“Usability Evaluation”: Criteria for Quality Architecture In-Use

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Abstract

There are varieties of health-care evaluation either for the quality of design or service, as well as the impact of those factors to the patients or management system. Usability is one of the evaluations, which evaluate the quality in-use. Usability approach is focusing on the method of collecting data. It is based on the exploration of the user experience by knowing their perspective. It is measured by three parameters; the effectiveness and efficiency of the design or facilities offered and the user’s satisfaction. The purpose of this study is to explore an understanding of the complexity of patients who use the facilities provided. In addition it also to observe the phenomenon of patient feedback during journey experience in the hospital spatial design and it relationship. The methods of collecting data in this study are through walkthrough observation and interviewing patients from two public hospitals. As a result, we identified that a variety of usability criteria contributes to the quality of architecture in-use. Most of the respondents expressed the usability factors are caused by accessibility, reach ability and way finding criteria. Later, all those issues will be used as measurement criteria for a main case study.

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1. Introduction

The International Organization for Standardization (ISO) defines usability of a product as “The extent to which the products can be used by specified users to achieve specified goals in the specific context of use with the particular environment” [1]. ISO also pointed out that usability is measured based on the
three basic parameters; effectiveness, efficiency and satisfaction [2, 3, 4]. Hence usability evaluation is all about users’ experience and feedback to the design and environment. It is also associated with human experience and its influence on people’s understanding of a design context of-use [5]. The usability studies started in the 1950s, emerging from various disciplines, backgrounds and fields and is widely known in relation to applications within product design, information technology and Human Computer Interaction [2, 4]. Hence, user friendliness and functionality of the system or design meets user requirements [6].

In a built-environment, it was started by the Facilities Management (FM) field with the concept of responsibility of the Facility Manager to fulfill the demand of stakeholders by knowing the action and feedback from users experience to building in-use. Consequently, FM related to improvement of surrounding, people and spatial relationships, social, functional aspect, environment and economic [7, 8]. Therefore, to get a quality system or design and satisfied stakeholders involved the responsibilities of the FM as the evaluator before and after the building is occupied and during the designing process. From the body of literature, there are various criteria of assessment involved in a built-environment, especially relating to healthcare sectors, including; healthcare design evaluation and healthcare service evaluation. It’s was introduced by International Council for Research and Innovation in Building and Construction (CIB) Task Group 51 "Usability of buildings 2005" , Workshop W111 - "usability of workplaces 2-2008"and "usability of workplace 3- 2010" has been established to apply concepts of usability and to provide a better understanding of the user experience.

2. Usability as assessment –the issues

Few researcher found that the design has been relying on previous acquired knowledge, hunches, convictions resulting from experience for the decision making process. There are loops in healthcare design areas, which focus on patient friendly care, hence most of the design is adopted and adapted without knowing if users are satisfied. Malaysia’s hospital design also lacks collated data to support a positive design based on the end users needs. To achieve sustainability in design, the healthcare service must meet the needs of the people and to achieve the balance in the outcome. Consequently, a building which satisfies the user is associated with physical design, mediated by human experience, consistent principles that resolve and give users a positive experience. The most significant aspect of patient experience is through spatial design which contributes to satisfaction as well as the overall efficiency and effectiveness of the hospital design. Hence according to MOH, users’ satisfaction is also influenced by the effective future which includes spatial boundaries, physical – environment and attractiveness, feels and understands the needs of users [9].

In the body of literature that exists in the user’s experience of healthcare design and service, only a small number of participatory studies focus on the spatial design aspects. Most of the studies are related to the issue of service quality and users’ satisfaction of the physical environment and the systems. Furthermore, there is lack discussion on the usability of spatial issues, which focuses on the gap of users’ experience in the waiting-time process and the service journey experience [9]. Consequently, spatial design is about the reaction of humans to space. It is about human feedback to the surrounding.

