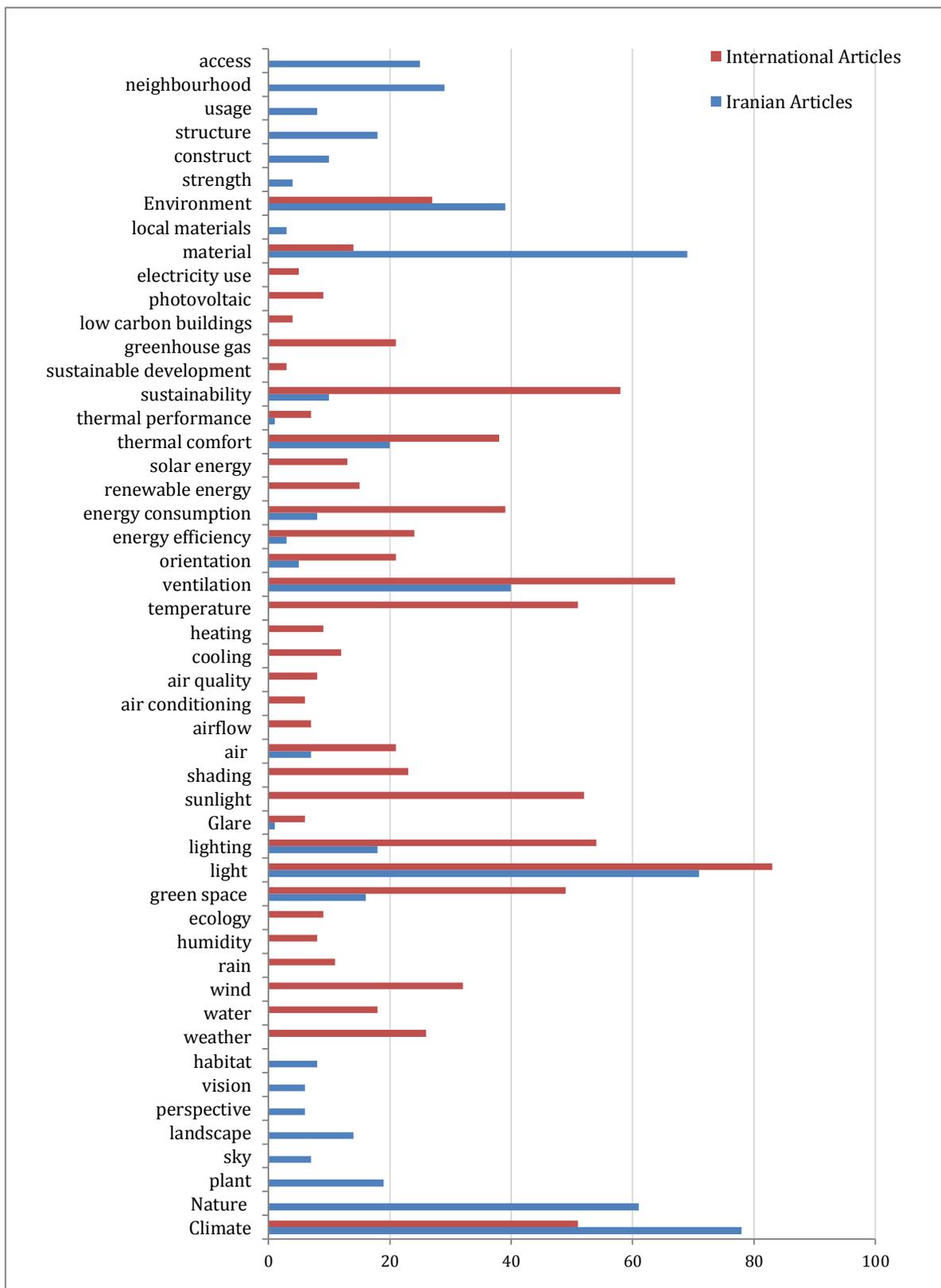[3] Kind of window that opens upwards

Fig 6. Frequency of Environmental Factors studied in Iranian and International Papers [1]

