

Post-occupancy evaluation Correlated with Medical Staffs' Satisfaction: A Case Study of Indoor Environments of General Hospitals in Sulaimani City

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ABSTRACT

This study aims at identifying the notion of Post-Occupancy Evaluation (POE) pertinent to the performance of three general hospitals constructed inside the Sulaimani City, tracing the relationship between the quality of the indoor environments and medical staff (doctors and nurses) satisfaction level. Using some indoor environment elements in the right way will positively influence the mood, stress level of the medical staff, and patient recovery as a result. The POE toolkits (AEDET and ASPECT) have been implemented on targeted wards at the selected hospitals. AEDET and ASPECT questionnaires were distributed among 152 medical staff to obtain their perspectives. In total, 112 valid questionnaires were received. The medical staff at tested hospitals were generally satisfied with the quality of newly built hospitals' indoor environment. The results have shown that exploring medical staff experiences can expose factors that affect their satisfaction levels. Also, the findings reveal that the building's physical quality can be vastly related to the fulfillment of the medical staff's satisfaction. Moreover, the findings underline the role of the quality of the indoor environment in increasing medical staff's satisfaction levels, informing design decisions. Additionally, the persuasive associative outcomes have proven that POE (AEDET and ASPECT) will be pertinent as a tool to the building's physical quality.

Keywords: POE, Medical Staffs' Satisfaction, Healthcare facilities, AEDET and ASPECT, Indoor environment.

ارتباط تقييم ما بعد الإشغال بمستوى رضا الكادر الطبي: البيئة الداخلية في المستشفيات العامة في مدينة السليمانية - حالة دراسية

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الخلاصة

يهدف البحث إلى تحديد مفهوم تقييم ما بعد الإشغال (POE) المتعلق بمدى كفاءة ثلاثة مستشفيات مبنية داخل مدينة السليمانية، لغرض تحديد طبيعة العلاقة بين مستوى رضا الكادر الطبي (الأطباء والتمريضيين) وكفاءة البيئة الداخلية لهذه للمستشفيات. إذ

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يؤثر الإستخدام الصحيح لبعض عناصر البيئة الداخلية للمستشفيات بشكل إيجابي على خفض مستوى القلق عند الكادر الطبي مما يعكس على عملية شفاء المريض بشكل عام. إعتد البحث المنهج التحليلي الوصفي نظراً لملائمته مع طبيعة البحث بإستخدام المقياس الكمي والمتمثل بإستمارة الإستبانة المعروفة بـ (AEDET و ASPECT) في وحدات الإقامة التمريضية في المستشفيات المختارة. فقد تم توزيع 152 إستمارة إستبانة على عينة الدراسة ومن ثم تم إسترداد 112 إستمارة إستبانة صالحة بعد ملئها من قبل المستبنيين لمعرفة وجهة نظرهم حول كفاءة البيئة الداخلية. ومن أهم النتائج التي توصل إليها البحث شعور الكادر الطبي بالرضا عن البيئة الداخلية للمستشفيات المبنية حديثاً بشكل عام. كما أظهرت النتائج دور خبرات الكادر الطبي في تحديد العوامل المادية المؤثرة في مستوى رضاهم. كما وبينت النتائج أن كفاءة البيئة المادية للفضاءات الداخلية يمكن أن تكون مرتبطة إلى حد كبير بتحقيق الرضا عند الكادر الطبي، وأن التغييرات الإيجابية في التصميم الداخلي لهذه الفضاءات قد تتعكس إيجاباً على مستوى رضاهم. كما أكدت النتائج على دور مكونات البيئة الداخلية في زيادة مستوى رضا الكادر الطبي والمساعدة في توجيه القرارات التصميمية. وخلصت الدراسة الى ملائمة إستخدام أدوات تقويم ما بعد الإشغال المعروفة بـ (AEDET و ASPECT) في تحديد طبيعة العلاقة بين كفاءة البيئة المادية ومستوى رضا الكادر الطبي في البيئة الداخلية للمستشفيات.

الكلمات الرئيسية: تقويم ما بعد الإشغال، مستوى رضا الكادر الطبي، الأبنية الصحية، إستبانة (AEDET و ASPECT)، البيئة الداخلية.

1. INTRODUCTION

Healthcare facilities are currently regarded as one of the most complex institutional constructions, including complicated performative and medical supplies in healthcare buildings and some subtle and less concrete concerns, as the satisfaction of the users. Although it will be initially built for the patient's well-being, the hospital's functional properties will come before physical and psychological properties influencing the patient. Consequently, innovative hospital design has regarded new medical care movements, medical staff needs, and health technology requirements, providing the patient with medical care in the best possible ways (Grah and Stigsdotter, 2010; Cesario, 2009).

The research has shown that hospital indoor environments influence the patient, visitors, and staff. Some elements have been scrutinized to constitute the hospital's indoor environments, and if used in the right way, they will have a positive impact on medical results. It is hypothetically possible for a hospital's indoor spaces to influence the mood, stress level of the healthcare users (Whitehouse, et al., 2001).

Compared to other sectors, public buildings in the region of Kurdistan north of Iraq occupy a distinctive location. Despite the vital significance of continuous managing and maintenance processes pertinent to such buildings and facilities, there is no regular and organized method for implementing that (Mustafa, 2017). The qualifications and criteria sometimes do not comply with anticipations and changeable users' requirements affected by various factors such as religion, culture, education, and locality. A lot of complaints from those buildings' users are connected with deficiencies and inadequacies after being occupied, like performativity and functioning efficiency, spaces' accessibility concerning distribution and arrangement, thermal comfort, air circulation, and daylighting, safety, productivity, and security (Meir, et al., 2009). Hence, POE can be assumed as a multidimensional instrument adopted in managing problem-solving related to buildings and



facilities as a way to assess the performance of buildings after a systematic collection of data (**Mustafa, 2017**). POE is now a significant tool by which the building's design and operations are improved in solving misconceptions and filling gaps that can be frequently found between client and design anticipations to a specific performativity level. The practice of POE relates to incorporating users' needs and place of work (**Husin, et al., 2015**).

