

The Perspective of Turkey in the Post Occupancy Evaluation Studies

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Abstract

From past to present, the evaluation of structures has been the subject of both academic studies and practices through different systematic methods. One of these methods is the "Post Occupancy Evaluation". The method, whose first implementations date back to the 1960s, enables to process hard-to-evaluate data that is based on the dynamic structure of the user. It focuses on detecting the gaps between user satisfaction and physical environment. POE provides advantages in certain subjects such as comprehending the relationship among the use, attitude, and evaluation of the building performance, and making conscious decisions about the future building designs. In this study, a review was conducted about the definition and advantages of the "Post Occupancy Evaluation" as well as its introduction into the literature and its place in the literature. Subsequently, progressing further, the studies of this model in Turkey were presented. Concerning the studies conducted since the evaluation was introduced into the academy in Turkey, the qualifications, objectives and types of buildings they focused on were cited. It was determined that the majority of the studies were conducted on several building types, and mainly focused on design evaluations, user evaluations, energy performance evaluations, and IEQ evaluations that are defined as the direct objectives of the POE studies. By evaluating the findings, the deficiencies were discovered in the implementation of the method in Turkey and the development of country-specific evaluation protocols, the importance of the evaluation method was emphasized, and the need to improve the deficiencies was stated.

Keywords

Post Occupancy Evaluation, POE studies, user satisfaction, Turkey

1 POE Studies

Although the evaluation of structures is not systematic, it is based on methods in Mesopotamia of the king Hammurabi in the 17th century BC, in which the quality was treated as a very strict phenomenon (Preiser, 1994). Today, with the evolving technological conditions and spatial needs, architecture has become more complex. As a result, certain considerations such as decision-making process, improvement of the structured environments, and evaluation of the environmental impacts have been taken into consideration in a multidisciplinary way (Göçer et al., 2015). One of these methods, Post Occupancy Evaluation (POE), is an approach based on receiving feedbacks about factors of a building such as building performance, indoor quality, and user satisfaction (Li et al., 2018). It is a tool that focuses on user satisfaction and functional "compliance" assessment (Zimmerman and Martin, 2001). It is significant in order

for determining the potential gap between the performance of the building and the needs and expectations of the users (Bento Pereira et al., 2016). It includes a systematic evaluation of a given building from the viewpoints of its residents (Turpin-Brooks and Viccars, 2006). The differences of the POE studies from the general environmental and behavioral studies or applied social science studies are the validation of aimed intentions of design during the examination and the analysis of the impacts of design on the environment (Göçer et al., 2015).

According to Preiser (1994), the advantages of post occupancy evaluation are monitored in three stages:

1. *Short Term Advantages (Urgent actions)*

- Defining and presenting solutions for the problems in the buildings,
- Enabling a building management that meets the values of the building and users,

- Measuring the functionality and the compliance of the design,
 - Receiving feedbacks about the improved spatial use and performance requirements,
 - Giving satisfaction to the building residents through active participation in the evaluation process,
 - Comprehending the performance impacts of the changes dictated through the budgetary cuts,
 - Consciously deciding about the design and comprehending the results of the design.
2. *Medium-Term Advantages (3-5-year time periods)*
 - Adaptation of the buildings to the changes in time including the transformation into new usages,
 - Providing cost saving during the lifetime of the building,
 - Adding the responsibility of meeting the minimum building performance by the designers.
 3. *Long-Term Advantages (10-25-year time periods)*
 - Long-term improvements in the building performance,
 - Defining the design databases, standards, criteria, and counselling literature for the repetitive buildings,
 - Measurement of building performance (Preiser, 1994).

In brief, Post Occupancy Evaluation provides various activities and advantages such as evaluation of the building performance, examining the relationships between resident attitudes and building use, space optimization for the building residents, and making more conscious decisions for future building designs (Li et al., 2018).

The POE studies are observed in three types (see Fig. 1):

1. **Indicative POEs:** It is the indicator of important strengths and weaknesses of the performance of a given building (Preiser, 1994). It includes building evaluations with a short inspection process, interviews with the users, general building performance

inspections, and evaluations of archival documents (Turpin-Brooks and Viccars, 2006).