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[1] The factors with the occurrence of 0 or 1 in both Iranian and International articles are omitted
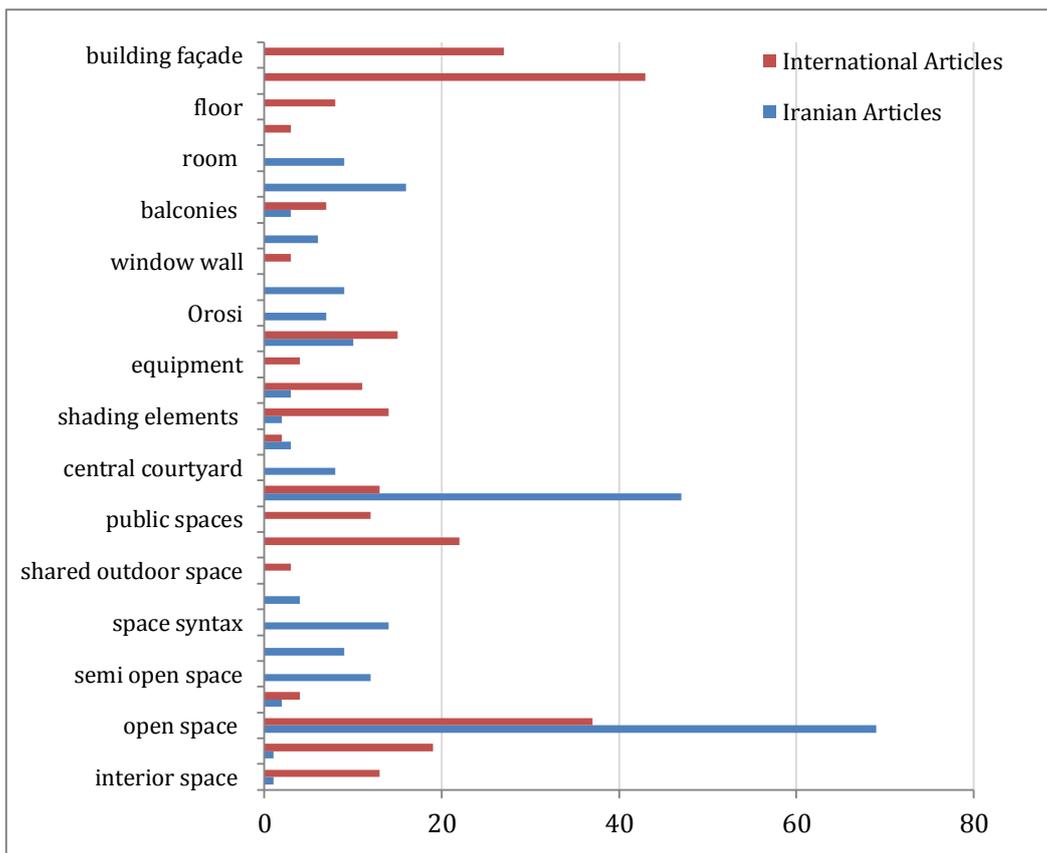
Fig 7. Frequency of Architectural Elements studied in Iranian and International Papers [1]
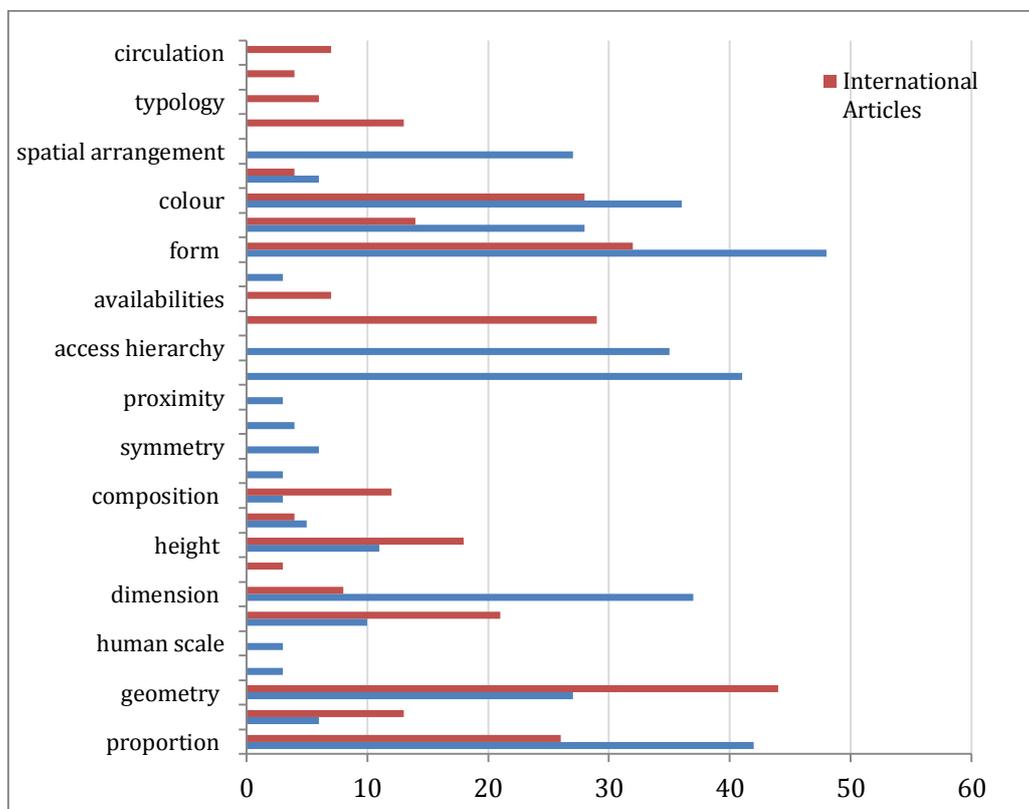