In the region covered by this study, little real evidence is available to find out the main problems and exact causes of "insufficiency" or "dissatisfaction" in available buildings of healthcare and services. POE is not yet adopted for government and public buildings in the region of Kurdistan north of Iraq (**Mustafa, 2017**). Therefore, POE is defined as the best strategy of an application approved in assessing governmental and public buildings' functioning in general constructions and Hospital buildings in Kurdistan north of Iraq, which is not implemented up to now.

2. LITERATURE REVIEW:

All kinds of assessments are conducted throughout the design, building, and habitation stages of a construction project. Post-occupancy evaluation (POE) has been developed during the past 25 years, as critical masses of experience; discoveries, applications, and reliability have been accumulated. POE differs from traditional studies on construction performance when focusing on necessities and requests of the building's occupants. For POE, occupant requests and needs are put at (3) levels of the main concerns, which are; (i) safety, security, and health; (ii) performative and effectiveness requirement; (iii) psychological comfort or satisfaction (**Husin, et al., 2015**)

Researchers agree on the definition of POE as a systematic and rigorous method of evaluating the performance of buildings after occupation. In this regard, Preiser et al. (**1988**) say that POE is "the process of evaluating buildings systematically and rigorously after they have been built and occupied for some time". Similarly, Watson (**2003**) states that it is a regular evaluation of people's attitude using the occupied constructions. Usually, POEs have targeted delivering building considerations that function appropriately and focusing on the considerations that are not supposed to be reiterated in the upcoming construction designs.

POE has developed out of architectural programming practices in the late 1950s and the beginning of the 1960s in the US, Canada, France, and the UK. Early significant evaluative attempts came as a response to hard problems the institutions faced, like mental hospitals and reformatories, some of which belong to the built surroundings. The middle of the 1960s has seen the research progress emphasizing the relationship between human beings' behavior and the design of buildings, causing a new arena of an environmental design study to be formed. During the 1970s and 1980s, a significant increase was observed pertinent to the scope, number, difficulty, and scale of assessment research and publications. The last decades of the twentieth century have been the age of applied assessment that POEs have been consistently conducted in (**Mahmood and Tayib, 2019; Woon, et al., 2014; Malkoc and Ozkan, 2010**).

From an architectural perspective, assessment research comes under (3) aspects related to the environment: i.e., the physical, social, and socio-physical environments. Under all circumstances, there is a notion that occupants will make judgments on their settings' competence based on pre-specified criteria of quality. Some researchers assess cognitive replies to the physical



setting, emphasizing topics like the perceived quality of constructions and ecological quality. The utmost significant advantage of POE can be regarded as the ongoing development of services' quality and functioning. It is especially advantageous in projects including repeated building programs or where many services become distinctive, like the healthcare facility (Nwankwo, et al., 2014; Lawrence, 2013).

The previous studies emphasize the impact of the working environment on medical staff efficiency, productivity, and satisfaction. They identified that well-designed hospital indoor environments had enhanced medical staff satisfaction; reduce medical errors, and decrease staff stress and injuries (Ulrich, et al., 2008). Uncomfortable indoor environments can reduce productivity and increase absenteeism from work (Huisman, et al., 2012). Design evaluation toolkits for healthcare facilities have been specifically promoted worldwide to have a hospital environment that gives the best performance in terms of function, merely trying to do this. AEDET Evolution (Achieving Excellence Design Evaluation Toolkit) and (A Staff and Patient Environment Calibration Toolkit) ASPECT as POE tools enable the users to assess the design by producing a design evaluation profile (DH Estates and Facilities, 2008a & b). British Healthcare Design Centre suggests the possibility of assessing healthcare design according to three simple titles: Impact, Excellence, and Functionality. Patient and staff environs in a healthcare facility are important in producing 'Impact' (Ghazali and Abbas, 2011).

Previous research has hardly incorporated the fulfillment of users to design the quality of healthcare buildings in projects belonging to the public and government in Kurdistan north of Iraq. Accordingly, this research aims at bridging this research gap. The main objective of this research is to find whether the government building medical staff (doctors and nurses) of Jemhuri General Hospital (JGH), Shar General Hospital (SGH), and Educational General Hospital (EGH) in the city of Sulaimani are satisfied with the overall quality of interior design provided by healthcare buildings or not. This research's significance lies in determining the shortages that could have affected the interior design of wards that can be more supportive and contribute to understanding the field of assessing design quality of healthcare buildings and services regarding POE and the medical staff. The term POE is novel in the region of Kurdistan. A lot of construction experts are unacquainted with such an approach in assessing building functioning, and POE, like a regular approach of data collection on occupied constructions, has not received extensive usage concerning healthcare buildings and services the region of Kurdistan north of Iraq, which is the need for this study.

2.1. User Satisfaction:

The area in Architecture, environmental design, anthropology, psychology, and society has begun to produce a new specialization called "environmental psychology". Investigators working in this problem field are concerned with interactive effecting between human behavior or individuals and the setting of their behavior in the physical environment (Lo Verso, et al., 2016). The problems and their causes must be recognized, and the causes affecting the fulfillment level need to be specified. A factor that is the most significant one, like a criterion for a building's success in fulfilling the design purposes, is the extent of the occupant's fulfillment. According to the space of



the research, the satisfaction of the users has been viewed differently with different definitions according to the space of the research (**Kamaruzzaman, et al., 2018**). It denotes the relation between the user's satisfaction and IEQ (visual, air quality, acoustic and thermal qualities) beside characteristics of the interior spaces and place of work (such as cleanliness, aesthetic appearance, furniture, and size) (**Mahmood and Tayib, 2019; Frontczak, et al., 2012**).