2. **Investigative POEs:** It's a more in-detail method. Objective evaluation criteria are clearly defined in the functional program of a building, or they are compiled from the guides on a certain type of building, performance standards, and published literature (Preiser, 1994). It includes research surveys completed in a time period ranging from a week to several months. The answers can be adapted to a certain type of building. Solutions are presented that are appropriate for the problems (Turpin-Brooks and Viccars, 2006).
3. **Diagnostic POEs:** It includes complex data collection and analysis methods taking long times ranging from several months to several years. It includes surveys, interviews and physical measurements (Turpin-Brooks and Viccars, 2006). The environmental measurements are related to the subjective user answers in the studies. Sample POE case studies in these 3 stages can be found in Preiser et al. (1988) and Preiser (1994).

In this study, the introduction of the abovementioned "Post Occupancy Evaluation Method" into the literature, its place in the current literature, and studies particular to Turkey will be reviewed. Thus, the qualifications and deficiencies of the studies conducted in Turkey will be presented. It is considered that the data of the research will provide an insight for further studies in this field in Turkey.

2 Introduction of POE into the literature and its place in the world literature

The organization, service quality, and productivity studies of the architectural practices conducted by The Royal Institute of British Architects (RIBA) in the early 1960s were effective in the development of the POE. In context of these studies, it was stated in the report of the RIBA (RIBA, 1962:p.15): "The RIBA should gather and disseminate information and experience on user requirements ..." which was presented as the proof of this impact (Cooper, 2001).

In the late 1960s, Sim van der Rijn from the California University, and Victor Hsia from the Berkeley and Utah Universities conducted systematical studies about the situation assessment of the student dormitories in the universities. However, these studies were not named as POE until the 1970s. The first publication with the POE title was an assessment, which was conducted by Herb McLaughlin on the hospitals in San Francisco and published in the AIA journal in January 1975 (Preiser, 2005). Among the other pioneers of these studies was Thomas A. Markus (Li et al., 2018).

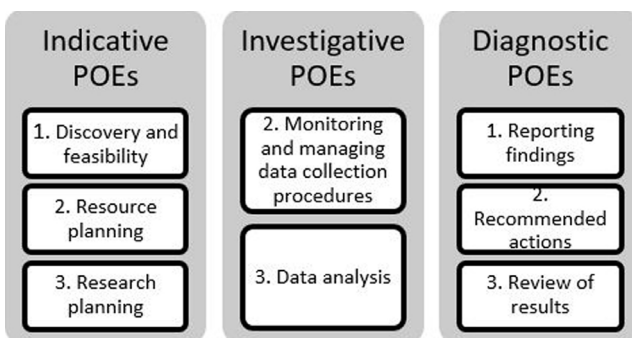


Fig. 1 Stages of POE studies (Source: Preiser, 1995)

In 1988, Preiser, Rabinowitz and White, who were among the leading POE researchers, wrote the first POE textbook under the title "Post Occupancy Evaluation". A year after the publication, it was published with case studies from around the world (Preiser, 2005). Following this first book, George Baird et al., introduced the book titled "Building Evaluation Techniques" in 1996, including 120 evaluation concepts, techniques, and tools in terms of "how to do" (Li et al., 2018). After these years, POE studies continued with building inspections and model proposals. A list of the main studies conducted is presented (see Table 1). The studies are defined as the turning points of the POE studies between 1967 and 2017. Although early studies are often unavailable, as understood from the quotations of Preiser (1994), it can be mentioned that the studies were mainly defining the study field, specifying its significance, developing the evaluation elements, and proposing evaluation methods. Since 1995, increasing POE studies have gone beyond building evaluation method proposals, and ultimately gaining the status of a protocol.