Fig 8. Frequency of Geometry and Proportions studied in Iranian and International Papers [2]

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[1] The factors with the occurrence of 0 or 1 in both Iranian and International articles are omitted
[2] The factors with the occurrence of 0 or 1 in both Iranian and International articles are omitted
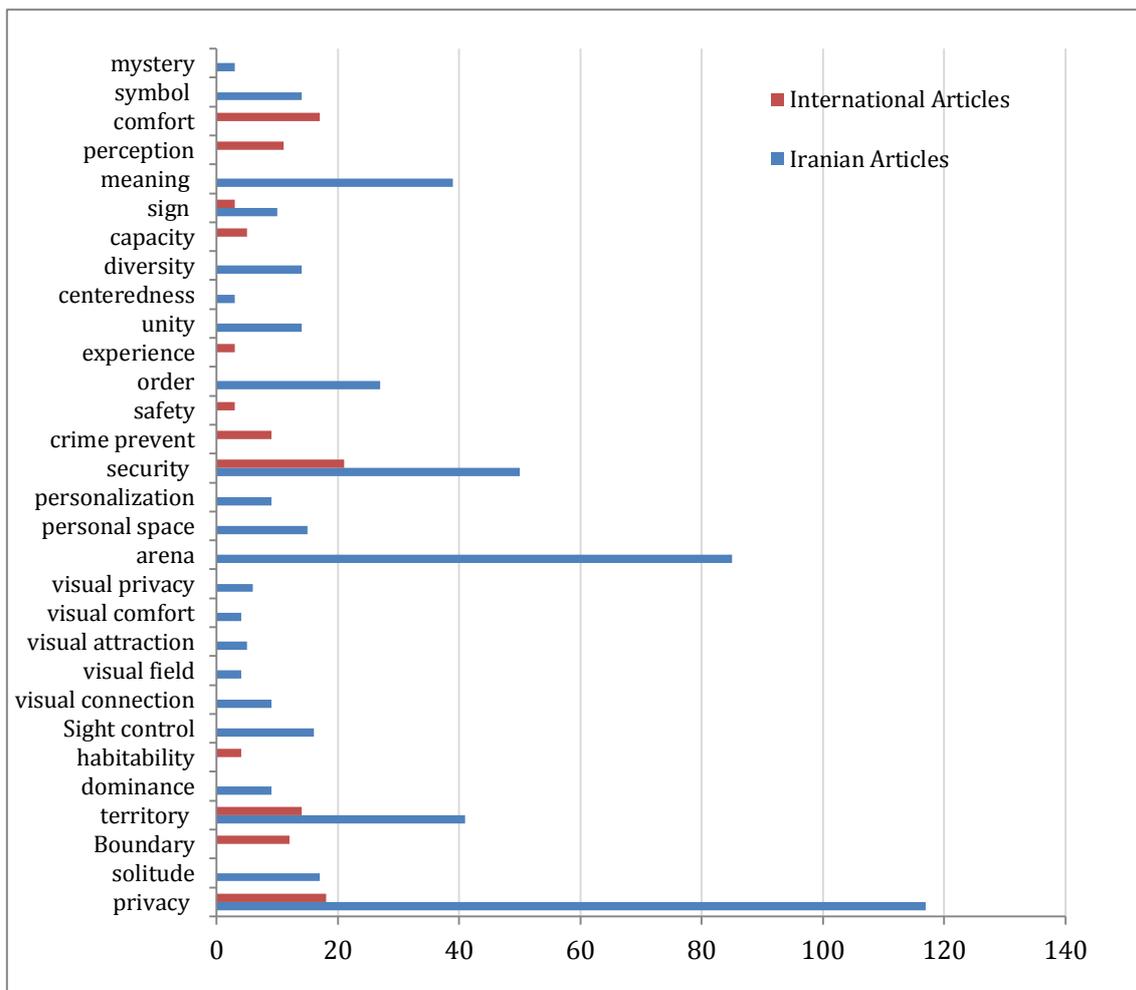
Fig 9. Frequency of Architectural Concepts studied in Iranian and International Papers

In Iranian articles, environmental factors, architectural elements, geometry and proportions, as well as the standards and codes are the physical and tangible components. The basic concepts of architecture and psychological and social concepts that are more challenging and are related to semantic aspects of housing which covers 61.69% of studied subjects of housing will be further perused through Shannon's entropy method. The issues considered in international papers the most (around 67.08% of all subjects) are environmental factors and standards which will be studied by the same technique. In the first stage, all articles were presented to two evaluators along with the variables of the four selected areas; architecture and psychological and social concepts in Persian and environmental factors and standards in English. Each evaluator reported the frequency of the variables or concepts in all articles. It should be noted that both evaluators[1] were graduate of architecture. After obtaining the frequency of each component, Cohen's kappa statistic was used to find the agreement between the two evaluators. Cohen's kappa coefficient is a measure for the internal estimation of the agreement of nominal scales between two observers or evaluators [16]. According to Warrens, Cohen's kappa value can range from -1 to +1, -1

indicating disagreement and +1 indicating full agreement [18]. Also, the coefficient above 0.6 is regarded as an acceptable agreement [18]. In this research, the information provided by each evaluator was inserted into SPSS to measure the level of agreement. Cohen's kappa coefficient between the two evaluators was 0.771, indicating a significantly high agreement (Table 3).

