AN ANALYSIS ON POST OCCUPANCY EVALUATION METHOD IN BUILDINGS

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ABSTRACT

Determining the positive and negative aspects of the built environment is important in terms of the feedforward it will provide to the structures to be produced in the future and the feedback will provide to the existing structures. Many assessment models have been developed based on this idea. While many of these models focus on the evaluation of the current performance of buildings, the ''POE'' model is based on the evaluation of both the building users and their needs and the level of the buildings fulfilling the expected performance. From this point of view, the POE (Post Occupancy Evaluation) method, which is a prominent method among building evaluation methods, was discussed in the thesis study. The study aimed to provide systematic knowledge to architects or designers who want to benefit from the results of research using the POE method and to guide researchers about new research areas. For this purpose, a search was made for academic studies that have the concepts of ''KSD'' or ''POE'' in their keywords, and that was made between the years of ''2010-2020''. ''Science Direct, Emerald Insight, Springer, Taylor and Francis, Bursa Uludağ University Network, Turkish National Academic Network and Information Center, the Council of Higher Education National Thesis Center, and ProQuest'' databases were used to scan the publications. A total of 279 publications were included in the study within the scope of the thesis. The meta-analysis method was preferred for the systematic analysis of the publications. In the light of the data obtained as a result of the study, it was concluded that POE is a versatile method that can be applied for different purposes.

Keywords: User satisfaction, Post occupancy evaluation, POE, Meta analysis,

BİNALARDA KULLANIM SONRASI DEĞERLENDİRME YÖNTEMİ ÜZERİNE BİR ANALİZ

ÖZET

Yapılı çevrelerin olumlu ve olumsuz yönlerinin belirlenmesi, gelecekte üretilecek yapılara sağlayacağı ileri besleme ve mevcut yapılara sağlayacağı geri besleme bakımından önem taşımaktadır. Bu düşünceyi temel alarak geliştirilmiş olan birçok değerlendirme modeli bulunmaktadır. Bu modellerin birçoğu binaların mevcut performansının değerlendirilmesine odaklanırken, ''KSD'' (Kullanım Sonrası Değerlendirme) modelinin temelinde hem bina kullanıcıları ve onların ihtiyaçları hem de binaların beklenilen performansı yerine getirme düzeyinin değerlendirilmesi bulunmaktadır. Buradan yola çıkarak çalışmada bina değerlendirme yöntemleri arasından öne çıkan bir yöntem olan KSD yöntemi ele alınmıştır. Çalışmada KSD yöntemi kullanılarak yapılan araştırmalarda ortaya çıkan sonuçlardan yararlanmak isteyen mimarlara veya tasarımcılara sistematik bir bilgi birikimi sunmak ve araştırmacılara yeni araştırma alanları hakkında yol göstermek amaçlanmıştır. Bu amaç doğrultusunda anahtar kelimelerinde ''KSD'' veya ''POE'' kavramları bulunan ve ''2010-2020'' yılları arasında yapılmış olan akademik çalışmalara yönelik yayın taraması yapılmıştır. Yayınların taranmasında ''Science Direct, Emerald Insight, Springer, Taylor and Francis, BUÜ ağı, Ulakbim, YÖK Ulusal Tez Merkezi ve ProQuest'' veri tabanları kullanılmıştır. Sınırlılıklar kapsamında toplam 279 adet yayın incelemeye dahil edilmiştir. Çalışmaların sistematik bir biçimde analiz edilebilmesi için meta analiz yöntemi tercih edilmiştir. Meta analiz yöntemi, tüm bu yayınlara bir genelleme yaparak literatürdeki boşlukların tespit edilmesi ve yeni araştırma alanları hakkında fikir vermesi açısından etkili bir yöntem olarak akademik ortamda kabul görmektedir. Yapılan değerlendirme sonucunda; yıllar içerisinde KSD çalışmalarına olan ilginin giderek arttığı gözlemlenmiştir. Ayrıca KSD çalışmalarının çoğunlukla konut ve ofis yapıları üzerine olduğu ve en çok ele alınan konunun kullanıcı memnuniyeti olduğu da tespit edilmiştir. Çalışma sonucu elde edilen veriler ışığında KSD'nin farklı amaçlara yönelik uygulanabilen çok yönlü bir yöntem olduğu kanısına varılmıştır.

Anahtar Kelimeler: Kullanıcı memnuniyeti, Kullanım sonrası değerlendirme, KSD, Meta analizi.

1. INTRODUCTION

The full achievement of the purpose of the buildings built to meet the demands and needs of people depends on the level of satisfaction of the users with the building quality and performance (Mustafa, 2017; Vásquez-Hernández and Restrepo Álvarez, 2017). One of the main purposes of the buildings is to provide a comfortable, healthy and safe environment to the users. However, although certain rules and standards are used in the construction of buildings, it is not possible to state that these standards are always compatible with user requirements. Therefore, it cannot be said that users are always satisfied with the building quality and performance (Ibem et al., 2013).

Evaluation studies in buildings are important both in terms of improving the current quality and performance in buildings and creating a database for architects and researchers for future projects. The POE method is one of the most frequently used evaluation methods in terms of detecting the problems arising from the design decisions of the buildings and depending on the application and usage stages and evaluating the user satisfaction in the buildings. POE is an evaluation method that aims to solve the existing problems of buildings (Günaçar, 2022). This method can be used in studies with various and different objectives, such as determining the current needs of buildings, evaluating performance and quality in buildings, and examining user satisfaction in buildings (Preiser et al., 1988).

When a literature search was conducted on POE, it was determined that there are many studies on this subject. However, the lack of a study that brings all these studies together and examines them systematically has attracted attention. From this point of view, within the scope of the study, a systematic evaluation of the academic studies on the POE of the buildings was made. With this evaluation, it is aimed to determine the deficiencies of POE studies in the literature. For this purpose, it is aimed to guide new researches on this subject. In line with this purpose, it is aimed to guide new researches on this subject. It is aimed that this study will be one of the pioneering studies in order to contribute to the spread of the POE concept both in the academic field and in the field of practice. With the data obtained as a result of the study, it is aimed both to identify new research areas for researchers and to provide information on the design stages of projects for designers and architects.