The previous study by other researcher had shown that good spatial design reflected the health outcome, emotion, reduction of stress and frustration for the visitor, functional efficiency, visitor accessibility, safety, patient empowerment and improving cognitive skills in spatial understanding. It considers parts of the problem-solving process in identification of service and design. Healthcare end-users have their own requirements and needs; in particular, they have a range of views and expectation about standards of service and quality of care. Dissatisfaction of hospital users can exert either minor or a major influence on an organization reputation. Generally, the factor affecting end-users demand is the
design or service that meets their needs and expectation. Therefore, studies of users’ experiences and their expectations towards hospital design are important in improving healthcare design quality.

2.1 **Usability** an assessment of quality in-use

Usability studies are a cultural phenomenon from understanding user’s experience. It is a part of human behaviour activities and reaction study or to value the end users satisfaction. Those experiences are created not only by elements which the provider or management can control, but also by elements that are outside of the providers control that affects the end-users experience to be either positive or negative.

Otherwise, experience is an event quality of experience, which is attached to sensation knowledge resulting from the interaction with different elements of a context of use [4]. It involves the cognitive psychology, influencing, emotional reaction, attitude, scenarios and perception. It is influenced by personal interpretation of a situation based on the cultural, background, mood, sensation and physical conditions of users. It’s about the individuals comparing their expectations to the outcomes generated by their interaction with a system, design, product, service or facilities offered. Which is an interconnected cycle of attempting to satisfy hopes, dreams, needs, and desires of human [10, 9].

Quality of experience is user’s expectations that benefit end users, and influence social factors, emotional, and physical well being after delivery of services or reaction to design or service. Consequently, most of the usability research had been done in the built-environment field, find that usability measures the values of users’ experience related to assessment of quality in-use [3, 2, 6]. In conclusion, we can define that usability is the quality of experience on the context of use or architecture in-use related to users’ needs and expectation by their reactions (demand) to the facilities and the spatial design (value of assets) offered (supply).

2.3 **Usability evaluation criteria**

Purpose of this pilot is to achieve the main objective of this study which are to explore the behaviour activities of user experience the healthcare spatial design and to identify the usability criteria. Moreover, this pilot is to test the method of data collection and the usability evaluation framework before applying it to the main case study. The evaluation derived from Voordt 2005; 2009, which is an assessment on healthcare architecture-in-use, using 9 dimension,(1) reach ability and parking facilities,(2) accessibility,(3) efficiency,(4) flexibility,(5) safety,(6) spatial orientation,(7) privacy, territoriality and social contact,(8) health and physical well-being and,(9) sustainability. This evaluation adopted from NHS, Achieving Excellence Design Evaluation Toolkit (AEDET): its Post Occupancy Evaluation (POE) toolkit with the systematic questionnaire (Excel-based program) related to how building performed, provides three key areas; (1) functionality-use, access and space, (2) impact-character and innovation, form and materials, staff and patient environment, urban and social integration, and (3) build quality and standard performance, engineering and construction [11] alteration on method of evaluation to qualitative approach using observation and interview. In other to get the respondent to understand, and in –depth study to the usability scenario was conducted.

This study was conducted in a replacement hospital. A replacement hospital is a new hospital built to replace the original hospital which had been closed or turned into the state health department or health clinic. Currently there are 10 replacement hospitals, and three hospitals that have been selected, in which the hospital had begun operation in 2000 and above. For this pilot three different categories of hospitals had been selected, referral hospital (22 medical discipline and 812 beds), district hospital (11 medical disciplines and 498 beds) and district hospital (six medical disciplines and 250 beds). It focuses on the northern region of peninsular Malaysia, due to lack of researcher studies and focus on this area and on spatial design.
3. Methodology

In this study, the usability evaluation is referred to the process of collecting data. It is derived from the usability research method; systematic if usability process by previous researcher and from review of the usability theory and concept. The detail of usability evaluation flow was described in figure 3. It had been chosen as there is a lack of reliable assessment method that thoroughly observes and identifies the user’s action from their experience of the real thing. It recognized the need for a concerted response to what had been designed or applied from the management or the medical planner. Data collection drew extensively on multiple sources of information, which included multiple data-collections; (a) Document review; from the hospital current and previous reports, healthcare design and facility guidelines, hospitals issue and findings from other researchers relating to patient satisfaction had also been done to support the issues being highlighted in this study (b) semi-structured interviews during walkthrough journey experience and (c) observation patients, their friends and family members (visitors or accompanying person) during walkthrough journey experience.

