

VALUE GENERATION THROUGH USER INVOLVEMENT IN HEALTHCARE DESIGN

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ABSTRACT

This paper reports on the initial outcomes of a postgraduate research about user involvement in healthcare design. The purpose is to highlight the importance of involving healthcare professionals in the design of healthcare buildings, to ensure efficiency in the delivery of care services and to meet user requirements. It is believed that participatory approaches can help to increase value generation for users.

A case study is used to describe the user involvement in the early stages of the refurbishment process of a Hospital in Brazil. Data was collected through six interviews, documental analysis, archival record analysis and direct observations.

Results suggest that user requirements are better considered in design through participatory approaches. Furthermore, the necessary time to perform healthcare services can be reduced due to more appropriate building reconfiguration. Findings also emphasize the importance of effective management, both by the design team and by users' representatives, to minimize conflicting requirements and to avoid delays in the design process.

KEYWORDS

User involvement, value, design process, healthcare buildings.

INTRODUCTION

Due to myriad factors concerning the quality of the physical space and the need to improve the delivery of care services, the design of healthcare buildings is complex (Caixeta & Fabricio, 2012; Tzortzopoulos et al., 2009). Each healthcare building has its particular staff and patients; thus, the idea of a generic hospital is an unachievable abstraction (Risse, 1999). Moreover, an important aspect is that healthcare buildings can be responsible to a wide variation in patient experiences about their settings and also in cultural and social interpretations about how much efficient and therapeutic their healthcare settings are (Gesler et al., 2004).

It is important that building design and healthcare service delivery are aligned, to allow new ways of working, delivery patient-focused environments and redesigned

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care. Therefore, designers need to understand service delivery, better linking service design with building design (Tzortzopoulos et al., 2009). However, designers usually do not have detailed knowledge about users and how they perform the services in the building.

User involvement can help designers understand the users' needs and align the design of the physical space with that of services, as well as designing environments that contribute to the well-being and help in the recovery of patients. So, the main purpose of this paper is to investigate approaches of involving users in healthcare design, and how these may contribute to increase the quality of this type of building.

From a Lean thinking perspective, aligning service and building design, besides increasing efficiency, reducing cost and improving quality, can create value for patients, as a "bottom-up revolution" in healthcare (Dart, 2011). Client values need to be understood to avoid low realization of client expectation or excessive design changes, which means waste and disappointment among the participants (Thyssen et al., 2010). This further supports the importance of involving users in design.

USER INVOLVEMENT

According to Gesler et al. (2004), only expert visions have guided the design of many healthcare buildings, with emphasis on efficiency concerning costs and clinical functionality. However, it is important that designers fully understand the client values to ensure high achievement of client expectations or to avoid numerous design alterations during the design process, which can bring frustration among designers and additional costs to the project (Thyssen et al., 2010). Therefore, participatory approaches may align design and the preferences and needs of current and potential users (Andrade et al., 2012). Especially at the early stages of the healthcare design process, when changes are more feasible, the involvement of users as "experts on their own experiences" (S.Visser et al., 2005), can bring important information about the use of the building, and be crucial to identify appropriately the users' needs, expectations, preferences and requirements, which are often evolving, and ensure high-quality performance in activities in the future building (Sfandyarifard & Tzortzopoulos, 2011; Steen et al., 2007; Stern et al., 2003). Participatory design still contributes to legitimize and justify decisions, which may also avoid later disagreements with the design outcomes (Olsson et al., 2010).

Concerning the difficulties of participatory approaches, users generally are not used to the language and design representations used by architects, and are seldom prepared to contribute in the process with the necessary data, which hinders the participation (Reich et al., 1996; Tzortzopoulos et al., 2006). User involvement in the design process also requires more from designers than the traditional design, because designers have to open up the process to bring decision making into the public discussion. So, the design quality will depend on their ability as educators as well (Johnson, 1979). Moreover, some authors discuss two types of risks in user involvement: one concerning the reduction of control over the project, due to the involvement of different people; and the other referring to the increasing of complexity, due to the need to manage different objectives and interests, requiring extra efforts in coordination (Hoyer et al., 2010; Steen et al., 2011). Damodaran (1996) argues that, despite the high costs of resourcing and managing the process with user involvement, participation usually brings great rewards.