1.1. Post Occupancy Evaluation

Post occupancy evaluation is the systematic evaluation of design decisions and performance of spaces with a focus on the users of the space in order to build better built environments in the future. This evaluation approach aims to develop the design decisions and practices in buildings by highlighting the good aspects, to identify the bad aspects and to find a solution for them (Dülger, 2017). With POE, the design decisions of the buildings are questioned and data is collected about their performance. This collected data provides feedback for the design and manufacture of higher quality structures in the future (Preiser et al., 1988).

Preiser et al. defined POE in the same study as "*the process of systematic evaluation of buildings over a period of time after they have been constructed and used*". It was stated that the main target point of POE is users and their needs. According to Lackney (2001), POE is the systematic examination of the extent to which buildings match the needs of users. In addition, it is possible to consider the POE method as a method and strategy used to make buildings more sustainable (Brambilla and Capolongo, 2019). In addition, POE studies have benefits (safety, circulation, temperature, maintenance, etc.) to reduce the negative effects of buildings on user health (El-Darwish and El-Gendy, 2018).

POE has an important role in measuring building performance and user satisfaction (Kim et al., 2022). In line with the data obtained as a result of the evaluation of the quality and performance of the existing buildings, it is important to make improvements in the buildings in order to make the built environment we live in more liveable. Buildings can often show different performance than anticipated at the design stage. It is thought that the POE method will be useful for designers and architects to improve themselves in this regard and not to repeat similar mistakes in their designs (Kahya, 2018; Colclough et al., 2022).

Transforming the data obtained as a result of the evaluation of the buildings into a design criterion is important in terms of ensuring the continuity of quality and user satisfaction in buildings. The concept of POE first appeared in the 1960s. Although studies are mostly carried out in the academic field in the first years, it is a method that is frequently used in the professional field, especially in the last 30 years. The POE method, which focuses more on users, has also focused on different issues such as performance and quality throughout its development (López-Chao and López-Pena, 2021; Ahmed et al., 2021). Even though this method is frequently used by architects and designers, we see that different stakeholders use this method for different purposes in a project. It can be used by investors to increase the design quality of buildings, managers to reduce energy consumption in buildings or building owners, users and architects to improve environmental conditions and increase productivity. The main purpose for all these different stakeholders to use this method is to provide improvement and development by focusing on the success and failure of the project (Ilesanmi, 2010).

2. MATERIAL AND METHOD

In order for the study to reach the desired goal, a four-stage process has been established. Figure 1 shows the stages of this process. Each of these stages can be considered as an input for the next stage. It is aimed that the data obtained from the conclusion part, which is the last step of the process, will be input to the future POE studies and new projects to be designed.
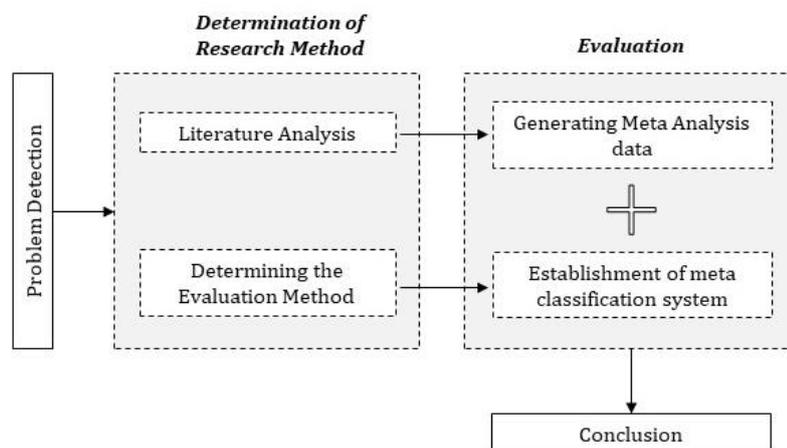

Figure 1. Flow chart of the research

In the problem identification phase, which is the first stage of the process, research problems for the study were determined and are given below.

- In which research areas are there gaps in studies conducted with the POE method?
- How can the meta-analysis method be used to identify these gaps in the literature?
- Can a data repository be created that can benefit researchers in future research with a systematic review to be created using the meta-analysis method?
- How can architects and designers benefit from the data repository to be created in their new designs?

In the determination of the research method, which is the second stage of the process, the meta-analysis method was used to evaluate the studies to be examined in this context within the framework of a certain system in order to achieve the desired goal of the study. In this method, a meta classification system has been created so that the studies can be examined under a single system. With this system, general information about the studies, the content of the study, the method and the result of the study were focused.

The meta-analysis method is a quantitative method that systematically combines and analyses many independent studies on similar topics. Meta-analysis method is defined as a literature review method used to systematically examine and analyse many studies. The purpose of this systematic review is to evaluate the studies with a critical point of view (Başol, 2009).

In the meta classification system to be created within the scope of this study, the meta classification systems in the studies of Betts and Lansley (1993), Serin (2016), Aydın (2019) and Karaağaç (2020) were taken as reference. A meta classification system suitable for the study was created by associating the POE method with the reference systems. The meta-classification system created for the systematic analysis of the studies includes the main headings of "general information and content, method and result", and consists of three main headings as shown in Table 1.

Under the main title of general information and content, the year the study was published, the type of publication (article, thesis, conference material), the country where the research was conducted, the source (journal name, etc.), the keywords in the study and whether the definition of POE was made in the study are examined. Under the main heading of the method, the subject or purpose of the study (the subject of the study), the type of building evaluated (school, hospital, residence, public spaces, etc.), data collection techniques used in the study (survey, physical measurement, observation, simulation, interview, etc.) and the evaluation criteria of the study (user satisfaction, thermal comfort, acoustic comfort, technical performance, energy, etc.) are examined. In the main title of the conclusion, the findings and results obtained as a result of the study are examined.