After reviewing the agreement coefficient and ensuring accuracy of the data, the acceptability and significance coefficients of each variable in Iranian and international papers were obtained through Shannon's entropy tool presented in Table 4. The results indicate that privacy, culture, area, lifestyle, mental and emotional relaxation, satisfaction, security, identity, territory, and meaning are the 10 most challenging and factors in the articles published in Iranian periodicals based on Shannon Entropy calculations which was mentioned in methodology [19-51]. Whereas, light, ventilation, sustainability, climate, sunlight, temperature, green space, energy consumption, thermal comfort and wind are 10 factors with higher rates of stimulation [52-68]. Variables, whose absolute frequencies are 0, are assumed 0 in all calculations due to avoiding miscalculation with limitlessness.
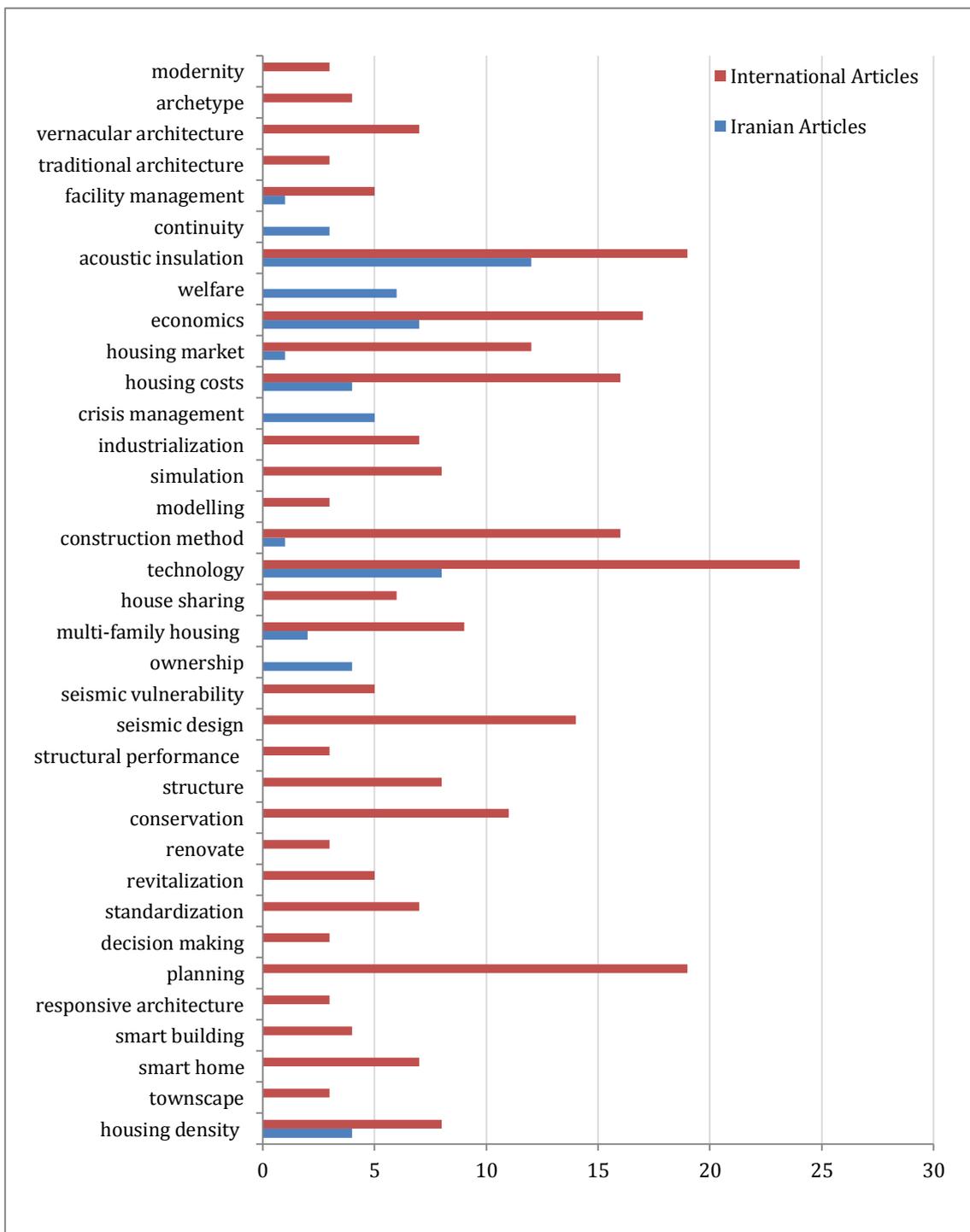
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[1] Sheyda Nakhaei and Rozhan Rustaie