The research of fulfillment cut across a broad group of disciplines in management, social sciences, and built environment (**Ibem, et al., 2013**). Briefly, fulfillment is a measure of dissimilarity between real and expected functioning of products or services in fulfilling users' requirements and anticipations from the occupants' or consumers' viewpoint during or after the experience of consumption. In general, fulfillment is a subjective assessment of products' or services' functioning in satisfying occupants' or customers' requirements and anticipations (**Hanif, et al., 2010**). Lawson et al. (**2003**) study the impacts of hospital settings on the medical staff, and they have presented that the healthcare setting has an important role to play to support the recovery of the patient. Moreover, Douglas and Douglas (**2004**) recommend providing a hospitable homely environment, which will support health and well-being. User satisfaction studies indicated some relevant physical environment features that could be considered during design (**Mourshed and Zhao, 2012**).

Zagreus et al. (**2004**) indicate that the building occupants' viewpoints are very significant in scrutinizing the building's performance to fulfill the users' requirements and anticipations. The assessment of medical staff environment performance has conventionally been built either on physical monitoring or on the surveys of users' satisfaction. This can be regarded as significant, as occupants will show their opinions and/or emotions about occupied buildings depending on their experience and connections with constructions, compared to the viewpoints of specialists designing and constructing buildings, yet they may never use them. Since patients frequently experience intensified sensitivity to interpersonal events as well as their physical environment, hospitals need to take distinctive care in offering a pleasant, psychological comfort and supportive environment (**Mourshed and Zhao, 2012; Huisman, et al., 2012**).

3. RESEARCH METHOD:

The current research has been built on medical staff fulfillment surveys that adopt the coming methodological steps to achieve the goals and solve the research problem.

3.1. The case studies:

The case studies have involved three general hospital wards in Sulaimani City. The hospital wards chosen for the research have included (JGH) Jemhuri General Hospital (which has been renewed in 2000) **Fig.1**, (EGH) Educational General Hospital (which has been renewed in 2005) **Fig.2**, and (SGH) Shar General Hospital (which has been built in 2013) **Fig.3**. In total, 37 doctors and 75 nurses were involved in this study, as presented in **Table 1**. The new hospital was the benchmark for the hospitals' selection, which was built or completely renovated in the last two decades.



Figure 1. Jemhuri General Hospital JGH Indoor Environment.
(Source: Researcher).



Figure 2. Educational General Hospital EGH Indoor Environment.
(Source: Researcher).



Figure 3. Shar General Hospital SGH Indoor Environment.
(Source: Researcher).



Table 1. Hospitals involved based on the year of built or renovation and number of respondents, (Source: Researcher).

| Hospitals | Year of built or *Renovation | No. of Beds | Respondents (Doctors) | Respondents (Nurses) |
|-----------------------------------|------------------------------|-------------|-----------------------|----------------------|
| (SGH)Shar General Hospital | 2013 | 400 | 18 | 32 |
| (EGH)Educational General Hospital | 2005*R | 320 | 12 | 25 |
| (JGH)Jemhuri Genral Hospital | 2000*R | 200 | 7 | 18 |
| Total Respondent | | | 37 | 75 |

The method of collecting data has been implemented to assess the physical environs using ASPECT Toolkits and AEDET Evolution that has been used by the UK' National Health Service (NHS) since 2008 to assess the influence of healthcare indoor physical environment on staff and patient satisfaction levels (Mahmood and Tayib, 2020) in their original form. Observation of the wards, personal visits to sites, and surveys have been added to the toolkits' evaluations. Consents, recognized via formal applications, have been primarily taken from hospitals' directors before visiting the site. Representatives from those hospitals went together with the site visits offering answers to spontaneous general explorations about the wards' physical setting after given primary briefings about the hospitals' arrangement.

3.2. Questionnaire Surveys:

A vital element of any building functioning assessment research is the questionnaire surveys (Mustafa, 2017; Nooraei, et al., 2013), and POE researches are the most important parts of any study of building evaluation because even if the physical criteria of those buildings are deemed appropriate, the constructions that do not realize the requirements of their occupants cannot be seen as functioning appropriately (Sanni-Anibire and Hassanain, 2016).

This research paper has implemented an analytical POE using some defined benchmarks, words, and characteristics, following ASPECT Evaluation and AEDET Evolution Tools (DH Estates and Facilities, 2008a & b). Accordingly, evaluating occupant's fulfillment in building assessments is essentially proactive in evaluating functioning and acting based on the collected information. By virtue of the POE studies that highlight the feedback significance received from the occupants, users' fulfillment is evaluated to develop the increasing issues in a pertinent building (Husin, et al., 2015; Watson, 2003).

The population size (N) of medical staff (doctors and nurses) was 152 in this study. The sampling error was (e = 0.05) based on that the sample size precisely signifies the population with a 95% level of confidence. To calculate the representative sample of respondents (n) necessary to consider the study statistically valid, Sloven's formula was used (Kanire, 2013). The calculation led to a sample size of (n = 110).

$$n = \left(\frac{N}{1+Ne^2} \right) \tag{1}$$

To complete the questionnaire, respondents were randomly selected and contacted in writing and told that the confidentiality of the data would be maintained and that their participation will be voluntary. AEDET Evolution and ASPECT evaluation toolkits have been filled. A total of



152 questionnaires, 50 for doctors and 102 for nurses, were distributed, and 112 valid questionnaires signifying around 74% of the distributed questionnaires were retrieved, 37 from doctors, and 75 from nurses, **Table 1**. Thus, only usable questionnaires returned by 112 occupants (doctors and nurses) of the three hospitals' wards were used to reach the results of this study.