Roughly defining the studies, it is observed that these studies focus on structures such as office, education, dormitories, health, housing, etc. In these studies, environmental comfort elements were examined such as visual comfort, summer and winter temperature, and indoor air quality, lighting, acoustics, humidity, fire protection, and functional comfort elements such as design, needs, efficiency, health, operation and maintenance, furniture, providing individual space, guiding, materials, as well as cost-related subjects such as energy consumption involving electricity, gas, and water and budgeting. Interview and survey methods were used for the qualitative data, and measurement method was used for the quantitative data.

According to a 2018 dated source, evaluating the performance and user satisfaction of a building during its use is relatively underdeveloped compared to the evaluation methods applied during the design phase. Statistical analyses obtained by creating a POE database for building performance have emerged in the last 5-10 years (see Fig. 2) (Li et al., 2018).

It is observed that the studies focused on the performance of green and traditional buildings, the advantages and disadvantages of various criteria for the IEQ satisfaction, the impact of spatial configuration (open-plan office and closed office) on the IEQ satisfaction, gender differences of the office staff concerning the IEQ perception, relationships between user satisfaction and indoor

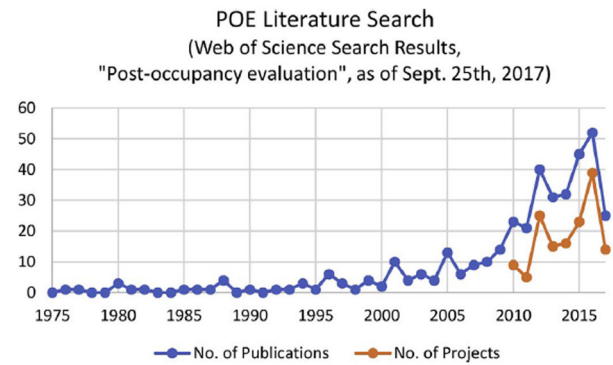


Fig. 2 POE studies in literature (Source: Li et al., 2018)

environmental parameters and structural characteristics, individual IEQ factors and general relationships among them, workspace satisfaction, and the impacts of non-IEQ factors (office type, spatial layout, distance from the window, building size, gender, age, type of work, work space and weekly working hours) on the user satisfaction (Li et al., 2018).

POE analyses of different structure types vary both in terms of their objectives and methods. Studies conducted on housing, offices, universities, kindergartens, and medical buildings differ in terms of user comfort, user productivity, and analysis of behaviors, accessibility and navigation, as well as analyses requiring physical measurement (Li et al., 2018). When studies conducted on the POE were examined, it was observed that the popular research topics were housing, office, and educational structures and most of the building examinations were carried out in this area. However, it was understood that there was a gap in the literature concerning studies on commercial, transportation, and state structures (see Fig. 3).

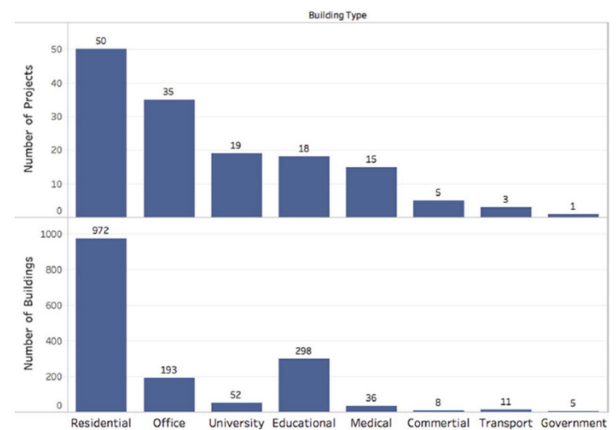


Fig. 3 Distribution of POE studies by building types (Source: Li et al., 2018)