Table 1. Meta classification system

MAIN TITLE	SUBTITLE	ITEMS OR DEFINITIONS
1. General Information and Content	Year	Publishing date
	Publication Type	Source type (Thesis, article..)
	Country	Country of study
	Keywords	Keywords
	Definition of POE	Definition of POE in the study
2. Method	Subject/ Purpose	The focus of the study
	Structure Type	Evaluated building type
	Data Collection Technique	Survey, observation, etc.
	Evaluation Criteria	Thermal comfort, technical performance, etc.
3. Conclusion	Results and Conclusion	Research result and findings

Within the scope of the meta-analysis study, academic studies on POE of buildings were examined. Figure 2 shows the process of identifying the studies to be included in the meta-analysis. In the material formation scheme, the databases examined within the scope of the study, the study limitations (keywords, year range and study type), the number of studies obtained from the databases, the criteria of the studies included and excluded from the study, and the number of studies which obtained as a result of each step of this process are shown.

Between March 7 and April 4, 2021, a literature review was conducted on databases determined within the limitations of the year, key concepts and study type. In order to evaluate more recent studies, it was deemed more appropriate to examine the studies conducted between the years 2010-2020. The languages of these studies are limited to Turkish or English. These studies consist of local and foreign theses, "Science Direct, Emerald Insight, Springer, Taylor and Francis and Turkish National Academic Network and Information Center " databases, articles and conference materials that can be accessed through the "Bursa Uludağ University network", and " the Council of Higher Education National Thesis Center and Accessible from ProQuest'' databases.

These databases were searched using the keyword "Post Occupancy Evaluation" terms both in Turkish and English. These databases were searched using the keyword "Post Occupancy Evaluation" terms both in Turkish and English. As a result of the search, a total of 3267 studies were obtained. Studies that do not contain the concepts of "POE" or "POE" in the keywords of these 3267 studies and that do not belong to the field of architecture were not included in the scope of the research. After eliminating the studies that did not comply with the research limitations, the number of studies obtained was 1387. Considering that the same study can be accessed through more than one database, it was checked whether there were repetitive studies. As a result of this control, duplicate studies were not included in the meta-analysis. The number of studies obtained by excluding repetitive studies from the scope of the study is 459. When these studies are examined in detail, in some of the studies, "Post Occupancy Studies", "Post Occupancy Method" and "POE System"

keywords and "Post Occupancy Evaluation" keywords and "Post Occupancy Evaluation" keywords Concepts such as "Evaluation in the Use Process" and "Use Evaluation Process" were used instead of the word. These studies were not included in the meta-analysis study. The number of studies obtained within the framework of all these limitations is 370. Among these studies, only studies evaluating a certain area and structure were examined, and the total number of studies to be examined within the scope of the study is 279.
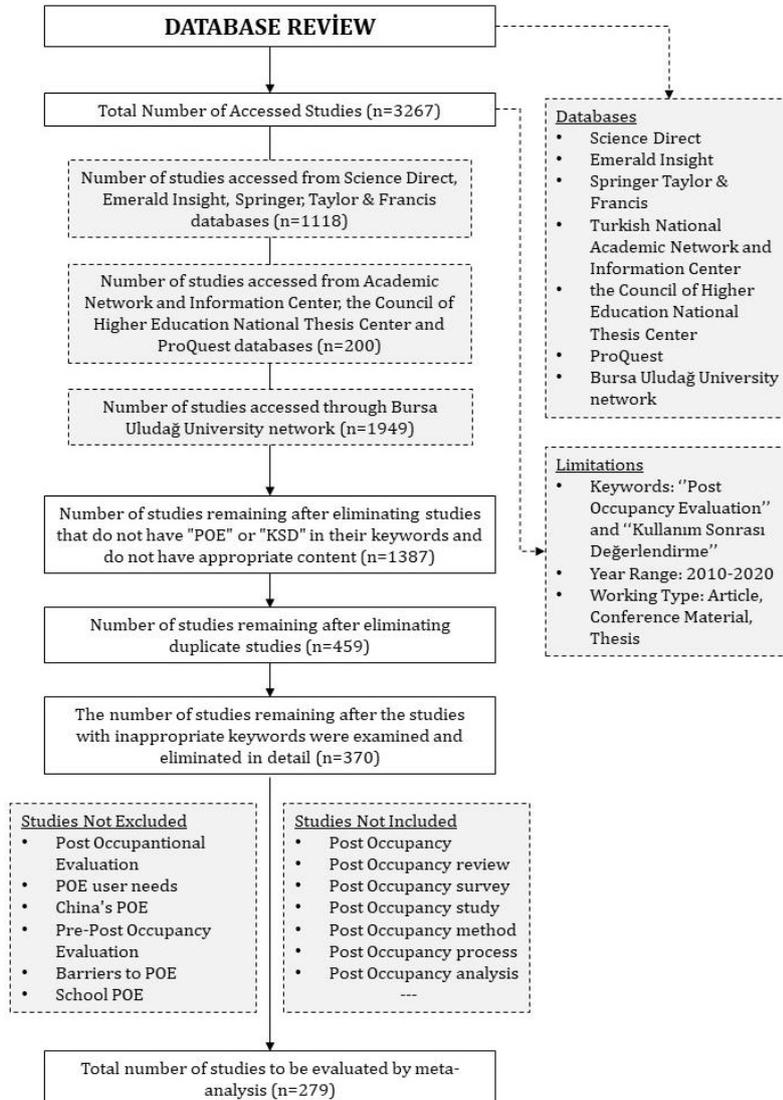
Figure 2. Material formation chart

3. FINDINGS

279 POE studies included within the scope of the study were analysed under the headings created in the meta-classification system. The studies were analysed under the sub-headings in the meta-classification system according to the years of the studies, the type of publication, the country where the research was conducted, the keywords used in the study, the definition of the concept of POE in the study, the type of structure evaluated, the data collection technique used, the focal points of the studies and the results of the studies.

3.1. Analysis of studies by years

Within the framework of the limitations determined within the scope of the study, a total of 279 studies were examined. The distribution of the number of these studies by years is shown in Table 2. It was concluded that the average number of studies on the basis of all countries during the time period of the research was approximately 25 per year. It is seen that the number of studies in the last five years is at or above this average. It is observed that there has been a continuous increase in the number of studies as of 2014 within the specified time interval, but the average number of studies has only been reached as of 2016. While the lowest number of studies was 12 in 2011, the highest number of studies was 36 in 2020, and the number of studies has almost tripled in ten years.