Through each assessed section separate from the assessment score between 0 (lowest) and 6 (maximum). In both the AEDET Evolution and ASPECT, three choices have been offered. First, for statements not related to the study topic, a weight of zero is given, which will not be considered in the calculation. The second is for applicable statements which are given the weight of one (normal), and for the most important factors, a two (high) weight is given. For the sake of discussion, the analyzed scores were classified in this way: score of 1 point as Virtually no Agreement (VnA), a score of 2 points as Hardly any Agreement (HaA), a score of 3 points as Little Agreement (LA), a score of 4 points as Fair Agreement (FA), a score of 5 points as Strong Agreement (SA), and a maximum score of 6 points as Virtually complete Agreement (VcA). The last part demonstrates the correlational analysis between the quality of hospital wards scores towards the indoor environment and medical staff satisfaction level, and secondly between doctors' and nurses' satisfaction level based on the statements contained within the assessment toolkits for the designated hospitals.

3.2.1 The AEDET Evolution (Achieving Excellence Design Evaluation Toolkit):

Designing healthcare construction often includes complicated concepts challenging to calculate and assess. Achieving Excellence Design Evaluation Toolkit is more commonly recognized as AEDET Evolution, representing important progress to the original AEDET toolkit. It maintains the same goals and typically is concerned about the same issues. AEDET is an assessment tool used to provide a profile indicating strengths, weaknesses of a design, or an available construction in the design quality in healthcare constructions (**Ghazali, et al., 2013**). The three aspects are covered in a sequence of expressions by which the tool assesses a design as illustrated in **Table 2**.

This research has involved the analysis in six sections;. In comparison, the four sections including Engineering, Urban and social integration, Form and Materials, Character and innovation, as well as Construction were excluded because they are not related to this study.

Table 2. A scoring layer of the AEDED Evolution toolkit, adopted from (**Abbas and Ghazali, 2010**).

| Aspect | Section | Focuses on: |
|-----------|-----------------------------|---|
| 1. Impact | a. Character and Innovation | - Design concept. - Overall feeling of the building. - Degree of caring and reassuring atmosphere. - Degree of interest. |



| | | |
|------------------|----------------------------------|--|
| | b. Form and Materials | <ul style="list-style-type: none"> - Overall building form and materials. - Sense of welcoming. - Human scale. - Maximizing sunlight availability. - Sheltering prevailing winds. - External materials quality. - Entrance obvious and logically positioned. - Effect of external colors and textures. |
| | c. Staff and Patient Environment | <ul style="list-style-type: none"> - Privacy and dignity of patient & staff. - Internal and external good views. - Good outdoor access. - Attractive interior. - Control of comfort. - Good facilities for patients and staff. |
| | d. Urban and Social Integration | <ul style="list-style-type: none"> - Relation with surroundings. - Positivity and locality of the hard and soft landscape. - Building sensitivity to neighbors and passersby. |
| | 2. Building Quality | a. Performance |
| | b. Engineering | <ul style="list-style-type: none"> - Building engineering systems as opposed to the main architectural features. |
| | c. Construction | <ul style="list-style-type: none"> - Building construction techniques. - Performance of the main components. |
| 3. Functionality | a. Use | <ul style="list-style-type: none"> - Inability to performing duties. - Operating the facilities and healthcare systems. - The brief requirements were satisfied. - Optimal and flexible circulation. - Facilitating security and supervision. |
| | b. Access | <ul style="list-style-type: none"> - The way in which the users of the building can come and go. - Appropriate ambulance access. - Adequate parking and Accessibility. - Segregated circulation for services, goods & users. - Outdoor safe lighting. - Inclusive, pleasant, and obvious Pedestrians' route. |
| | c. Space | <ul style="list-style-type: none"> - Minimizing circulation distances. - The amount of space in the building concerning its purpose. - Adequate storage space. -Gender segregation. |

3.2.3 The ASPECT (A Staff and Patient Environment Calibration Toolkit):

A Staff and Patient Environment Calibration Tool (ASPECT) is designed based on a database of over 600 pieces of study, dealing with how it will be possible for to healthcare environment to



influence the fulfillment degree presented by patients and staff, and its influence on health results of patients and staff functioning (Abbas and Ghazali, 2011). The current study and the ASPECT toolkit itself have been arranged under seven titles, as illustrated in Table 3.

Table 3. A scoring layer of the ASPECT toolkit, adopted from (Ruddock and Aouad, 2005).

| Section | Focuses on: |
|----------------------------------|--|
| 1. Privacy, company, and dignity | <ul style="list-style-type: none"> - Privacy for conversation opportunities, both to be alone and to be with others. - Visual privacy. - Toilets/bathrooms are located accessibly and separately. |
| 2. Views | <ul style="list-style-type: none"> - Spaces having windows. - Interesting views. - Staff can see both the calming ground views and the sky. |
| 3. Nature and outdoors | <ul style="list-style-type: none"> - Staff can easily see plants, vegetation, and nature. - Staff can go outside. - Access to usable landscaped areas. |
| 4. Comfort and control | <ul style="list-style-type: none"> - Diverse lighting patterns. - Ease of control of temperature, ease of exclusion of daylight and sunlight, easily opening windows/doors, and the design layout minimizes undesirable noise. - Ease of control of artificial lighting. |
| 5. Legibility of place | <ul style="list-style-type: none"> - Easy to understand the layout. - Entrance is obvious. - Different characters for different parts of the building. So it is easy to find the way to other members of staff, - Logical hierarchy of places in the building, the way out is obvious. |
| 6. Interior appearance | <ul style="list-style-type: none"> - Interior looks clean and tidy, and it has a variety of views and colors. - Spaces feel homely; the interior feels light and airy. - Suitable floor coverings. - Ceilings are designed to look interesting, and the interior has provision for flowers, plants, and art. |
| 7. Facilities | <ul style="list-style-type: none"> - Choice of shower /bath, assistance/non-assistance, religious observance can take place. - Bathrooms are safe. - Easy tables and chairs in the spaces, facilities to make drinks. Vending machines for snacks, facilities for relatives' overnight stays - Live performances can take place. - Convenient places to concentrate on work, a safe store, to change, and to obtain snacks /meals. - Basic banking and shopping facilities. - Relaxation area segregated from patients. |