The term ‘involvement’ is general and covers a range of degrees of participation, each one representing a relationship between users and service providers, with different levels of power (Arnstein, 1969; Kujala, 2003). According to Damodaran (1996), a broadly characterization can include all these levels of participation, with three forms of involvement: Informative, consultative and participative. In informative form, users only provide and receive information, which is the level with lower involvement. Consultative form is the intermediate level, where users can make comments on a predefined service or range of facilities. Finally, participative form is the higher level of involvement and gives influence to users in decisions concerning the whole system.

In literature, there are two approaches of user involvement in design: user-centred design and co-design. In the first, the user is seen ‘as subject’, a ‘passive object of study’, and the researchers develop knowledge about users through observation and interviews. In co-design, users are seen as ‘partners’, and have an important role in idea generation, knowledge development, etc. (Sanders & Stappers, 2008). In this PhD research, forms and methods of user involvement will be further studied, especially in design process of healthcare buildings, in order to understand deeply the benefits and difficulties of user involvement approaches.

Although it appears that the term ‘user’ indicates a single person or a well-defined group of people, it is complex and wide, covering many different groups, that have diverse values and needs, often conflicting (Bertelsen & Emmitt, 2005; Jensen, 2011). Some issues – such as the separation of ownership and occupation of buildings, the rise of the corporate client, the emergence of the concept of the stakeholders and the continuing client penetration of the construction industry – have confused the client’s identity and relation with the construction industry, in the last fifty years in the United Kingdom (Newcombe, 2003).

Jensen (2011) presents a view which places the building client as a mediator between the demand side – owner, investors, managers, employees, visitors, etc – and the supply side – architects, engineers, contractors, material suppliers and service providers – owing to the complexity and specialized nature of such deliveries. The mediator is important to translate the needs from the demand side into service levels or requirements, according to the professional language used by the providers at the supply side. The selection of the appropriate people to participate, the appropriate roles and stage of participation is critical to the success of the project, since design process and outcomes can be significantly affect by the choice of methods and ways of working (Steen et al. 2011).

In brief, the literature review highlights the importance of designers understand clients’ needs and expectations to produce well designed buildings that increases the service performance and positive impact in users. Participatory approaches, especially at early stages of the design process, may help designers to understand the users and legitimize decisions, avoiding later disagreements with the design outcomes and several changes in design. Despite the difficulties and risks, if designers involve users with appropriate levels, methods and approaches, it may generate value to clients.

RESEARCH METHOD

In order to study the state of the art of value generation through user involvement in healthcare design, a literature review has been carried out, with the focus in

definitions, importance, benefits and risks of participatory design, and also in the profiles of healthcare buildings users.

The ongoing PhD research will have three case studies, to study how the involvement of users in the design process can improve the understanding of their real needs, the activities performed to delivery care, as well as the benefits and difficulties of involving users. The preliminary results of the first case study only are here presented. This case study focused on the refurbishment design process of a Hospital in Brazil, with a focus on the architecture consultancy responsible for the design. As proposed by Yin (1994), multiple sources of evidence were used to collect data: interviews with key-people, document analysis, direct observations and archival record analysis (Table 1). Data collect was satisfactory to analyze this case, but the other cases will be useful to understand better the questions about user involvement through different views.

Table 1: Multiple sources of evidence to collect data.

Sources of Evidence	Description	Data Collected
6 open-ended interviews	General director of the architecture company, responsible for the architectural design (3 interviews);	- Description of the design process; - General description of the user involvement strategy; - Description of benefits and difficulties noticed. - Description of his view about participatory approaches - Description of architects' role in the design process with user involvement.
	President of the Hospital (Client);	- Description of his view about the design process and the user involvement; - Description of his role as the coordinator of the users' group.
	Architect involved in the process	- Description of the design process; - Description of the procedures for data collection for the as built design - Description of the relationship between architects and healthcare staff; - Description of her view about participatory approaches.
	Professional responsible for getting data from users (forms)	- Description of the method used to collect data from users.
Document analysis	Architectural blueprints for building refurbishment;	- Knowledge about the original building and the refurbishment design
	Public web site.	- Further information about the hospital, concerning its history, healthcare services, capacity and user profile
	Refurbishment dissemination publications, produced by the Hospital.	- Information about the refurbishment design and the way that users are informed about the current situation and the changes that will take place in the building.
Direct Observation	Forms used to get data from users	- Knowledge about the user involvement strategy.
	Visit to the Hospital	- Observations of the physical space, organization and use.
	Visit to the refurbishment design exhibition room.	- Notes on how users are informed about the current situation and the changes that will take place in the building.
Archival record analysis	Visit to the architectural company	- Observations of the design team organization.
	General director personal records	General director's experience with healthcare design and relationship with clients.
	Books published by the general director of the architectural company	Theory and experience on design and organization of services in healthcare buildings.

