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Users contributions to an architectural project at the start up

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Abstract

Changes to architectural projects can be seen as an ongoing process from design concept to use. This paper analyses a particular phase of an architectural project, the start-up, which is characterized by the initial occupation of a workplace by users and the start-up of services. This paper aims to show that the experiences in this phase are unique and may make specific contributions to the design process. Analysis during the start-up phase may reveal experiences and users'needs that have not been met by designers, as well as inadequacies in the newly built space. This paper presents the results of a case study carried out in a sector of a hospital dedicated to patients with HIV. The analysis of the start-up of this newly constructed centre was performed using two methodologies: Post-Occupancy Evaluation and Ergonomic Work Analysis. The results suggest that ergonomic interventions in projects should encompass the start-up phase.

Keywords

Architectural design process. Start-up. Experience.

1. Introduction

Post-occupancy Evaluation (POE) is often recommended to enhance the architectural design process, as it provides user feedback from the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied (Preiser et al., 1988). The POE process uses a variety of techniques that treat issues of built environments, and it includes analysis of user satisfaction and of problems detected by users, in order to support corrective actions and future projects. However, POE is not often used immediately after a project is delivered. It is expressly recommended that some time is allowed after construction and occupation (Ornstein & Rómero, 1992) for the situation to stabilize. This article aims to demonstrate that during this "move-in" period important information may be lost through a lack of evaluation from the starting point of occupation.

The period between handing over the built environment to its end-users and stabilising its occupation is known as the start-up or move-in phase

(Castro, 2010). This move-in phase is a specific stage; it begins with the planning and preparations for moving to a new built environment, encompasses the transport and organization of contents, and results in the start of operations. In a similar way to an industrial unit that only reaches its nominal production capacity after a transition period, the move-in phase starts from the initial occupation of the built environment and lasts until relative stability is reached.

Analysis of the start-up leads to two important conclusions that constitute the central theses of this article: 1) users' experiences during the start-up are unique and can contribute to the design process; 2) the continuity of ergonomic interventions during the start-up can support the appropriation of the workplace by users and be an invaluable addition to the Ergonomic Work Analysis (EWA) that usually guides the design process and often the construction phase.

The importance of the move-in phase is firstly due to the evolutional (or historical) nature both of the built environment and of the experience, and

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it also underlies the design's continuity during use (Rabardel, 1995; Béguin & Rabardel, 2000; Béguin, 2004; Folcher & Rabardel, 2004; Duarte & Lima, 2012; Resende, 2011). After only a few months, the situation under analysis is no longer the same as when the built environment was handed over to its users. Social and physical relations between users and the built environment are dynamic (Fonseca & Rheingantz, 2009). User needs regarding the built environment follow this evolution, and on occasion lead to alterations to the initial design and even to the *as-built,* which should represent the end result. The relative stability of methods of use for the built environment may actually obscure transformation and adaptation processes and may hinder the recovery of this fleeting experience. "The type of instrument is not given a priori; on the contrary, it emerges little by little in the course of design, validation, and use." (Vinck, 2003, p. 8).

As design ergonomics has shown, design, execution and use are not pre-defined fixed stages. Changes to the architectural design are made throughout the life cycle of the built environment in every phase after its conception: in the construction, the "execution and implementation phase" (Duarte & Cordeiro, 2000) that is finalized in the *as-built*, right up to later reforms and adaptations of the spaces. These changes to the design may be motivated by designers, staff, entrepreneurs, accountants, or by users themselves. Each of these stakeholders may to a greater or lesser extent influence the development of the project, depending on the stage in which they play a role.

The start-up is the transformational phase of the project, where the users play an important role. They are alone, without the specialists, designers, or ergonomists and they themselves change the project. In this phase, POEs have not yet begun and ergonomic analyses have not been motivated by any specific demand (which may even be seen as out of place, particularly if future users have been involved in the project).

Thus systematic analyses are not undertaken and there is no follow through for the start-up, despite the fact it is recognized as a period of instability and as having potential to provide important information that may be useful to the project. In ergonomics, the potential of studies carried out in an industrial start-up is recognized by Guérin et al. (2001, p. 261) as:

> [...] allowing unexpected difficulties to be pinpointed and quickly resolved; it makes it possible to identify training elements that benefit users involved in the start-up, and which can then be formally passed on to those users who come in at a later stage and who are unaware of this earlier stage; it enables

lessons to be learnt about the design development for any subsequent transformations.