4. RESULTS:

The results have been taken from questionnaires (evaluation toolkits) distributed to the users (doctors and nurses) of the targeted governmental public hospitals, **Table 1**. By applying the statistical software program IBM SPSS (Statistical Packages for Social Sciences, version 24), the analysis was performed to scrutinize the data resulted from the questionnaire and find the percentage and Mean Satisfaction Score (MSS). The questionnaire responses have been used to help the research to reach definite conclusions after analyzing the results.

4.1 Personal characteristics of the respondents:

Table 4 shows the analysis of the respondents' personal characteristics, including the educational attainment and practical experience at the hospital wards. The medical staff results show that the majority of them were nurses (67%), while (33%) were doctors. Considering practical experience in hospital wards, (44%) of the staff respondents had six to ten years, (30%) had five years or less, and (26%) had more than ten years of practical experience.

Table 4. Demographic information of medical staff respondents (**Source: Researcher**).

| Item | Classification | Total number of respondents (n = 112) | | Doctor | | Nurse | |
|--|-------------------|---------------------------------------|-------------|-----------|-------------|-----------|-------------|
| | | Freq. | Percent | Freq. | Percent | Freq. | Percent |
| Educational attainment | Bachelor's degree | 65 | 58% | - | - | 58 | 78% |
| | Master's degree | 30 | 27% | 16 | 43% | 17 | 22% |
| | Doctoral degree | 17 | 15% | 21 | 57% | - | - |
| | Total | 112 | 100% | 37 | 100% | 75 | 100% |
| Practical Experience at the Hospital Wards (yr.) | 5 or fewer | 34 | 30% | 4 | 12% | 27 | 36% |
| | 6 - 10 | 49 | 44% | 17 | 46% | 31 | 42% |
| | 11 or more | 29 | 26% | 16 | 42% | 17 | 22% |
| | Total | 112 | 100% | 37 | 100% | 75 | 100% |

4.2 Results of AEDET Evolution

Evaluation upon physical qualities of three wards has been summarized based on AEDET Evolution as shown in **Fig.4**.

4.2.1 Medical Staff environment:

There was a tremendous improvement in the medical staff environment, increasing slightly from no agreement with scores of (1.8) at JGH to hardly any agreement with scores of (2.0) at EGH,



and a great improvement recording mean scores of (4.7) at SGH respectively, indicating that the level of indoor quality achieved agreement degree.

4.2.2 Performance:

Notable developments have been observed in this section, recording a slight increase in mean scores from (1.8) for JGH to (2.0) for EGH with a high increase for newer hospital SGH recording mean scores (4.7). This result shows the achievement of an agreement degree in newer hospitals.

4.2.3 Use:

Likewise, a significant increment has been observed related to newer hospital SGH with mean scores of (4.4) compared with other hospitals, which recorded a slight increase in mean scores from (1.7) for JGH to (2.2) for EGH. The result of this section denotes an agreement level for SGH.

4.2.4 Access:

The Access section at JGH with mean scores of (4.1) is slightly better than that of EGH with mean scores of (3.8) and greatly better than that of the newer hospital SGH, which recorded mean scores of (1.7), indicating the effect of the location of SGH on the level of agreement of its users.

4.2.5 Space:

The space section has revealed substantial progress from no agreement with mean scores of (1.4) in JGH and (1.5) at EGH to fair agreement with mean scores (4.4) at SGH. This result reflects the effect of realizing a new design for the hospital on the building's quality.

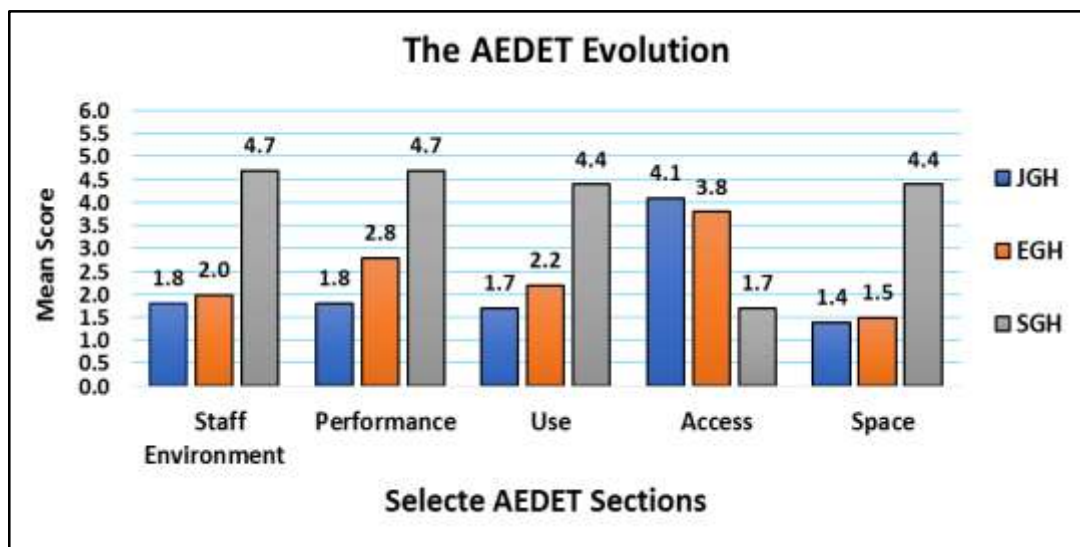


Figure 4. The AEDET analysis – Summary of finding for the three hospitals, (Source: Researcher).