Data analysis followed the general process proposed by Creswell (2012) for qualitative research: preparation and organization of data collected for analysis;

reduction of the data into themes – using a process of coding and condensing the codes – and then the representation of the data in a discussion and figures.

PRELIMINARY RESULTS

PORTO ALEGRE HOSPITAL AND THE ARCHITECTURAL DESIGN COMPANY

Founded in 1971, the Porto Alegre Clinical Hospital is located in Brazil and has an area of 1,381,422.61 square feet and includes, for instance, 795 beds for inpatients, 33 operating rooms, 139 medical offices. The Hospital is a member of the network of university hospitals of the Ministry of Education, and is academically linked to the Federal University of Rio Grande do Sul (UFRGS).

The refurbishment project includes physical and operational reorganizations, with 939,976.13 square feet of increasing area, reaching a total of 2,321,398.74 square feet. The extension will add new buildings that will host research, teaching, welfare, administrative and support activities.

The architecture company responsible for the project is located in the city of São Paulo, Brazil and is skilled in design for healthcare and educational buildings and consulting. A general director, a design director, and a design coordinator, all of them architects, composes the architecture company, together with a multidisciplinary design team, with architects, economists, hospital consultants, ecologists, professionals involved in epidemiology, biostatistics, a market analyst, a doctor and other professionals. During over than 50 years of experience, it has designed several buildings in many countries.

USER INVOLVEMENT IN EARLY STAGES OF THE DESIGN

At the beginning of the design process, the representatives of both the design group and the users group is defined. The responsibilities of the representatives are to collect information from their respective group and discuss it with the representatives of the other group. In addition, they make decisions on behalf of the users and are responsible to communicate the decisions to the group (fig. 1).

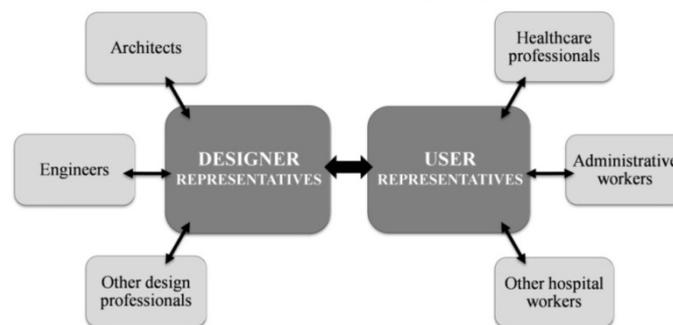


Fig. 1. Representatives of the designer and user groups.

Users invited to participate at the early stages of the design process were the medical staff, such as doctors; medically trained staff, such as nurses; and non-medical support staff, because they can help designers to understand how the activities of delivering care are performed in the building. Non-staff users, such as patients and visitors, were not invited to participate, because the architecture company believes

that they cannot bring relevant data to the efficiency of the delivering care. Non-staff users, according to the architecture company, do not spend enough time at the building to know it deeply. Involving this type of users demands more efforts from design team, and the chance of this involvement really benefit the design are minor, especially concerning operational efficiency.

The design process proposed has a stage of planning of the delivering care model preceding the physical space design, due to the complexity and the unique nature of each healthcare building and its need for functionality for activities of delivering care (Caixeta & Fabricio, 2012). At this stage, the activities need to be described as a production line, such as in industry.

To encourage the participation and strengthen relationships between users and designer, a room was established inside the Hospital as a physical space for meetings and discussions about the project. To collect information, all users – except non-staff users – were asked to fill in a questionnaire with the description of their activities and flows. The architecture company highlights the importance of ask “how do you make” and not “what do you do”, because designers need to understand how activities are performed and how is the operation of the building, not only ‘what’ is doing on the building. After, answers were analyzed and organized to be used in the design.

The general director of the architecture company described the method utilized to understand and describe the building operation, as a healthcare service pathway (Tab. 2). This comprehension is crucial to enable designers to propose improvements concerning the operation. The method aims to describe and analyze the healthcare service pathway considering each process – medical consultation, exams, surgeries, etc – as a “chain-link” that composes each macro-process, which composes the healthcare supply chain. Four steps are included in the method: identification, design of macro-processes, measurements and analysis. Architects skilled in service production have oriented the process and stimulated users to participate at this stage.