Fig 10. Frequency of Standards and Criteria studied in Iranian and International Papers[1]

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[1] The factors with the occurrence of 0 or 1 in both Iranian and International articles are omitted
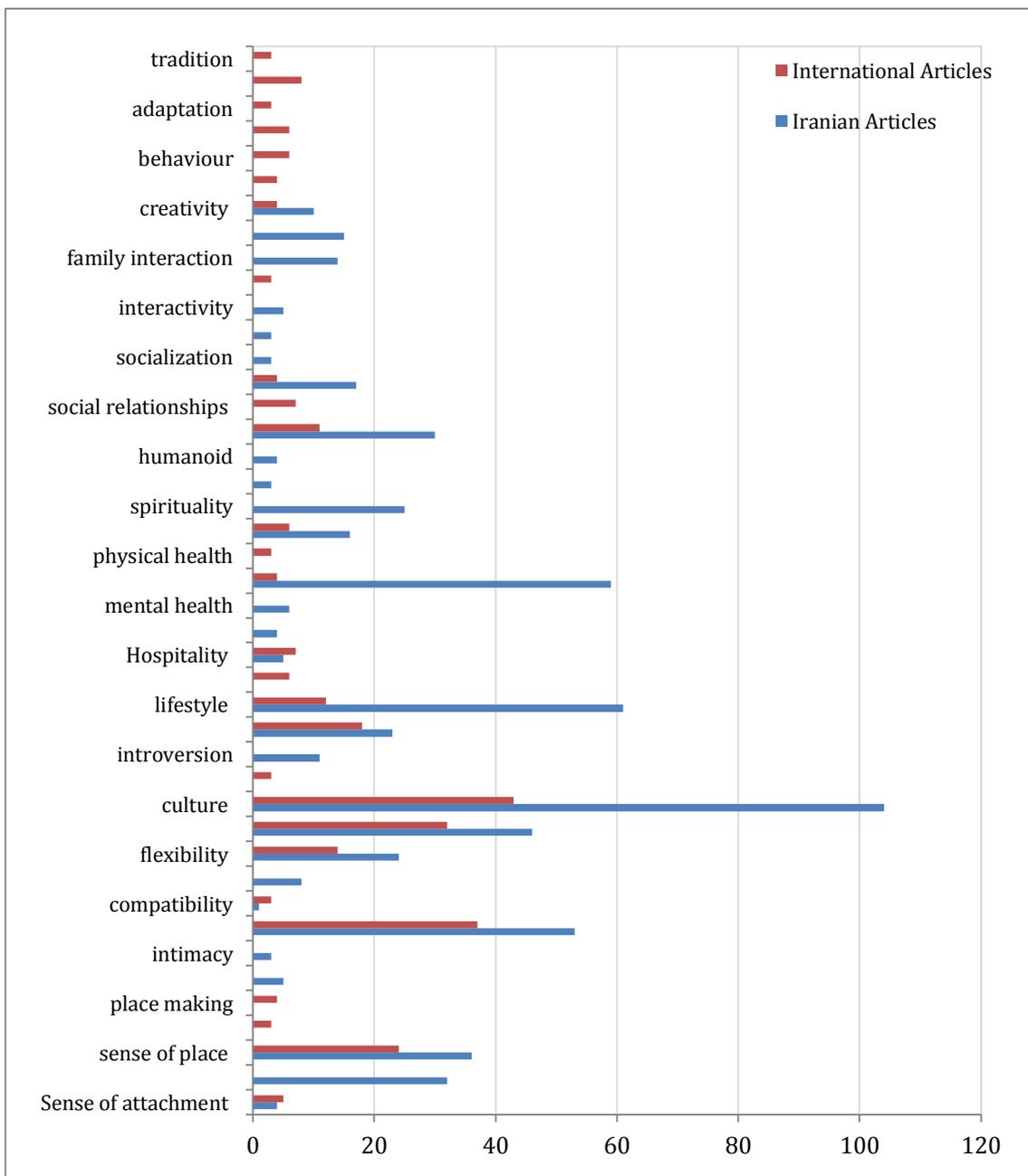
Fig 11. Frequency of Psychological and Social Concepts studied in Iranian and International Papers[1]