4.3 Results of ASPECT:

ASPECT analysis has been conducted to assess medical staffs' satisfaction levels in the tested hospitals' wards; the findings are summarized in Fig. 5.

4.3.1 Privacy, company, and dignity:



The section has improved slightly from Virtually no Agreement of (1.1) at EGH to recorded mean scores of (1.3) at JGH and strongly raised to recorded mean scores of (4.7) at SGH. This result indicates an enhancement in interior design in the newer hospital.

4.3.2 Views:

There were small changes in the recorded mean score from Virtually no agreement (1.5) at JGH to Hardly any agreement (2.2) at EGH and strongly improved to Fair agreement (4.3) SGH. The result reveals that the new hospital's view recorded a better level of importance and the designers were aware of this point.

4.3.3 Nature and outdoors:

This section has improved similar to the views section slightly from Virtually no Agreement with mean scores of (1.5) at EGH to recorded mean scores of (1.7) at JGH, and strongly increased to reach mean scores of (4.5) at SGH, which indicates the possibility of improving healing environment through nature.

4.3.4 Comfort and control:

The results regarding this section show an increment slightly from Virtually no Agreement with mean scores of (1.5) at EGH to Hardly any agreement (2.2) at JGH, and significant raising to a strong agreement with mean scores of (5.0) at SGH. This great change indicates the importance of comfort level in creating satisfied hospital wards at new hospitals.

4.3.5 Legibility of place:

The results show slight changes in mean score from Virtually no agreement (1.8) at JGH to Hardly any agreement (2.2) at EGH and strongly improved to Fair agreement (4.5) at newer hospital SGH.

4.3.6 Interior appearance:

The most notable progress was in the interior appearance, improving from no agreement with mean scores of (1.8) in JGH to hardly any agreement with mean scores of (2.7) at EGH and greatly improved to Strong Agreement with a mean score of (5.5) at SGH, which reflects the importance of interior design in the new trend of hospital design.

4.3.7 Facility:

The facility section has increased from Virtually no Agreement of (1.5) at JGH to Hardly any agreement with mean scores of (2.1) at EGH, and strongly raised to recorded Fair agreement mean scores of (4.1) at SGH. This result indicates an improvement in the facility at new hospitals.

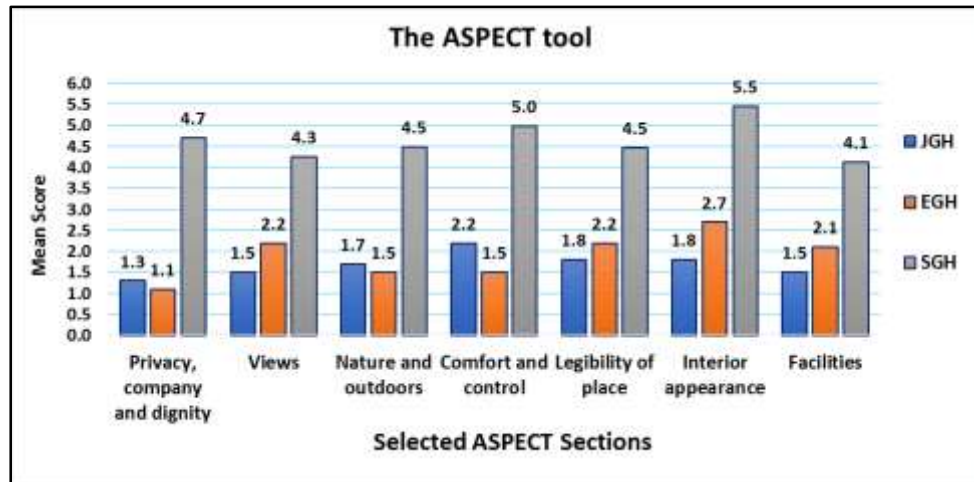


Figure 5. The ASPECT analysis – Summary of finding for the three hospitals, (Source: Researcher).

4.4 Doctors and Nurses Satisfaction level:

The doctors' feedbacks have involved seven sections. From the results presented in Fig. 6, their degree of fulfillment (VCA), (SA), and (FA) was the highest for the newest hospital SGH-2013 with (37%), (44%), and (11%), respectively, most notable it was for the newer hospital EGH-2005 with (2%), (2%), and (18%), respectively, for which the rating is below the satisfied level compared to the oldest hospital JGH-2000 which recorded (3%), (3%), and (11%), respectively.

As the nurses' feedbacks have shown in Fig. 6, the overall patients' satisfactory level (VCA), (SA), and (FA) seems to be the highest (24%), (37%), and (20%), respectively for the newest hospital SGH-2013, followed by the new hospital EGH-2005 with (3%), (9%), and (25%), respectively, and not surprising the oldest hospital JGH-2000 to be rated as the lowest (3%), (5%), and (22%), respectively.