Furthermore, walkthrough observation to user behaviour activities had been done by watching people use their environment and activities related to spatial-relationship and surrounding. It was done by analyses of the space and movement “tour” of the building, assessing different qualities of functions of the environment. At the same time Interviews were used to support humans without disturbing their activities, and it took place in a personal meeting, according to the expressed wishes of respondents. In addition, interviews were useful to support behaviour reaction, and know in-depth information around the topic and related issues. Those methods being used to know the expected uses, new uses and misuses of design, recognized needs by getting the story behind a participant’s experiences (Figure 1 explain the usability evaluation frameworks flow).

Figure 1: Usability evaluation frameworks

3.1 The objective of the evaluation

- This exploration pilot study is to know the ease of use and how the spatial design matches with the real situations which focus on context of use in Malaysian public hospitals.
- To know the feedback and deficiencies of the method and usability evaluation framework had been proposed.
- To explore the usability issues and criteria that will support the main case study.

3.2 Scope and limitation of the evaluation
- Patient experience and expectation to spatial design features: Flexibility of design attached to service waiting process inclusive of the factors effective and efficient criteria that contribute to their satisfaction.
- Reaction and feedback of the patient journey experience through the spatial design environment and orientation starting from the accessibility aspect to reach the service or their goals.
- The 10 respondents from each hospital were interviewed during the walkthrough process due to the limited area (first floor area or service attached to a patient, and visitors flow- figure 2, 3&4).

![Limitation area of pilot study](image)

**Figure 2:** Area of walkthrough observation and interview (Hospital X)
Figure 3: Area of walkthrough observation and interview (Hospital Y)
3.3 Keys informant interview

There are few key questions asked during the to investigate the phenomena related to how users experience spatial design during the walkthrough process. **It is based on the main research questions of this study which are:**

- How the usability of spatial design can influence the healthcare spatial design in order to produce quality architectural in-use?
- What is the patient's concern on their process of journey experience and how their expectations from the spatial design reflect support to the way is used by them?

The specific key questions for this main interview are:

- How do you feel about this space? How does this area make you feel?
- How do you find your experience along this journey? Do you like it? How would you describe it?
- What do you think of this environment and the facilities?
- Where do you want to go and from where? What is your expectation from this experience?
- How long have you been here? What do you do? Are you satisfied?

3.4 Keys of observation
Keys of observation while visitors or patients are walking into the target area are by identifying any errors:

- How a respondent identifies the space- using signage/ map/ asking somebody.
- Reaction to any of the usability issues highlighted by them.
- Reactions of family members and friends who accompany patients to those above criteria.

4. General Findings:

The result from this pilot analysis found, in order to assess these usability parameters; effectiveness, efficiency and satisfaction there are few usability criteria explained in those parameters by identifying the usability issues (refer to figure 5 a; b; c and table 1). Patient satisfaction is just not associated with long waiting time, but it is related to the activities, atmosphere, environment and facilities offered during the waiting process. Besides that, patient satisfaction and usability criteria also related to the fulfilment of the needs and expectation from the patients family members and friends. In addition, the usability criteria that were equally important depend on their situation and context; the age factor, the patient's or family member’s condition and how often the users visit the hospital.