Table 2. Analysis of studies by years

YEAR	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of Studies	14	12	23	22	23	24	29	31	32	33	36

3.2. Analysis by publication type of studies

Table 3 shows the distribution of studies according to their types. Between 2010 and 2020, a total of 226 articles, 25 conference materials and 28 theses were reached. On the basis of total studies, approximately 81% of the studies are articles, 9% are conference materials and 10% are dissertations. According to Table 3, it is seen that the number of articles is considerably higher than other types, and the conference materials and theses are similar in number.

Table 3. Analysis of studies by publication type

PUBLICATION TYPE	Article	Thesis	Conference Material
Number of Studies	226	28	25

3.3. Analysis of studies by country

Figure 3 shows the distribution chart of the countries where the research was conducted. The country with the most studies is the USA. With a total of 52 studies, it constitutes approximately 18% of all studies. Then, the countries where more studies were conducted were England with 35 studies, Turkey with 34 studies, Australia with 16 studies, China with 16 studies and Malaysia with 11 studies. The 279 studies examined within the scope of the meta-analysis are the sum of the studies conducted in 47 different countries. Apart from the countries shown in Figure 3, there is 1 study in 21 different countries.

3.4. Analysis of studies by keywords

Figure 4 shows the frequency of using keywords other than the POE keyword among 279 studies. There are seven or more used keywords in the figure. The keywords used are important in terms of being able to give an idea about which subjects the studies generally focus on.

The most used keyword among 279 identified studies is "indoor environmental quality" and it is found in 50 studies. The other most frequently used keywords and their frequency of use are listed as follows; occupant satisfaction is used in 43 studies, thermal comfort in 28 studies, green buildings in 21 studies, building performance in 17 studies, evidence-based design in 14 studies, daylighting, IAQ and LEED in 9 studies, and BPE, energy performance, passive house and satisfaction in 7 studies.
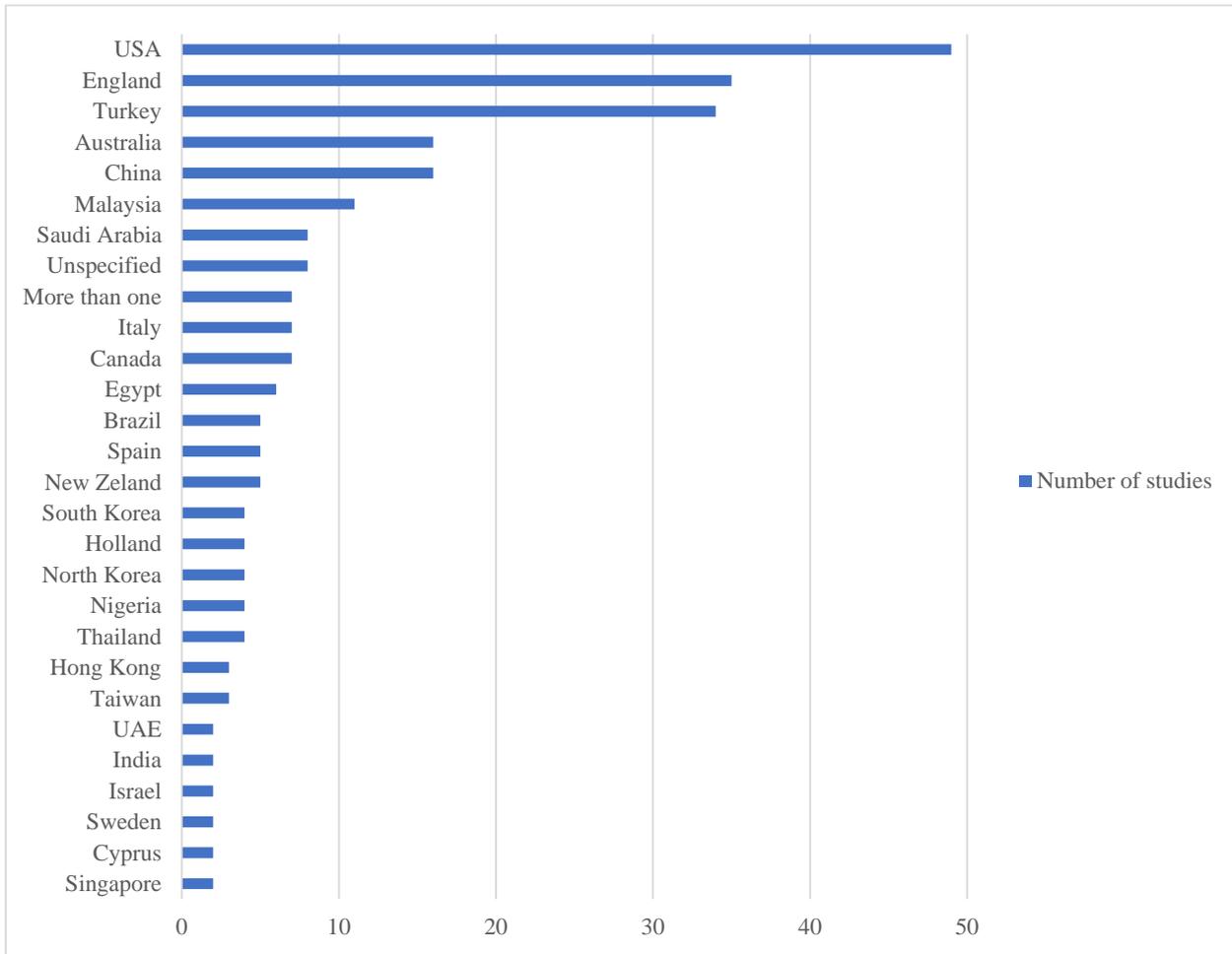
Figure 3. Analysis of studies by country

Keywords are important in terms of giving the reader an idea about the subject of the study. From this point of view, according to Figure 4, it is seen that many different subjects can be handled with the POE method. While some of the keywords used in the studies examined are related to each other, some of them are very independent concepts. However, in most of the studies, it is seen that the concepts related to comfort, performance and user satisfaction are discussed.