Table 1 Chronological list of major POE studies¹

Year	POE protocol	Country	Researcher	Building type	Note
1967		America	Van der Ryn and Silverstein (California)	Dormitory	Rooms, socializing spaces, working environment, meals, intellectual environments, furniture and tools, through the common areas, the adequacy of physical properties, maintenance, cost, wet volume arrangements were evaluated (Van der Ryn and Silverstein, 1967).
1969		America	Preiser	Dormitory	The publication, named Behavioral design criteria in student housing, was not accessible. Preiser (1994) stated in this publication "Environmental Performance Profiles: subjective and objective correlation, measures of performance" were evaluated.
1971		England	Field	Health facilities	The publication, called Evaluation of hospital design: a holistic approach: Tufts-New England Medical Center, was not accessible. Preiser (1994) stated in the publication that the "multi-method approach to data collection" was addressed.
1972		England	Markus et al.	-	The publication, named Building performance, was not accessible. Preiser (1994) stated in the publication that the "cost-based structure performance evaluation model" was addressed in this publication.
1974		America	Becker	Corporate housing	The publication, called Design for living: the residents' view of multi-family housing, was not accessible. Preiser (1994) stated in the publication that the "cross-sectional, comparative approach to data collection and analysis" was addressed.
1975		Britain	General Services Administration	Office	Topics such as budgeting, leasing, communications, telecommunications, materials, project management, energy and environment are evaluated (General Services Administration, 1975).
1976			Department of Army	Military facilities	The publication was not been accessed. Preiser (1994) said that in this publication Design Guide series with updatable, state-of-the-art criteria was evaluated.
1976			Rabinowitz	Educational facilities	The publication was not been accessed. Preiser (1994) said that in this publication comprehensive, full-blown assessment on technical, functional, and behavioral factors was addressed.
1979		America	Francescato et al.	Corporate housing	The publication, called Residents' satisfaction in HUD-assisted housing: Design and management factors, was not accessible. Preiser (1994) stated in the publication that "evaluation models "of resident satisfaction" allow for physical management intervention" are addressed.
1979		Canada	Canadian Public Works	Public buildings	The publication was not been accessed. Preiser (1994) stated in the publication that Poe was included in the project delivery system.
1980-81			Daish et al.	Military facilities	The publication was not been accessed. Preiser (1994) stated in the publication that "the necessity to conduct POE as routine personnel activity in the government building process" was addressed.
1981			Marans and Spreckelmeyer	Office	Preiser (1994) stated in the publication that the "evaluation model linking perceptual and objective qualities" was addressed.
1982		America	Parshall and Pena	-	The publication, called Evaluating Facilities: a Practical Approach to Post Occupancy Evaluation, was not accessible. Preiser (1994) stated in the publication that "simplified and standard assessment methodology" was addressed.
1983			Orbit 1	Office	The publication was been accessed. Preiser (1994) stated in the publication that "office research linking buildings and information technology" was addressed.
1984		England	Brill et al.	Office	The publication, whose name is "Using office design to increase productivity" was not accessible. Preiser (1994) stated in the publication that "linking worker productivity and office design" is addressed.

¹ This table was developed by adding resources and information previously cited by Preiser (1994) and Li et al. (2018).