Table 2: Method to describe the healthcare service pathway.
Source: General Director of the Architecture Company.

Step	Activity	Description
1 ^o	Identification	Identification of all available production units to compose the healthcare supply chain.
2 ^o	Design of Macro-processes	<p><u>1^o Macro-process:</u> Patients from the Emergency: The macro-process was designed to describe ‘the chain-links’ and the qualitative and time demand, in order to list the most critical flows, according to ‘case’ and ‘state’ of the patients . Examples of flows:</p> <ul style="list-style-type: none"> a. Heart rhythm disturbances: ICU and Hemodynamic; b. Polytraumatism: CT and surgery c. Cardio-respiratory problems: ICU <p><u>2^o Macro-process:</u> Ambulatory: It was designed to show numerically the service types and qualities, with distance and time consuming.</p> <p><u>3^o Macro-process:</u> Infirmary: similar to ambulatory.</p>
3 ^o	Measurements	Times, distances and frequencies of moves were measured, as well as the operational capacity of each sector.
4 ^o	Analysis	The capacities of each ‘chain-link’ in the service pathway were analyzed to determine ‘restrictions’ that hinder the fluidity of the flow.

The design of the macro-processes crosses supply flow demands, times and distances between the "chain-links" that comprise the service pathway, according to "types of

consumers" – for instance, elderly people, pregnant women, children, etc. Macro-processes are then organized into the qualitative and quantitative flows of activities (Fig. 2 and Fig. 3). The description of the whole system enables designers to reorganize space in order to reduce waste during the performance of delivery of care activities.

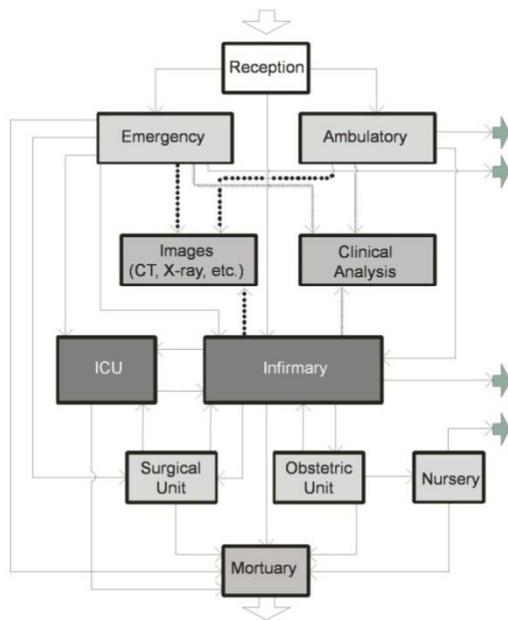


Fig. 2. Healthcare supply chain: Example of the qualitative flow of activities.

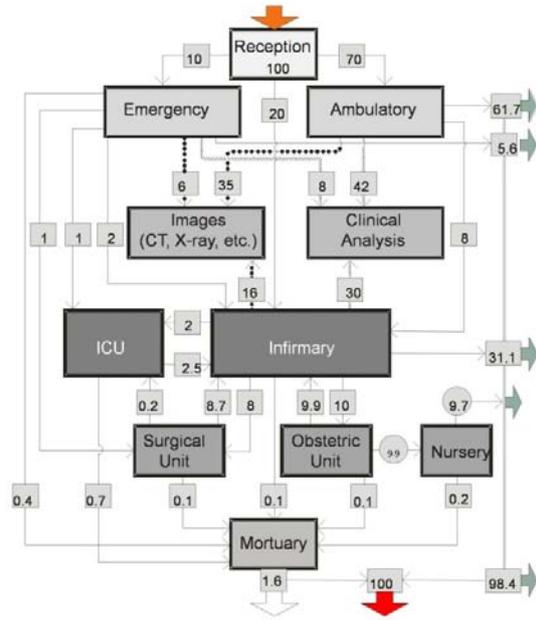


Fig. 3. Healthcare supply chain: Example of the quantitative flow of activities.