Figure 5 (a): reach ability aspect of design ability and function of facilities provided in the environment
Figure 5 (b): Multiple levels introduce a difficulty to disabled people and to patients and visitors safety

Figure 5 (c): multilevel space design reflects the safety issues for children and disabled
Table 2.3: The usability criteria from the pilot study

| Usability criteria          | Usability issues and problems                                                                                                                                                                                                 | Case study |
|-----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Accessibility               | Insufficient parking area.  
|                             | • Not enough car parks provided.  
|                             | • Lack of a signage and info board.  
|                             | • There are no covered walkways from parking area to main entrance.  
|                             | • Lack on landscaping area creating shading and more rest areas out of the building.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Reach ability               | • Facility provided especially against the appropriate baseline for the function of space and facilities.  
|                             | • Lack on social area – Just a space but lack on activities and facilities  
|                             | • Problem to place the children when the parents meet the doctor.  
|                             | • Insufficient area- some of the area is close to public.  
|                             | • Limited shops with limited choices.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Spatial orientation        | Wayfinding:  
|                             | • Signage design or systems area confusing.  
|                             | • The directional clarity from the spatial characteristic and access a route are not related to each other’s.  
|                             | • Small signage or symbol to show the name of area or building  
|                             | • Alternative wayfinding system for who could not read or not understand the language.  
|                             | Learn ability and memorability:  
|                             | • Recognizable functional units, tracking by a landmark for space and design and all are showing their own identity or image, so that it is easy to remember.  
|                             | • Confusing direction and layout, especially for systems covered in walkways to the main area.  
|                             | Efficiency  
|                             | • Long distance and wayfinding issue will cause the patient tired and no pit stop area for rest especially for disable and elders people.  
|                             | • Wastage of space and the lengthy corridor.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Aesthetic elements         | Emotional comfort  
|                             | • The interior environment not livelier and enjoy.  
|                             | • There’s no window can view the external of the building.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Comfort & Well being       | Physical comfort  
|                             | • The selection of furniture not comfortable–not suitable for long use.  
|                             | Social comfort  
|                             | • Separate men and women in waiting area  
|                             | • have natural lighting at waiting area  
|                             | • The sitting arrangement – easy for communicate and interaction.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Flexibility in design      | Multi-function activities in an area.  
|                             | Fully utilized the area by the various categories of users.  
|                             | X Y Z                                                                                                                                                                                                                           |            |
| Safety aspect              | Lighting not efficient –especially in closed area and walk way.  
|                             | • There was broken furniture, inviting the danger to the end users  
|                             | • Separate area for men and woman – woman feel safer and comfort.  
|                             | X Y Z                                                                                                                                                                                                                           |            |

| X                           | Small district hospital | Y | Large district hospital | Z | Referral Hospital |
However, from the usability issues shown in the component of layouts, and facilities provided play an important role in measuring the performance of healthcare spatial design. Mainly, it involves identifying the component of the spatial and facilities available by optimizing the usability of the design. Moreover, from that usability issues, we can conclude that there are several factors of users’ experience and expectation affecting that usability criteria, especially on patient satisfaction. Which, it will be achieved if the respondent’s questions can be answered in the easiest solution either by the design or the hospital environment. Eventually, from the analysis it can be concluded, usability is satisfying experience with meeting user’s goals and fulfilling their expectation (see Table 3).

Discussion

To summarize, from my experience, qualitative methods are a wright’s method in collecting data dealing with human needs, especially when it touched on field experience and reflection of experience. The pilot, enabled researchers explore that usability is related to human action and factors. It is a reaction between the applications or provision of service provided to the user, whether it is good or not. The usability parameter is defined as the effectiveness: whether the design or facilities provided is effective and beneficial to consumers in full and meet their expectation. While Efficiency is related to something that is easily accessible, do not take too long to be resolved, and it is related to timing and distance. This issue is not frequently raised compared to effectiveness criteria. Satisfaction is a degree or value of satisfaction related to both parameters that the meets patient’s expectations. Based on the analysis of the survey is was found that, usability criteria are influenced by several factors. The factor is based on the (1) frequency of visits of patients and visitors, (2) the physical condition of the patient (3) the age of patients and visitors (4) and waiting period of service.

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