However, as the start-up does not represent an immediate demand, it may be considered as an interval between one completed ergonomic action and another to be undertaken at a later stage. Therefore, although the importance of this moment is recognized, systematic analyses of start-ups are still not automatically carried out, and this leaves a lacuna in the initial ergonomic approach. A part of this lacuna may be resolved by analysis of Typical Action Situation – TAS (Garrigou et al., 1995), prior to the start of a specific project, and which is described in a more general fashion than typical recommendations by ergonomists (Duarte & Lima, 2012).

Users' perception is also subject to transformation over time. When there is user participation prior to the start-up, it is possible that those involved in this participatory process do not get the same sense of satisfaction from the start-up. This phase has its own difficulties that can influence users' evaluation of the new environment. (Daniellou, 2006)

However, little is known about how appropriation of the space begins and of how it is achieved. The appropriation can be translated through the changes in the environment introduced by the users or the workers when they are inserted into the workplace (Fischer, 1981). On occupation of the space, users tend to modify it in order to make it fit their needs. If evaluation of the ergonomic intervention is made twelve or eighteen months later, the context will quite possibly have nothing more in common with when the intervention was carried out. The people in the new situation may no longer be the same, the products or services may be different, the name of the company may have changed, or the problems found may not necessarily be related to the previous intervention. "This only shows our inability to ensure long-term results within a changing context." (Daniellou, 2006, p. 40).

According to Pegoraro et al. (2011), uncertainties and changing requirements are inevitable in built environment design, for such reasons as the long development time, the numbers of stakeholders and the complexity of the product. These reasons partly justify how a project that has been approved - often by its own users -, can also be later considered inadequate by them in the start-up.

Contexts are constantly changing and the needs of the users of the built environment accompany these changes. Users' spontaneous evaluations, even when subconscious, are constant as they experience the built environment intensely at all times.

Precisely because of their transitory characteristics, start-ups offer an opportunity to give continuity

to the design process, whether by validating the solutions proposed by the designers, or whether showing up inadequacies as well as the solutions that users themselves come up with to adapt the built environment to their needs. Even though these processes of redesign and appropriation are still rather obscure and underused in terms of practical experience for new projects, its benefits appear to be well recognized.

One of the competitive advantages of Japanese companies is their design of more efficient factories. (Lojkine, 1992; Dertouzos et al., 1989). In some of them, this is explained in part by the continuity between design and operation, keeping on a part of the design team responsible for the start-up until nominal production is reached or when production is stabilized. This is a system similar to the "Production Key Contract", which goes further than the "Turn Key Contract", and which ends with the commissioning of the equipment:

> While American design teams consist of specialists who are qualified, but who have barely anything to do with the production teams, and disappear once the system is implemented, Japanese design teams stay on until well after implementation and make continual changes, thereby accruing new knowledge that will go on to be transferred to the systems through the modifications made. (Lojkine, 1992, p. 248).

Considering what is revealed from the analyses of the start-up phase, it is clear that part of this efficiency can be attributed to the support that comes from a double learning curve: (1) the gains from the redesign and adjustments that take place due to the presence of the design team working in close association with the production team; (2) the feedback for the design team, which is able to learn from its own mistakes and from the solutions to the problems that arise in any start-up.

2. The continuity of the project in the start-up as a source of experience

The continuity of the design process during use is looked at in depth with the Instrumental approach, mainly during the "process of instrumental genesis" (Béguin & Rabardel, 2000; Rabardel & Waern, 2003). Based on this approach design is an ongoing process which continues in use. It is through use that the artefacts become instruments of the activity and take on a functional role or rather, the users use their experiences and abilities to restructure the functions predicted by the designers (Folcher & Rabardel, 2004). Seen from this perspective the built environment is

an artefact that becomes an instrument when it is appropriated by users.

The "built environment" encompasses

> [...] every environment that has been erected, moulded or adapted by mankind. They are human constructs or physical structures built or modified by man [...]" (Ornstein, 1995, p. 7).

The concept of "built environment" goes beyond the concept of "space", which is used to characterize mankind's surroundings, artefacts and objects; rather, space is the unlimited or infinitely large three-dimensional extension where events take place and which contains everyone and everything. The notion of built environment includes the "set of material, historical, social and cultural conditions" (Rheingantz et al., 2009, p. 13) that is embodied in all workplaces.

When considering the components of the built environment (artefact) and the human components (scheme of use), one can see that over its use, the built environment becomes an instrument for its users, and thereby becomes functional. Depending on the quality of the artefacts suggested, users will be able to partially or totally appropriate them or to refute them in order to develop their own instruments. Thus it is normal for users to "design through use" when faced with certain difficulties that were not foreseen by the designers.