Figure 4. Other keywords most frequently used in studies

3.5. Analysis according to the definition of POE

When we look at whether or not the definition of POE was made in 279 studies examined within the scope of meta-analysis, the definition of POE was made in approxim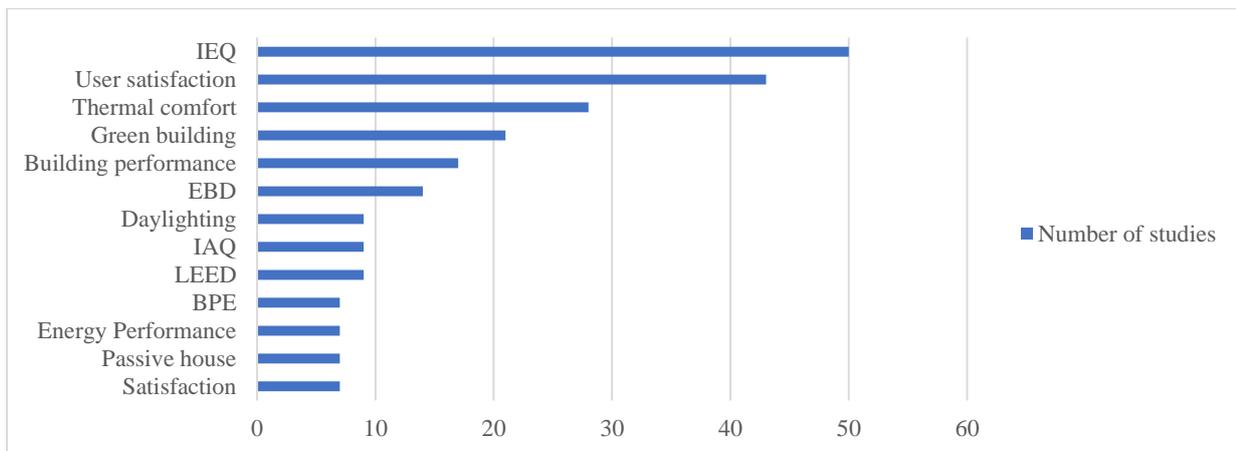ately 36% of the studies. The number of studies in which the definition of POE was made is 101, and the number of studies without the definition is 178. It is important that the POE (method used) is explained for a better understanding of the study, but when we look at all the studies in general, the content of the method is mentioned in only a few of the studies.

3.6. Analysis of the studies according to the evaluated building type

Considering the types of buildings and areas evaluated in the studies examined, it was determined that a total of 38 different types of buildings and areas were evaluated. We see all these building and area types in Figure 5. The number of evaluated building types and areas with a total number of studies of 10 or more is 5. These are dormitory building, health building, education building, residence and office buildings.

The number of studies evaluating office buildings is 65, the number of studies evaluating residences is 58, the number of studies evaluating educational buildings is 47, the number of studies evaluating health buildings is 30, and the number of studies evaluating dormitory buildings is 10. In total, the field types evaluated in 274 studies were specified. The area type evaluated in the remaining 5 studies was not specified.
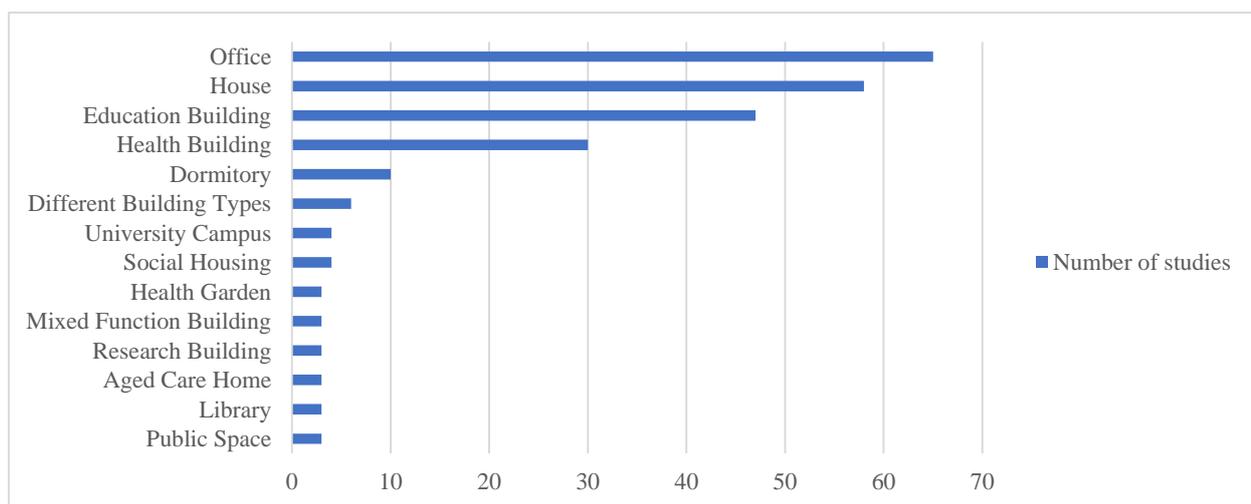
Figure 5. Evaluation frequency of building and site types

3.7. Analysis of the studies according to the data collection technique used

Data collection techniques used in the studies are shown in Figure 6. Under this category, 10 different data collection techniques were used, and the number of data collection techniques used in more than 50 studies is 3. More than one data collection technique was used in most of the studies. It is seen that a single data collection technique was used in a total of 156 studies. Among the techniques used alone, the most used evaluation method is the questionnaire and the number of studies is 114.

The most used data collection technique is the questionnaire and the number of studies using the technique is 218. The most used data collection techniques and the number of studies, respectively, are as follows; physical measurement consists of 71 studies, interview 50 studies, observation 44 studies, simulation 20 studies and literature review 13 studies (Figure 6).