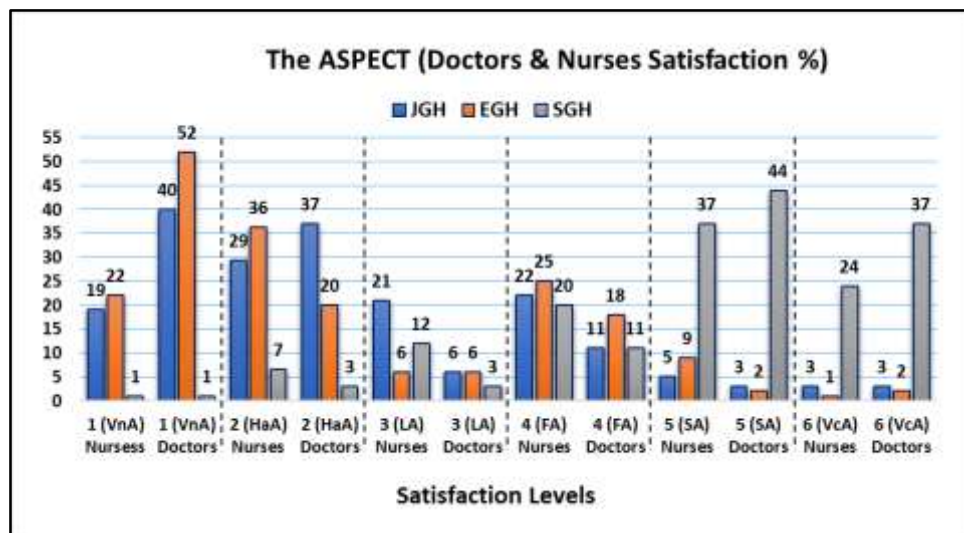


Figure 6. Doctors and Nurses Satisfaction level percentage for the three hospitals, (Source: Researcher).

4.5 Correlation between the results of AEDET Evolution (Building Quality) and ASPECT (Level of Medical Staffs' satisfaction):

The third analytical section demonstrates the result of the correlation between building Quality and medical staff satisfaction level. The correlational analysis is conducted by applying the Pearson correlation. The correlation test has inspected any important connection between the building quality level and the medical staff's satisfaction level at the tested hospitals. This test offers the reliability of using AEDET Evolution and ASPECT as the standard of post-occupancy evaluation in healthcare buildings.

The correlation between building quality and medical staffs' satisfaction scores, **Fig. 7**, is positive strong (high correlations (r 0.91)) at JGH, positively moderate (r 0.65) at SGH, and positively weak (r 0.22) at EGH. Those do not represent negative correlations despite having low correlations. Also, the results assessed in ASPECT did not seem to conform to the results assessed in AEDET.

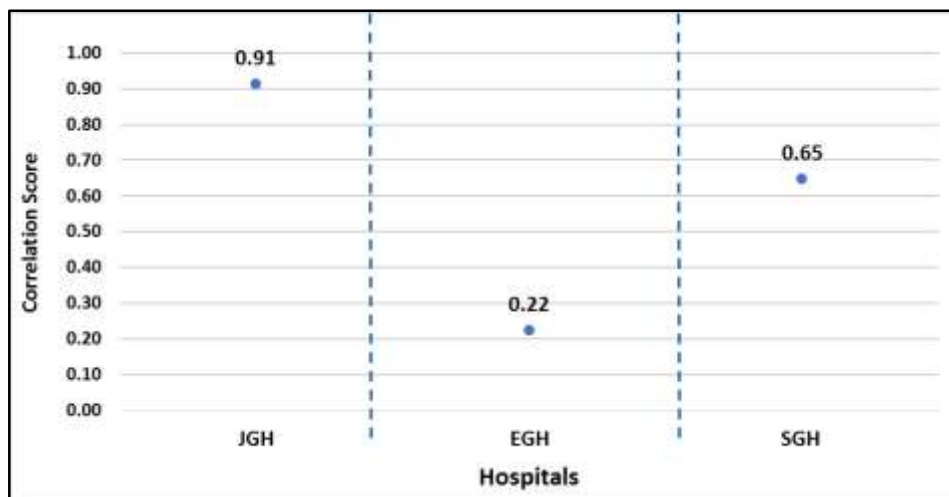


Figure 7. Correlation between Building Quality and medical staff satisfaction for the three hospitals (Source: Researcher).

For the correlation between doctors' satisfaction and nurses satisfaction in the four categories; Comfort and Control, Nature and Outdoors, Views, and Interior appearance, **Fig. 8**, there is a positive strong correlation (r 0.76) at JGH with positive moderate (r 0.35) at EGH and a positive weak (r 0.15) at SGH for views section. For nature and outdoors section, there is a positive moderate correlation (r 0.49) at SGH with positive weak (r 0.05) and (0.01) at JGH and EGH, respectively. The correlation for the comfort and control section has been positive strong (r 0.62) and (r 0.58) at JGH and EGH with positive weak (r 0.08) at SGH. Finally, for the interior appearance, there is a positive strong correlation (r 0.60) at JGH. In contrast, it has been positive weak (r 0.01) and (0.03) at EGH and SGH, respectively.

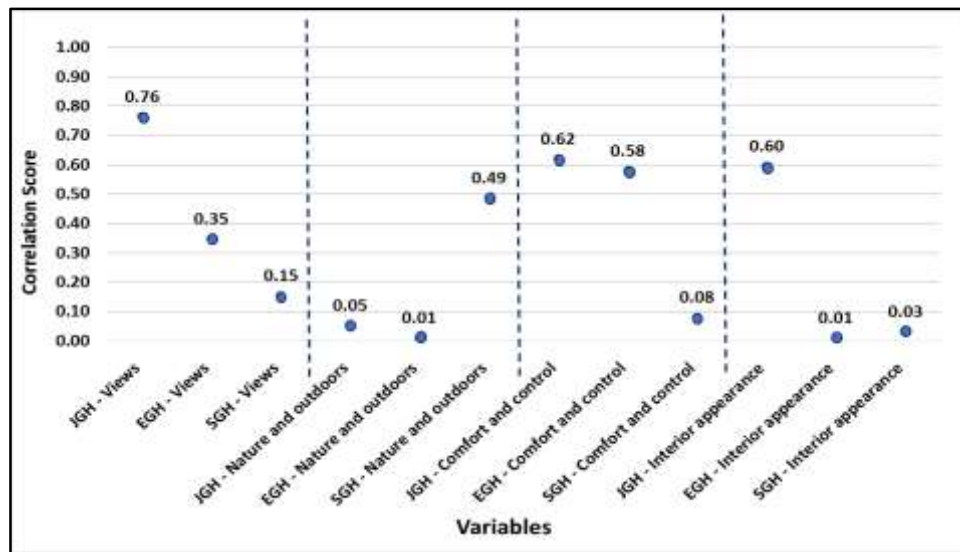


Figure 8. Correlation between doctors and nurses satisfaction for the three hospitals, (Source: Researcher).