Redström (2008) defends the idea that forms of use can be determined by the "design" or by the "use" itself. When the user utilizes an environment as prescribed by the designer, the project is defining the use and shows the "foresight" of the designer. If the user manipulates the environment in a different way or gives it a use other than that prescribed by the designer, then the use will be defined by the use itself and will submit to users' "appropriation". In this case, appropriation also suggests the idea of users overcoming difficulties that were unforeseen by the designer.

Faced with these difficulties, users embark on subjective and strategic procedures of adaptation that may result in acceptance or overcoming the difficulties under inadequate conditions. Users' subjective processes and strategies require instant decisions so as to solve problems that have arisen from past design decisions. This means that the requirements that have not been fully met by the design stimulate its continuity by users, without a specialist on hand.

In start-ups, users encounter the limitations relating to the changed situation and, also to its irreversibility. In an attempt to cope with these difficulties, users seek solutions inspired by past experiences.

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"Experience suggests an ability to learn from living [...]" (Tuan, 1983, p. 10). This comes through a variety of perceptions relating to the senses and to sociocultural information. If one considers experience as learning, to act in a space does not mean it is understood in its essence, as what can be understood is a reality that is built through experience. This is focussed on the world extant to the individual, and it is made up of feeling and thought (Tuan, 1983). The evolution of experience and the built environment is intertwined; they mutually influence each other, thereby soliciting analyses that can encompass and describe the flow of experience and the permanent evolution of the environment.

In addition to this, individuals carry within them the impressions of past experiences.

> To have the experience of a structure is not to receive it passively: it is to live it, accept it, take it up, to rediscover its immanent sense [...] (Merleau-Ponty, 1971, p. 264).

This suggests that the experience is not direct, but lived, and that a designed space will undergo occupation by its users, who are already the occupants of a similar space. While still occupying the previous space, individuals are full of expectations, dreams and illusions about their new objective reality, the future space. Normally expectations are due to the lack of the individuals' own clarity of vision, as if this were present, the illusion would become impossible (Merleau-Ponty, 1971).

The illusion of these expectations is then shattered by the new reality. On moving to the new space, the individuals begin a process of comparison with the previous space, based on their experiences and begin to understand that experience has a memory (Tuan, 1983). The users thus begin a process of evaluation; it is important to base considerations on both their individual and collective experiences, as certain built environments cannot be perceived from only a single angle. Different users can develop activities that may be correlated or dissociated, but these all interfere in the shared use of a built environment.

It is very common for different users to experience genuine and incontestable benefits from the new built environment, such as improvements to lighting for tasks that require precision, or a reduction of noise in spaces where people need to concentrate, or even simply more comfortable fixtures and fittings. However, feelings of improvement and relief are often short-lived, lasting only a few days or weeks due to "acclimatisation" (Dejours, 1987).

The subjective sense of relief is more intense when the benefits of the new space are more substantial, as a problem that is only superficially resolved may reveal other underlying problems. The benefits of a chair rather than a stool, which eliminate the user's back-ache, may be forgotten after a month if they then begin to notice their shoulders hurting after typing for several hours without support for their arms. Thus, 'acclimatisation' plays a definite role in the obsolescence of the sense of improvement and relief, and it is clear that there is a hierarchic scale of problems that are normally obscured by latent problems (Dejours, 1987).

Users' reactions to the problems with the new environment mobilize skills and strategy creation in order to overcome difficulties. However, the experience alters and "anaesthetises" perception, and individuals' perceptions gradually sink into an unconscious plane, one of automatism.

The start-up provides a more intense experience, one that has not yet crystallised, and that is boosted by the previous crystallised experience and by unmet expectations. The very specific temporality of this experience in the move-in phase allows designers to see users' perception before it alters and crystallises once again.

3. Case study: HIV Day-Hospital

The ideas set out in this article are supported by a case study that was looked at in a previous study (Castro, 2010), and that described the relationship between work situations and the architectural design of a day-hospital for patients with the human immunodeficiency virus - HIV.