Year	POE protocol	Country	Researcher	Building type	Note
1985			White	-	The publication was not been accessed. Preiser (1994) stated in the publication that "programming and POE connectivity in graduate architecture education" was addressed.
1986			Kantrowitz et al.	Educational facilities	The publication was not been accessed. Preiser (1994) stated in the publication that "POE's analysis of the entire building process and documentation" was addressed.
1986		America	Preiser, Pugh	-	The publication, named Senior centers: a process description of literature evaluation, walkthrough post occupancy evaluations, was not accessible. Preiser (1994) stated in the publication that the "POE process model and levels of effort" were addressed.
1989		Canada	Vischer	Office	The publication, whose name is Environmental quality in offices, was not accessible.
1991		America	Petronis	Health facilities	The publication has not been accessed. Preiser (1994) stated in the publication that "activation process analysis and guidelines for VA hospitals" were addressed.
1995	Post Occupancy Review of Building Engineering (PROBE)	Britain	Energy for Sustainable Development, William Bordass Associates, Building Use Studies, Target Energy Services	Office, University, Education, Medical, Government Buildings	Elements of comfort (scores for summer and winter temperature and air quality, lighting, noise, and general comfort) and other satisfaction criteria (elements based on ratings for design, needs, efficiency, and health) were evaluated (Leaman and Bordass, 2001).
2002	Health Optimization Protocol for Energy-efficient buildings (HOPE)	Europe	Bluyssen et al.	Energy efficient buildings	Health-related performance criteria are based on an expert assessment of the information available in standards, guidelines and research papers. Building design, interior climate, indoor air quality (chemical, physical and biological contaminants in relation to ventilation, the cleaning of HVAC systems and components, construction equipment, and emissions from commissioning, operation and maintenance requirements performance criteria specified; performance criteria, among others, heating, cooling, air conditioning, cooking and office Appliances, Lighting, Building Services, Building Automation System, domestic hot water) are defined (Bluyssen et al., 2003).
2003	NEAT	America	Lofness et al.	Office, education and hospital buildings	Thermal, visual, acoustic and air quality environment at a height of three by measuring the temperature, relative humidity, carbon dioxide (CO ₂) and carbon monoxide (CO) is the amount of total particles (particulate matter (PM) 2.5 and PM 10) and volatile organic compound (VOC), light levels, sound levels, air velocity and radiant temperature conditions are discussed (Lofness et al., 2009).
2006	Ecosmart	Canada	Keen Enginerrng.		Energy consumption and demand measurements, measurement of water consumption, with the building owner interview, interviews with employees, toilet and bath fixture assessment, indoor air quality measurements, illumination measurements, acoustic measurements, thermal comfort measurements, complementary discussion with representatives reviewed the design team and user has been discussed (Keen Engineering, 2006).
2006	The development of robust methods of post occupancy evaluation	Britain	Turpin-Brooks and Viccars	Office	As part of a sustainable approach to workplaces, POE aims to emphasize the importance of evaluation in the process of Use and to guide the selection of tools. Choosing the right POE level, environmental conditions, occupancy satisfaction, relationship between efficiency and motivation, advantages and disadvantages of data collection techniques, comparison of POE tools and alternative methodologies are transferred. Thus it sets out suggestions towards a more holistic approach (Turpin-Brooks and Viccars, 2006).
2011	Creative Energy Homes (CEH)	Britain	Spataru and Gillott	Residence	The number of active users for 24 hours, the way a person uses space for 24 hours, environmental conditions against energy consumption for 24 hours, the distribution of cooking order in the dining room area by electricity were examined (Spataru and Gillott, 2011).
2011	Building Occupants Survey System Australia (BOSSA)	Australia	Candido et al.	Office	In this paper 9 criterias IEQ (Spatial comfort, indoor air quality, perceived controllability, noise, distraction and privacy, the connection between indoor and outdoor environments, the image of the building, individual space, thermal comfort, visual comfort) developed. Bossa handles these 31 criterias IEQ (Candido et al., 2016).

Year	POE protocol	Country	Researcher	Building type	Note
2013	CBE Building Performance Evaluation (BPE) toolkit	America	Heinzerling et al.	Office	Acoustics, indoor air quality, lighting / daylight, thermal comfort, wireless system have been studied in the study (Heinzerling et al., 2013).
2014	A Diagnostic POE Model for an Emergency Department	America	Guinther et al.	Health facilities	Environmental data focus on the environmental characteristics of the areas and their effects on care delivery, the sound environment, visual environment, security development, guidance system, treatment rooms, family support areas, Personnel Support areas, privacy and communication are examined. The experience topic focuses on the impact of design on patients, families and carers, and the visitor experience and staff experience are examined based on demographics. Organizational outcomes are examined by focusing on the impact of design layout on delivering efficient, reliable and safe maintenance (Guinther et al., 2014).
2015	A post occupancy evaluation framework for LEED certified U.S. higher education residence halls	America and Canada	Alborz and Berardi	Dormitory	The building's water, electricity and gas consumption and on-site renewable energy production, building systems commissioning, indoor air temperature and humidity monitoring, preventative maintenance program for HVAC systems and Building Preservation, building automation control systems (BACS) or building energy management systems (BEMS) use, IAQ parameters, controllability, user friendliness, end user, consumer awareness, indoor sound insulation, addressed (Alborz and Berardi, 2015).
2015	Framework model for Post occupancy evaluation of school facilities	Saudi Arabia	Hassanain and Iftikhar	Educational facilities	In the title the technical performance requirements of thermal comfort, visual comfort, acoustical comfort, indoor air quality and Fire Protection, the basic requirements of functional performance in the title space, the types, class design, interior design, and aesthetics and the adequacy of toilet facilities is to ensure the quality (Hassanain and Iftikhar, 2015).
2016	Capturing the social value of buildings: The promise of Social Return on Investment (SROI)	Britain	Watson et al.	Health facilities	Elements defined as "social value" are addressed through different conceptualizations of building users, user groups and nested user groups, looking beyond an individual user, and variables that govern building user group dynamics (Watson et al., 2016).
2017	Developing a performance evaluation scheme for engineering facilities in commercial buildings	People's Republic of China	Lai and Man	Commercial units	The study recommends a total of 71 indicators classified in five categories: physical, financial, equipment qualifications. (iv) environmental fitness to be evaluated finally under the headings health and safety (Lai and Man, 2017).