Figure 6. Frequency of use of data collection techniques used in POE studies

3.8. Analysis of their work by focal points

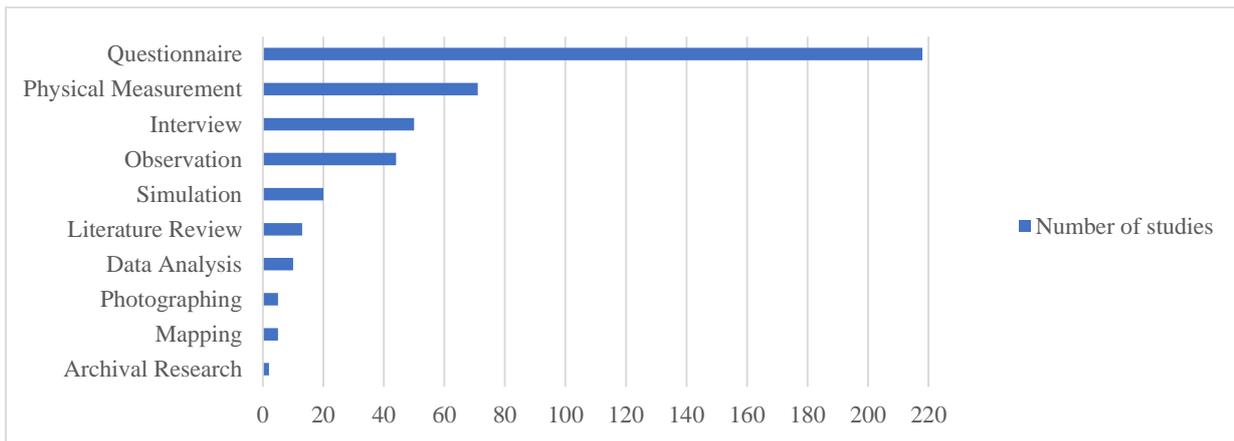Studies in which POE is used as a method are generally examined under seven headings according to their focal points. These headings are user satisfaction, indoor environmental quality, performance, sustainability, design, energy and other issues. Out of 279 studies, 90 are on user satisfaction, 61 on comfort, 56 on performance, 43 on sustainability, 11 on design, 8 on energy and 10 on other subjects (Figure 7).

It is seen that the concepts of user satisfaction, indoor environmental quality and performance, which we can express as the concepts that make up the essence of POE, are the most discussed topics and constitute 74% of all studies using POE as a method. When we look at the distribution of study subjects by years, we see that; User satisfaction was the most studied subject in 2010, 2011, 2012, 2013, 2014, 2016, 2018 and 2019, performance was the most studied subject in 2015, indoor environmental quality of the most studied subject in 2020 and the highest number of studies in 2017 is indoor environment quality and user satisfaction.
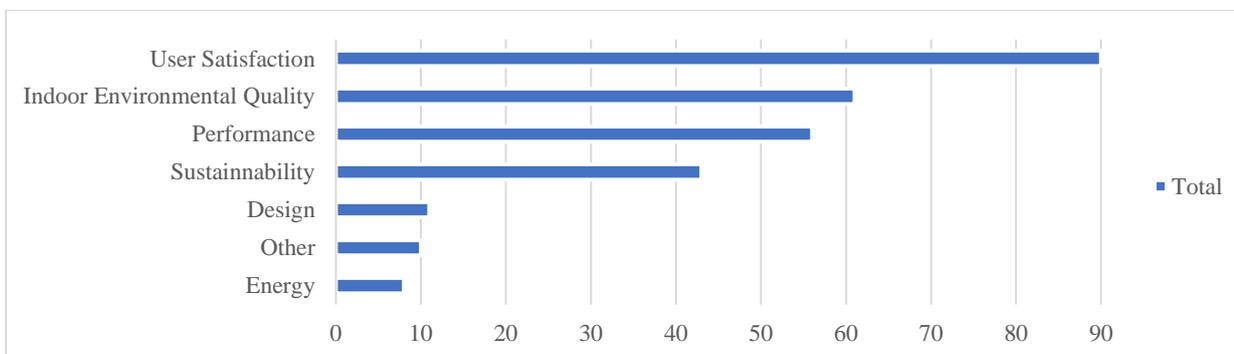
Figure 7. Distribution of studies in which POE is used as a method according to focal points

- **User satisfaction**

Among the evaluated studies, the most studies are on user satisfaction. There are 90 studies in total under this title. Figure 8 shows the analysis of these 90 studies regarding structure and site type and data collection techniques. Under the heading of user satisfaction, 27 different types of structures and areas were evaluated. The most evaluated among these types are office, residence and education buildings. The most frequently used methods in the evaluation of these species are questionnaire, observation and interview.

Data Collection Technique \ Structure and Area Type	Public open space	Courthouse	Research Building	Unspecified	Childcare Center	Education Building	Different Building Types	Hospital	Airport	Public Building	Public Space	House	Library	Lab	Market	Museum	Office	Hotel	Health Garden	Health Building	Art Center	Social Housing	Railway station	University Campus	Aged Care Home	Yacht	Residential area	Dormitory	TOTAL
Questionnaire	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	81
Archival Research								●																					1
Situation Analysis																								●					1
Physical Measurement		●						●							●	●	●				●				●				9
Photographing						●		●																					3
Interview			●			●	●	●				●	●				●	●	●	●	●		●			●			14
Observation						●		●	●	●		●					●	●						●	●	●	●		17
Mapping						●																		●					2
Literature Review												●		●							●							●	4
Regression Analysis						●																							1
Data Analysis																	●												1
TOTAL	1	1	1	1	1	11	2	9	1	1	1	14	1	1	1	1	19	1	1	5	1	2	1	3	1	1	2	4	

Figure 8. Investigation of user satisfaction studies in terms of structure/area type-data collection technique

The most frequently used evaluation criteria in the studies under the heading of user satisfaction; user satisfaction, user requirements, user perception, comfort, privacy, functionality, thermal comfort, indoor environmental quality, indoor air quality, noise, daylight, visual comfort, aesthetics, acoustic comfort.

- **Indoor environmental quality**

There are a total of 61 studies under the title of indoor environmental quality. Under this title, 16 different types of buildings or areas were evaluated and the most evaluated building types are office, education building and residence. The most commonly used assessment methods are questionnaire and physical measurement. Other building types evaluated under the title of indoor environmental quality and the methods used are explained in Figure 9.

Under the heading of indoor environmental quality, the most frequently used evaluation criteria are; acoustic comfort, visual comfort, natural and artificial lighting, indoor air quality, thermal comfort, material and quality, health, waste management, land use, energy consumption, ecology, shading and surface coatings.