The HIV day-hospital had existed since 1992, with an area of 149 m^2, but its number of patients had grown significantly over the years, which meant it needed to expand and to improve its infrastructure. Over time, some of the areas within the day-hospital (office, filing and research rooms) expanded into external areas, as there was no longer enough room to hold them. For the new project, the hospital gave over another area of 276 m^2 for the new HIV day-hospital installations. This suggested that the available area would increase by 127 m^2, which was nearly double (85%) that of the original area. However, in reality, the area given only increased the actual space by 67 m^2 (45%), as the day-hospital was already using external areas equivalent to 60 m^2. This created false expectations, as while users believed that the new space for the day-hospital was going to nearly double in size, in fact the increased extra area would not be as significant. Therefore, the greatest challenge the project team faced was to reconcile an area only slightly larger than the current one with a project that aimed to double the number of patient treatment

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areas and also to add further environments that did not yet exist.

Throughout the project, the project team worked with the hospital's participants, and these were organised over three levels: "Decision", "Operation and understanding" and "field information". The ergonomist was the moderator between the groups of each level. The "Decision" level consisted of the "project monitoring committee", which was formed of representatives from the hospital board, the planning and engineering sector, the day-hospital and the nursing staff. This group took part in the final meeting of each phase (diagnostics, initial plans and final plan) to validate the results and forms of implementation. The "operation and understanding" level was made up of the "task force" formed of people responsible for the hospital's engineering and day-hospital services. Other participants varied depending on the subject under discussion at individual meetings. At this level, the architect and/or the manager of the office overseeing the projects was also always present. The "field information" level included the "ield group", which consisted of the clinical studies' supervisor, doctors, nurses, administrative staff, the nurse lead and the director of the day-hospital. Only the health professionals and administrative staff took part in the project process; patients were not consulted, which, as we will see later, was to have repercussions on the success of the project solutions.

3.1. *Case study methodology*

The two methodologies used to study the appropriation of the built environment in the start-up were Post-Occupancy Evaluation - POE and Ergonomic Work Analysis - EWA. The first is more familiar to architects and the second to ergonomists. While the

> [...] central focus of POE is the use of built environments, understood as forms of appropriation, operation and maintenance of spaces [...] (Ornstein & Rómero, 1992, p. 13),

the main focus of EWA is the work activity inserted in a social conjunction of demands that guide analysis (Daniellou, 2004).

While these two methodologies are distinct from one another, there is also a certain affinity between them: POE gradually becomes closer to the idea of the activity as a mediating and regulating category of the user/built environment relation; EWA on the other hand closes in on the design of the built environment through the activity. This approximation, that is loaded with a variety of concepts, principles and procedures, converges on specific analyses that enable discussion of the importance of considering

the experience of using the built environment in architectural projects.

A team that included an architect, an ergonomist and specialised designers drew up the architectural project. They only worked together during the early design phases: the diagnosis of the existing situation (the original installations of the HIV day-hospital) and the pre-design phase of the new day hospital. The entire design process (pre-design, schematic design, design development), construction and start-up phases lasted two years (February, 2006-September, 2008). The case study was undertaken between March and September 2008.

The study looked at the analysis of the initial appropriation of the new building and the accompaniment of the staff involved in order to improve the project, and this made it possible to understand how they appropriated the built environment and adapted it to the demands of the work activity. This accompaniment was undertaken after an analysis of the reference situation, which enabled a greater understanding of the context of the work and the user population in the previous built environment (staff and patients) and also identification of the TASs, or rather, the existing situations that would continue in the new HIV day-hospital. It was also possible to accompany the preparation and the execution of the move to the newly built environment. In tandem with this accompaniment, the design process was reconstructed in order to try to understand the design constraints, the interests of the different stakeholders and the needs coming from the service.

Traditional tools of POE and EWA were used throughout the study. A documentary analysis was made of the minutes from meetings, of the design plans and of the reports by the project team. At the same time individual meetings were held with the architect, ergonomist, hospital engineer, and staff of the HIV day-hospital.

Traditional methods from classic POE such as walk-through evaluations - were used to collect the field information. These tools helped to evaluate technical, functional, behavioural, aesthetic and cultural factors of the success of the built environments prior to and after the project. The walk-through evaluation made it possible to compare the information on the old and new day-hospital in a qualitative sense.

For the EWA, observations, interviews and validations were carried out. These methods helped to build the study in a social sense, and facilitated interaction with users as well as the application of POE tools. They made it possible to understand the demands that led to the design of the future

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installation, which encompassed the negative aspects of the previous built environment and also what the users' expectations were regarding the new day-hospital environment. In addition they helped to identify the TASs and, thereby guide the observations and the elaboration of the POE tools. Some of the conclusions were validated collectively and were simulated in the design plans so that the whole team could follow the reasoning; this was mainly when members of staff who were involved in the context were not affected by the same problems as others. The collective understanding promoted collaboration, which led to discussions about other problems that had not been mentioned previously.