The leading centers of POE are the University of Illinois in Champaign-Urbana, the University of Utah, the campuses of University of California in Berkeley and Davis, psychology department at the University of Arizona, New York City University, architecture departments of the University of Illinois, the University of Maryland, New Jersey University Department of Technology, and North Carolina State University. In Brazil, The Building Research Station, The Department of Environment is responsible for extensive POE research from. Additionally, government-funded POE research has also been conducted in Norway, Sweden, Denmark, Eastern Europe, and New Zealand. In the United States, the necessity of private research has been emphasized (Marcus and Francis, 1998).

Many POE protocols were proposed in the United Kingdom, the United States, Canada and other countries; however, it could not gain a singular POE protocol in its worldwide or nationwide dominance (Li et al., 2018). POE studies in Turkey are limited to academic publications, without having a chance in practice, therefore, necessary steps were not taken to regulate a nation-wide protocol.

3 The place of POE in the Turkish literature

Examining the POE studies in Turkey, it is possible to mentioned that the term "Post Occupancy Evaluation" was used in the studies in the literature as "Kullanım Sonrası Değerlendirme" and "Kullanım Sürecinde Değerlendirme" (both of this Turkish terms mean in English "Post Occupancy Evaluation").

In this study, the studies of POE were grouped as masters' theses, doctoral theses and academic articles. Although the history of these works dates back to 1990, it has been observed to become widespread in the 2000s. Studies have been extensively published in the literature as academic articles (see Fig. 4).

The popular building types of the research field are residential buildings, urban area works, and educational structures. It is also possible to observe certain studies conducted on health structures, office structures, dormitories, and administrative structures. Post office, commercial unit, floating structures, traditional inn structure, chamber of architects building, smart buildings, transportation structures, monumental structures, and sports structures were also listed in the graph as other structures studied within the context of POE (see Fig. 5).

In master's theses and articles, POE often remains at the level 1, which was defined by Li et al. (2018), and it includes direct objectives such as design evaluations,