Data Collection Technique \ Structure and Area Type	Research Building	Unspecified	Education Building	Different Building Types	Hospital	Airport	Multifunctional Building	House	Corporate Building	Library	Lab	Office	Health Building	Social Housing	University Building	Dormitory	TOTAL
Questionnaire	●	●	●	●	●	●	●	●	●	●		●	●			●	46
Physical Measurement		●	●		●	●	●	●			●	●					25
Interview			●					●								●	7
Observation			●					●									6
Mapping			●	●													2
Literature Review												●					1
Simulation		●	●				●	●				●		●	●		9
Data Analysis			●														1
TOTAL	1	4	12	1	5	1	3	7	1	1	1	20	1	1	1	1	

Figure 9. Investigation of indoor environmental quality studies in terms of structure/area type-data collection technique

- **Energy**

There are 8 studies in total belonging to the energy title. The most evaluated building type under the energy heading is housing, and the most frequently used evaluation methods are simulation and physical measurement (Figure 10). It is seen that the data collection techniques used in these studies are questionnaires and interviews. The most frequently used evaluation criteria under the heading of energy; energy consumption, energy efficiency, energy systems and energy efficiency.

		Education Building	Different Building Types	House	Office	TOTAL
Data Collection Technique	Questionnaire			●		1
	Physical Measurement	●		●		3
	Interview			●		1
	Observation			●		1
	Simulation	●	●	●	●	5
	Data Analysis				●	1
	TOTAL	1	1	5	1	

Figure 10. Investigation of energy studies in terms of structure/area type-data collection technique

- **Performance**

There are a total of 56 studies under the title of performance. 21 building and area types were evaluated under this topic, and the most evaluated building types are educational buildings, residences and offices. The most frequently used evaluation methods are questionnaire, physical measurement, observation and interview, respectively. Other types of structures evaluated under the heading of performance evaluation and data collection techniques used are explained in Figure 11.

The most frequently used evaluation criteria in the studies under the title of performance; technical performance, thermal comfort, temperature, health, comfort, functional performance, indoor environmental quality, heating and ventilation, auditory comfort, air quality, safety, noise, daylight performance, visual comfort, functional performance, accessibility, energy performance, energy consumption, behavioral performance, building envelope, maintenance, relative humidity, lighting.

		Courthouse	Shopping Center	Research Building	Mosque	Education Building	Factory	Different Building Types	Hospital	Hostel	Cafe, Restaurant	House	library	Office	Park	Health Building	Art Gallery	Facility	Social Housing	University Building	University Campus	Dormitory	TOTAL
Data Collection Technique	Questionnaire		●	●	●	●	●	●	●		●	●		●	●	●	●		●	●	●	●	41
	Archival Research											●											1
	Physical Measurement					●			●			●		●				●			●		12
	Photographing					●																	1
	Interview			●		●			●	●	●	●							●		●		9
	Observation	●			●	●				●		●											11
	Literature Review		●						●			●									●		4
	Simulation					●						●											3
	Data Analysis			●									●										2
	TOTAL	1	1	1	1	15	1	1	2	1	1	14	1	7	1	1	1	1	1	1	1	2	

Figure 11. Investigation of performance studies in terms of structure/area type-data collection technique

- **Design**

There are 11 studies in total belonging to the design title. The most evaluated building/area types under the design title are hospital, education building and health garden; the most frequently used evaluation methods are questionnaires and interviews (Figure 12). The most frequently used evaluation criteria under the title of design; design process, design intentions, physical design features, development process, circulation, ergonomics and user experience.

Data Collection Technique	Education Building	Hospital	Zoo	Health Garden	Health Building	Office	Aged Care Home	Yacht	TOTAL
Questionnaire		●	●	●	●		●	●	7
Interview	●			●		●			4
Observation	●			●					2
Literature Review	●								1
TOTAL	2	2	1	2	1	1	1	1	

Figure 12. Investigation of design studies in terms of structure/area type-data collection technique

- **Sustainability**

There are 43 studies in total under the title of sustainability. 7 different types of buildings and areas were evaluated under the heading of sustainability, and the most evaluated building types are office and residence. 8 different types of evaluation were used in the evaluation of the buildings and areas under this heading, and the most frequently used evaluation methods are questionnaires and physical measurements (Figure 13). The most frequently used evaluation criteria under this heading are; acoustic, lighting, energy performance, energy consumption, visual comfort, indoor environmental quality, air quality, thermal comfort, thermal comfort, green building technology, water management.

Data Collection Technique	Bank building	Education Building	Different Building Types	Hospital	House	Office	Dormitory	TOTAL
Questionnaire	●	●	●	●	●	●	●	34
Physical Measurement		●			●	●		18
Interview		●		●	●		●	8
Observation					●	●		2
Mapping		●						1
Literature Review					●			1
Simulation					●			2
Data Analysis					●	●		3
TOTAL	1	5	1	2	16	16	2	

Figure 13. Investigation of sustainability studies in terms of structure/area type-data collection technique

- **Other studies**

There are a total of 10 studies under the title of other studies. The subjects of the studies are as follows; evaluation of physical elements in open spaces, evaluation of improvement works in buildings, quality evaluation of buildings, evaluation of program data in buildings, evaluation of quality of life in buildings, evaluation of retrofitting works in buildings, determining the deficiencies

of buildings, creating input for future designs, and evaluation of living behavior in spaces (Table 4). In these studies, 8 different building types were evaluated and the most frequently used data collection technique is the questionnaire.

Table 4. Examination of other studies in terms of structure/site type - data collection technique

SUBJECT	CONSTRUCTION TYPE	DATA COLLECTION TECHNIQUE	NUMBER of WORK
Evaluation of physical elements in open spaces	Public space	Observation	1
Evaluation of improvement works in buildings	Office	Questionnaire, interview, observation	1
Quality assessment in buildings	Health building	Questionnaire, interview, literature research	1
	Dormitory	Questionnaire, interview, observation	1
Evaluation of program data in buildings	Health building	Questionnaire, physical measurement, photography, interview, observation, literature review, semantic difference	1
Evaluation of quality of life in buildings	House	Questionnaire	1
Evaluation of reinforcement works in buildings	House	Physical measurement	1
Identifying the shortcomings of buildings	Mosque	Interview	1
Creating input for future designs	Aged care home	Questionnaire	1
Evaluation of living behavior in spaces	Zoo	Observation	1

3.9. Analysis of the Sample in the Context of Results

The examined studies show great differences in many aspects such as subject, method, sample size. The fact that the findings obtained as a result of each study are different causes the data to be incomparable. For this reason, the studies will be evaluated according to whether the studies examined in the conclusion part of the meta classification system make a recommendation for future studies. It was not possible to compare the findings of the study, as the 279 studies examined within the scope of the study showed great differences in many aspects such as subject, method and sample size. For this reason, the results of the studies were evaluated according to whether they made a suggestion for the future or not.