The description of the healthcare service pathway is reorganized and presented as the operational program, which includes the operation of the building, its activities, units and flows. The operational program is presented to the user representatives as bubble diagrams, to facilitate their comprehension and participation. Bubbles diagrams are the basis for the physical space design, which is developed later. According to designers, it is important to have an effective coordinator, among the user representatives, to solve conflicting requirements, due to the large number of users. Furthermore, during all the process, users used to bring ideas and requirements. In the present case, the coordinator was the president of the hospital, who played an important role to establish a period for giving requirements and suggestions, and then ensuring that deadlines were met.

When the conceptual design was finished, the Clinical Hospital administration organized a room inside the hospital and near the reception for the refurbishment design exhibition. This was a way to inform users about the design, so they can follow the changes that will occur in the building and also they can see the results of a design in which they were involved.

DISCUSSION

The preliminary outcomes of the case study point to the significant role played by users in designing activities and flows for the service design of healthcare buildings, in conformity with the literature review. So, participatory approaches may improve the efficiency of the building.

On one hand, *service design* can benefit from users' experience to fit the building to the best way of performing healthcare activities. On the other hand, *building design* demands specific knowledge because it makes use of technical language that users are not used. Therefore, the case study suggests that the most suitable form of user involvement in healthcare design is 'consultative' or even 'informative', at the building design stage, and "participative" at the service design, according to the definition proposed by Damodaran (1996).

The outcomes of this first case study emphasize the importance of involving healthcare professionals and other staff members in the design of healthcare buildings, in order to guarantee efficiency for the delivery of care services, to reduce waste and to meet the user requirements. It is necessary that the designers know the processes of performing services, which are the activities carried out by staff from the moment that the patient enters the hospital until the time he leaves it. This knowledge allows not only the alignment between physical space design and service design, but also the re-design of the healthcare service pathway, in order to propose enhancements to the services, through the improvement of flows and approaching or distancing sectors according to the need of the activities. The description of the healthcare service pathway used enables designers to understand the building operation and to detect points of inefficiency and waste. Thus, the refurbishment design may improve service activities and the operational efficiency, which can generate value to users.

Although user involvement may bring variable and conflicting requirements to the project, the studies of Kujala & Kauppinen (2004) defend that in most cases one may identify a core set of common needs, for the reason that user requirements do not vary much. Hence, a larger set of users' needs can be met in the design process. The authors state that it is important to identify and take additional and conflicting requirements into account at the early stages of the process.

Both the literature and the case study showed that the use of tools is important to promote user involvement, since most users are not prepared to produce the intended results through participatory approaches in the design process. The organization of multi-disciplinary teamwork, conversations and iterations enable users to have a real voice and designers to find inspiration with them. If not, user involvement does not generate value (Steen et al. 2007). Previous training of the users, in conjunction with efforts made in the way of simplifying the design representation, facilitate user involvement in the design process, according to the case study. Bubble diagrams as a tool to simplify the design representation are employed, because when users draw bubbles and arrows to represent their activities and flows they felt more at ease.

Despite its benefits, user involvement can increase the costs of the process and bring some risks. With more people involved in the project, the complexity increases and there are additional coordination efforts (Hoyer et al., 2010; Steen et al., 2011). Besides the user representative group, in the case study presented here there is a users' coordinator, who played a crucial role to avoid delays in users' activities during the process and to sort out conflicting requirements.

The architecture company studied, by its experience, believes that the benefits of the involvement of staff are more guaranteed, because the staff has experience and knowledge about the operation of the building and the healthcare service pathway. In the involvement of non-staff users, it is more difficult to achieve real benefits, as the variety and number of users is larger, and many spend very little time in the building,

and seldom have sufficient knowledge of the environment to contribute in the process. Thus, it is more difficult to get relevant data together with non-staff users.

CONCLUSION

This paper has presented the preliminary outcomes of a PhD research about user involvement in healthcare design. The importance of involving users in the definition of flows and activities of service design has been discussed. In addition, the preliminary results indicate the importance of simplifying the design representation and of training users for participation, with the purpose of facilitating user involvement in the design process as they are not usually familiar with design representations. On the basis of the discussion, it becomes possible to suggest that participatory approaches can facilitate the meeting of user requirements in the design and ensure efficiency for the delivery of care services, which can decrease waste and generate more value to final users.

Other two case studies are planned for this postgraduate research, with the aim of studying better ways of participation in healthcare design and further investigate participatory approaches in this type of design. Furthermore, it is necessary more study to verify means of involving non-staff users, and the benefits of their participation in the healthcare design process.

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