5. DISCUSSION OF FINDINGS:

This study reveals that the medical staff's satisfaction level relies on the building's quality level in their healthcare construction and services environment. This correlational conclusion is a vigorous confirmation of the feasibility of POE (AEDET Evolution and ASPECT) Toolkits as an evaluation tool in assessing the physical quality of constructions, including healthcare constructions and facilities. This result agrees with previous research findings (Mustafa, 2017; Woon, et al., 2014; Ghazali, et al., 2013). The study also indicates that the respondents were generally satisfied with the building quality of the newly constructed hospital rather than the renovated building; they proposed that the constructed hospital's interior appearance generally achieves their psychological needs and expectations. This appears to be in support of studies (Ulrich, et al., 2008; Mourshed and Zhao, 2012; Huisman, et al., 2012), which found that the users of newly constructed healthcare were most satisfied with the interior design of the facility.

In general, the research finds positive progress pertinent to all the three areas in the assessment toolkit dealing with Impact, Building Quality, and Functionality. The study reveals that the wards' design quality has seen large improvements in all sections within the two renewed hospitals (JGH) and (EGH) with the newly built hospital (SGH). An explanation can be given for this result. It seems that the designers were aware of new designs, using updated materials to enhance the space characters and the construction, yet lacking engaged space and accessibility consideration. In other words, the interior designers were aware of the new trends in healthcare interior designs and the results of the previous researches and used updated hygiene standards to enhance the quality (health and safety) of the indoor healing environment and raise the satisfaction level of the users. The evaluations indicate that the medical staff satisfaction level has changed to better strongly from the renovated hospitals JGH and EGH to newly built hospital SGH. The most remarkable progress was in the interior appearance, improving from no agreement at JGH to



Strong Agreement at SGH. The sections on Privacy, Nature, and Outdoor, and Comfort have improved slightly at EGH and strongly raised SGH. For the rest sections, including views, legibility of place, facilities, there were small enhancements in the recorded mean. Eventually, the staff section has greatly increased from renovated hospital to the newly constructed one.

The study finds an improvement in the medical staffs' satisfaction levels in the new hospital. This can be attributed to the designers' awareness of users' requirements so they have fulfilled user satisfaction in the newer hospital EGH-2005 and the newest hospital SGH-2013. Perhaps, the designers have considered the guideline details mentioned in the literature review before starting any renovation for the old hospital or designing a new one.

When comparing percentages of doctors' and nurses' satisfaction levels in those four categories; Views, Nature and Outdoors, Comfort and Control, and Interior appearance, **Fig. 6** shows that the nurses have been more satisfied than the doctors with the services for JGH and EGH. For SGH, the study has shown that the doctors were more satisfied than the nurses. The newer hospital has given more consideration for the doctors and their important roles in the healing process at the hospital. This apparent and important connection between the two variables supports the research aim assuming an important relationship between the building quality and the medical staff's satisfaction. The overall hospitals' physical qualities have revealed a more positive trend. In other words, if the wards' quality status and design trend had been truly positive towards the formation of a comfortable environment, the trend of medical staffs' satisfaction level would have shown an increase in the progression of the decades.

6. CONCLUSIONS:

The research has applied the Post Occupancy Evaluation (POE) method to specify the functioning of a built service based on the medical staff's satisfaction. The correlation scrutiny resolves to assist the use of Post Occupancy Evaluation (POE) as the evaluation tool of medical staff's satisfaction with healthcare services. According to the scrutiny of the results, based on AEDET Evolution and ASPECT, the overall physical qualities and design style of the wards during the last decade seems to be positive towards the creating of a comfortable indoor environment in the hospital wards built-in Sulaimani City and the survey respondents were generally satisfied with the physical indoor environment of those wards in the newest hospital. Accordingly, proper interior design and the tested factors increase medical staff satisfaction and wards' performance, leading to enhance the quality of the indoor environment for designing new wards and improving the current hospital wards in the study region. The medical staff perspective could be valuable in the design process when enhancing the physical environment to attain care quality at wards. Therefore, this study's findings may familiarize designers with using AEDET and ASPECT questionnaires in promoting the formation for the designer used as a guideline to enhance the consecrating of a more supportive indoor environment, not only for the design of the new wards but also to develop the existing wards.

Consequently, during the designing of new wards, designing components that include natural elements in the physical environment and permit patients to view the outside world should be considered. Healthcare architects and designers that are directly involved in designing a healing



environment need to be aware of factors identified in this study. Also, the findings may inform the architects and interior designers to consider the overall balance between the medical staff's physical and psychological needs in ways that would contribute to the solution of future interior design problems.

It is clear that the finding of this research is limited by assessing a small number of hospitals constructed or renovated after 2000, with focusing on hospital wards only. Also the findings emphasize the necessity for further researches to be conducted upon details of indicators and considerations involved in the questionnaires, such as thermal comfort, providing natural ventilation, acoustics and noise standards, comfortable furniture, and providing plants inside and outside hospital buildings as the interconnectedness with the natural environment to confirm their consistency with the healthcare users' satisfaction levels. This further researches can contain refining indicator details in the questionnaire design, as well. Consequently, the advanced POE method is operative and pertinent to evaluating healthcare buildings and services in the region of Kurdistan north of Iraq.

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