As a result of the evaluation, 79 of the studies made a suggestion for the future, while only the general evaluation of the study was made in the conclusion part of 200 of the studies. In order to produce better quality studies in the future, it is important to make inferences in the direction of future studies as a result of the study. However, in the vast majority of studies, it is seen that no suggestions are made for the future. Only about 28% of the studies made recommendations for future studies. Of these studies, 26 are performance, 16 are indoor environmental quality, 14 are user satisfaction, 12 are sustainability, 5 are other studies, 4 are energy, and 2 are design (Figure 14).
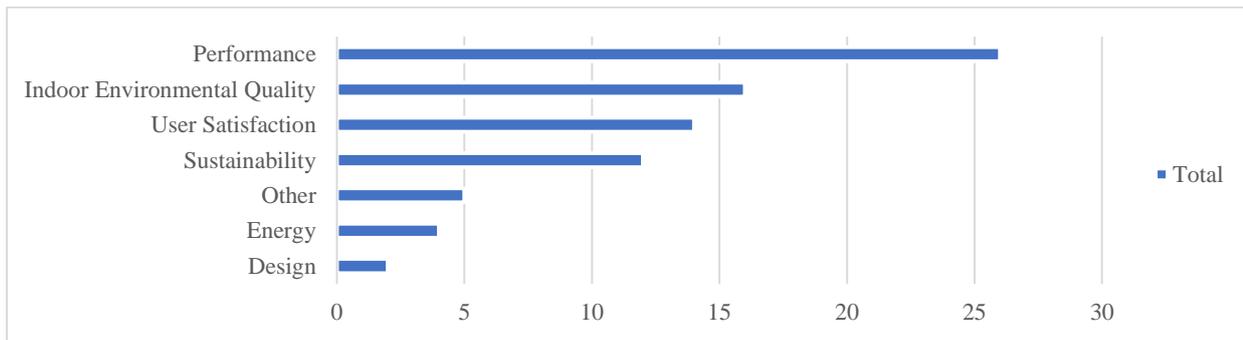
Figure 14. Distribution of studies that make suggestions for the future in the category of studies used as a method of POE by subject

4. DISCUSSION AND CONCLUSION

As a result of the study, it has been observed that the interest in the POE method has increased over the years in the academic field and it is possible to access the studies on POE through a large number of databases. As a result of the analysis of the studies with the meta-classification system, it is seen that although the subjects such as indoor environment quality, user satisfaction, building performance and green buildings are mostly discussed in the POE studies, the POE method can be applied on different subjects and different data collection techniques can be used according to the targeted purpose.

Although there are mostly studies on building types such as housing, office, and education in the studies examined, it has been concluded as a result of the research that POE is a method that can be applied to all types of buildings. In addition, it is seen that POE is a method that can be used not only on buildings but also for all kinds of built environments. In most of the studies, it has been determined that traditional data collection techniques are used and more up-to-date data collection techniques such as simulation are used less frequently. It is possible to carry out different studies and to deal with different subjects by spreading the methods that have been used more frequently in recent years, such as simulation and physical measurement as data collection techniques.

In future research, studies on different subjects and criteria can be done with the POE method. In particular, besides measuring user satisfaction in existing buildings, it is possible to provide input for future designs by evaluating the design decisions and results of the buildings. It is thought that the POE method can be used not only in the usage and design stages of the building life cycle, but also in the production stage, and by determining the successes and failures at this stage, it is thought that it can contribute to avoid similar problems that may be encountered in the future building production process.

It is thought that the data obtained as a result of POE studies can be used as a design criterion for architects and designers. By examining the POE studies on the type of building to be designed during the design phase of a project, it will be useful to consider the most common problems in that type of building and to learn what the users' expectations are from this type of building. User satisfaction and indoor environmental quality are the most frequently discussed issues in POE studies. Architects and designers can create design criteria for new projects by considering these issues. In this way, the repetition of dissatisfaction in the existing structures in the new buildings can be prevented and it can be beneficial to design better quality-built environments.

More conferences suitable for this field of study or workshops or seminars on this subject can be organized in order to disseminate the POE method and to present different ideas and studies. Conferences and seminars Making up-to-date speeches on POE is important in terms of following innovations and including them in studies. In addition, in order to raise awareness on the POE method, it can be considered as a subject in a part of the related courses at the undergraduate and graduate levels in universities. In this way, students' curiosity can be aroused in order to carry out studies on POE.

Guidelines on POE can be created for the practical use of the POE method. By creating evaluation templates in the guides, sample criteria and evaluation methods can be determined according to the building types or the subject to be discussed in the evaluation. In this way, it can be guided by providing a practical evaluation process for architects and researchers. We come across institutions in the world where such studies are carried out. More institutions could be established to carry out POE studies. In this way, POE can be disseminated and can be a guiding guide for users, owners and managers who want to improve the performance and quality of their buildings.

As in every profession, architecture is in a state of constant change and development. Making inferences from past studies can be considered as the most practical method for improvement. In this study, some statistical data were obtained with the evaluation made on the POE studies in buildings. It is thought that these data will be useful in both the theoretical and practical fields of architecture.

The data obtained as a result of the study will be useful in order to reveal more current studies in the academic field. It will also be useful in determining the missing points in the literature. For example, knowing the subjects and evaluation techniques or other related subjects in studies conducted in different countries can lead to studies in new subjects and fields. Academic studies support the development of architecture in the field of design and application. Such statistical data can guide architects and designers on what they should pay more attention to during the design and implementation stages of buildings.

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