Table 3. Cohen Kappa agreement coefficient between two evaluated results by two evaluators

Symmetric Measures

		Value	Asymptotic Standardized Error[a]	Approximate T[b]	Approximate Significance
Measure of Agreement	Kappa	.771	.044	27.454	.000
N of Valid Cases		100			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

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[1] The factors with the occurrence of 0 or 1 in both Iranian and International articles are omitted

Table 4. Final Ranking of International and Iranian Most Challengeable variables using Shannon Entropy

International Variables		Iranian Variables	
Variable	Final Rank Using Shannon Entropy	Variable	Final Rank Using Shannon Entropy
Light	1	Privacy	1
Ventilation	2	Culture	2
Sustainability	3	Arena	3
Climate	4	Lifestyle	4
Sunlight	5	Psychological comfort	5
Temperature	6	Satisfaction	6
Green space	7	Security	7
Energy consumption	8	Identity	8
Thermal comfort	9	Territory	9
Wind	10	Meaning	10
Environment	11	Sense of place	11
Weather	12	Place desirability	12
Technology	13	Social interaction	13
Energy efficiency	13	Order	14
Shading	14	Spirituality	15
Orientation	15	Flexibility	16
Greenhouse gas	15	Quality of life	17
Air	15	Neighbor interaction	18
Planning	16	Solitude	18
Acoustic insulation	16	Sight control	19
Water	17	Aesthetics	19
Economics	18	Collective feeling	20
Construction method	19	Personal space	20
Housing costs	19	Unity	21
Renewable energy	20	Diversity	21
Seismic design	21	Symbol	21
Material	21	Family interaction	21
Archetype	22	Introversion	22
Solar energy	22	Sign	23
Housing market	23	Creativity	23
Cooling	23	Dominance	24
Conservation	24	Personalization	24
Rain	24	Visual connection	24
Multi-family housing	25	Adaptation	25
Heating	25	Visual privacy	26
Photovoltaic	25	Mental health	26
Ecology	25	Visual attraction	27
Housing Density	26	Attachment	27
Structure	26	Hospitality	27
Simulation	26	Interactivity	27
Humidity	26	Mental comfort	28
Air quality	26	Visual comfort	28
Smart home	27	Humanoid	28
Standardization	27	Visual field	28
Industrialization	27	Sense of attachment	28
Thermal performance	27	Centeredness	29
Airflow	27	Mystery	29
House sharing	28	Intimacy	29
Air conditioning	28	Holy foundations	29
Glare	28	Social respect	29
Revitalization	29	Socialization	29
Seismic vulnerability	29	Enclosure	30
Electricity use	29	Distinction	30
Smart building	30	Abstraction	30
Low carbon buildings	30	Functionality	30
Townscape	31	Introversion and Extraversion	30