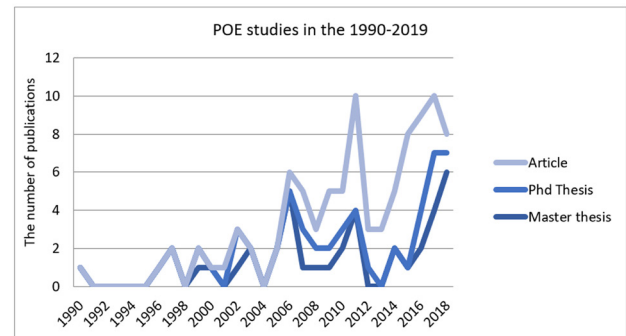


Fig. 4 POE studies in Turkey by year²

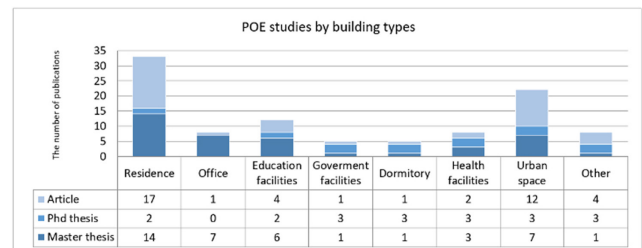


Fig. 5 POE studies by building types in Turkey

user evaluations, energy performance evaluations, IEQ evaluations, and building evaluations. As per the doctoral theses, they are often conducted for indirect objectives at level 2 such as defining problems, providing information for further studies, developing a POE method, standardizing, technology evaluation, and verifying models (see Fig. 6). Although the studies cover level 2 objectives, they remain mostly theoretical and do not correspond in practice. Therefore, a country-specific evaluation standard was not developed.

In addition to the academic publications on the subject, the place of studies of POE was examined concerning the official implementations in Turkey. In this context, a research was conducted through Turkey's official information system of regulations which can be accessed at the website: www.mevzuat.gov.tr (e-Mevzuat). This database collects the laws of the country, its statutory decrees, statutes, the codes of the Council of Ministers, codes of institutions, the university regulations and communiqués, takes out null and void ones, and allows for access to their final versions as well as the amendments. Certain keywords of the study such as "Kullanım Sürecinde Değerlendirme, Kullanım Sonrası Değerlendirme, bina

² The studies were obtained from <https://tez.yok.gov.tr/> (Ulusal Tez Merkezi) and <https://scholar.google.com> (Google Scholar) site between 1990–12 April 2019 by scanning the "Kullanım sonrası değerlendirme" which means "Post Occupancy Evaluation" in English.

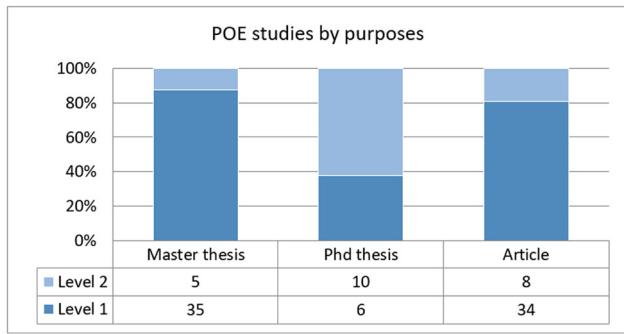


Fig. 6 POE studies by purposes in Turkey³

değerlendirmesi, kullanıcı memnuniyeti" (this Turkish terms mean in English respectively "Post Occupancy Evaluation, building evaluation, user satisfaction") were scanned in the Turkish database on 01.07.2019. According to the information system of regulations, no expression was found under these topics. This shows that the issue does not correspond to state practices.

4 Conclusion

POE studies provide significant data for improving, managing, and designing buildings by carrying clues

3 Level 1 (Direct objectives): Design assessments, User assessments Energy performance assessments, IEQ assessments, Building assessments

Level 2 (Indirect objectives): Identify problems, Giving information to future studies, Developing POE method, Standard setting, Evaluating technology, Verifying models (Li et al., 2018)

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about future problems in the same type of building, and the lessons learned for managers. Through this method, it is possible to increase both building performance and user satisfaction. Thus, a structured environment can be obtained, which is consistent with its function and can establish positive relations with its user.

Although the introduction of POE studies into Turkish literature dates back to 1990, it is possible to see that it has gained momentum after the 2000s. Initially, studies were conducted on defining the research field, stating its importance, developing evaluation elements and defining the method of evaluation, but over time, it has reached to an advanced level such as being a protocol. Considering its course in Turkey, although the articles, masters' theses, and doctoral theses involving the POE studies and conducted between 1990-2019 did not reach the desired level, it was determined that they focused on limited architectural spaces such as residential buildings, urban area studies, and educational structures. It was also determined that design evaluations, user evaluations, energy performance evaluations, IEQ evaluations, building evaluations, all of which are defined as the direct objectives of POE studies, were mainly addressed. Rather than accumulating these studies on specific topics, an important step will be taken to put the method into practice by developing research studies involving indirect and direct objectives specific to each building type, moreover new POE protocols will be improved specific to building types.

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