International Variables		Iranian Variables	
Variable	Final Rank Using Shannon Entropy	Variable	Final Rank Using Shannon Entropy
Responsive architecture	31	Futility avoiding	30
Decision making	31	Transparency	31
Renovate	31	Visual concentration	31
Structural performance	31	Visual diversity	31
Modelling	31	Allegory	31
Modernity	31	Thinking possibility	31
Sustainable development	31	Content	31
Suburbanization	32	Soul of place	31
Sensitivity evaluation	32	Remembrance	31
Prefabrication	32	Self-expression	31
Seismicity	32	Legibility	31
Earthquake damage	32	Adequacy	31
Performance evaluation	32	Folklore	31
Multi dwelling system	32	Performance	31
Isolated family house	32	Visual adaptation	32
Public housing	32	Visual order	32
Design	32	Reflection	32
Automation	32	Integrity	32
Acoustic performance	32	Sense of rooted	32
Indigenous buildings	32	Creating memory	32
Physical comfort	32	Experience	32
Moisture	32	Permeability	32
Global warming	32	Emotional assessment	32
Zero energy building	32	Modesty	32
Air leakage	32	Self sufficiency	32
Small scale settlement	33	Social benefit	32
Intelligent environment	33	Vitality	32
Production strategies	33		
Restoration	33		
Renewal	33		
Load matching	33		
Earthquake engineering	33		
Distributed control	33		
Assessment	33		
Monitoring	33		
Post occupancy evaluation	33		
Optimization	33		
Building system	33		
Indoor noise	33		
Container housing	33		
Spatial configuration	33		
Energy reduction strategies	33		
Air velocity	33		
Household size	34		
Population density	34		
Building age	34		
Housing capacity	34		
Vernacular architecture	34		
Facility management	34		
Traditional architecture	34		

5. CONCLUSION

This study is a type of thematic content analysis of papers on housing published in Iranian periodicals and international journals from 2013 to 2017. To begin with, the numbers of papers published worldwide have increased between the mentioned years. Throughout these five years, Iranian research count grew from 26 to 52 each year. Simultaneously the number of international article trends show fluctuations with increase toward the end of the

reviewing period. All the brought up papers revealed a various count of factors in housing studies which were categorized in six areas named by authors "Environmental Factors", "Architectural Elements", "Geometry and Proportion", "Fundamental Concepts of Architecture", "Standards and Codes" and "Psychological and Social Concepts". Among these classifications, fundamental concepts of architecture and psychological and social concepts have been more studied in Iranian research by the amount of 61.69% together. It can be said that this qualitative approach to housing in Iran has emerged from the history of Iranian residential architecture and researchers are trying to revive quality factors of housing in the past in order to improve the quality of contemporary housing and resolve its problems. On the Contrary, elements in environmental factors and Standards with the percentage of 67.08 were studied more in international research. The results of this systematic meta-analysis review indicate that researchers in Iran are more concerned with qualitative variables of housing while quantitative variables are more addressed in international journals. Construction standards, design criteria, sustainability issues and energy saving are issues that have become more prominent in international papers. So, there is a gap in international articles to do more research about qualitative factors and in Iran about quantitative ones.

Two categories of basic concepts of architecture and psychological and social concepts, were studied more in Iranian articles, and environmental factors and standards were considered mostly in international paper. They all were examined through Shannon's statistical tool. Shannon entropy shows the most challenging factors in researches based on its calculations which were mentioned in the methodology section. The most controversial variables in Iran were privacy, culture, area, lifestyle, mental and emotional relaxation, satisfaction, security, identity, territory and meaning. These variables were followed by place attachment, location desirability, social interaction, order, spirituality, flexibility, quality of life, neighbourly relations, aesthetics and visibility control. These variables are classified into five categories of spatial boundaries (privacy, area and territory), qualities of space (psychological and mental comfort, security, order, visibility control and flexibility), and social relationships (social interaction, neighbourly relations), qualities of life (culture, lifestyle, satisfaction, place desirability and quality of life) and psychological variables (place attachment, spirituality, meaning, identity and aesthetics). On the other hand, light, ventilation, sustainability, climate, sunlight, temperature, green space, energy consumption, thermal comfort and wind are the most debated factors in international journals. It can be said that English journals are frequently focused on calculative factors and in particular energy based standards. These variables were obtained from the studies from 2013 to 2017, and if the statistical population was larger and the studied period was more than five years, the research might include more components. It should be noted that the acceptability and significance coefficients of the mentioned components are the same, suggesting that these

variables are as important to researchers as they are to experts and thus continue to be the challenging subjects of further studies. (More comparisons are added through the whole paper highlighted green)

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