3.2. *Revelations and redesign over the start-up*

Some situations in the start-up illustrate that it is possible to learn from specific experiences that highlight inadequacies in the newly occupied environment and that show adaptations to the design by users, with or without the help of the designers. They faced problems relating to furnishings and undersized environments, lack of workbenches, inadequate layout and design propositions that do not match the culture of the users or the activities undertaken in the environments. Three examples will be given to show the solutions users found for these problems: (a) preparation for nursing procedures, (b) blood collection, (c) patients' reception.

3.2.1. *Preparation for nursing procedures*

The design of the preparation room aimed to keep doctors and nurses working in the same environment in order to facilitate collaboration and information exchange between them. The environment was divided into two areas (separated by a workbench for file preparation), which were specifically designed for each profession to ensure a space that met the demands of the distinct work situations (cf. Figure 1).

The nurses' area needed to consider file preparation, IT usage (data processing), sterilization procedures, stock control and the preparation of procedures like blood collection, new-fill, aerosol inhalation and chemotherapy. The doctors' area needed to allow internet research, oral records of consultations undertaken, information exchange between doctors and nurses on patients' cases.

Regarding the nurses' area, on the day of the move to the built environment, the nurses realised that the workbenches were undersized and that there was not enough space to carry out the required procedures. The workbench that had been allocated for nursing procedures was taken up by work materials for administrative tasks. This led to nursing procedures being performed on the nursing trolleys.

The design had allocated five nursing trolleys, which were to be kept under the workbenches in order not to hinder the flow of people and materials within the room. However, two of these trolleys were higher than the workbenches. The "solution" was to
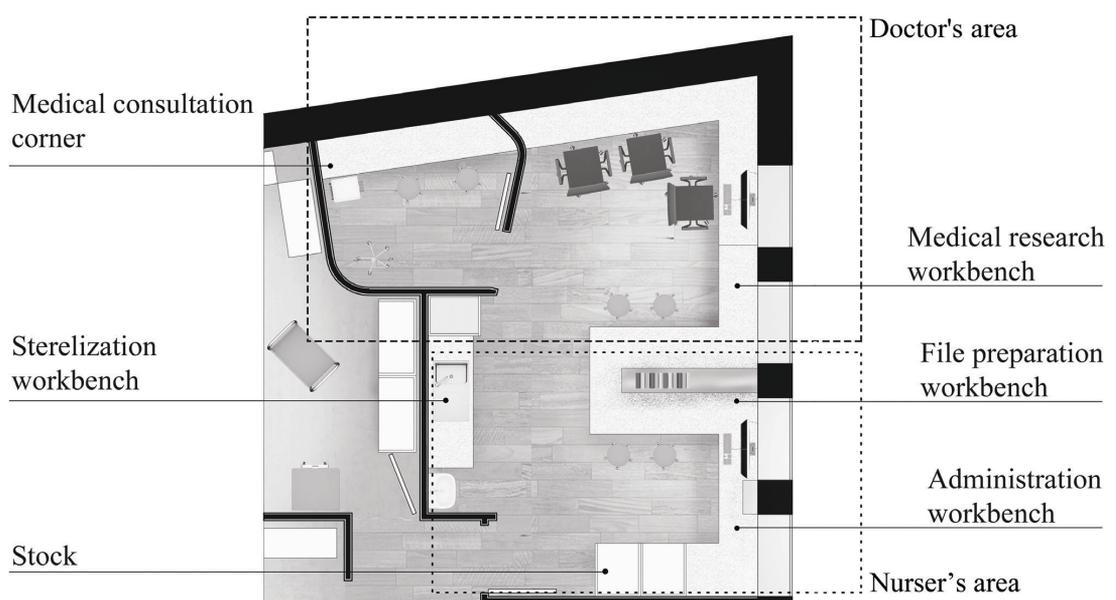

Figure 1. Preparations room plan: space divided into two areas.

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park them near the door of the preparation room, but this obstructed part of the circulation area.

The nurses realised that the blood collection generated considerable traffic of the trolleys used to prepare and carry the materials for the procedure. This position and the flow of the trolleys made movement in the environment difficult and led to conflict between nurses and doctors.

This problem was immediately solved (on the day of the move), by the nurses themselves. They transferred the preparations of blood-collection procedures to the appointment area, in the corridor of the HIV day-hospital, as can be seen in Figure 2.

3.2.2. Blood collection

Blood collection is the most frequently performed typical task in the HIV day-hospital. The design of the blood collection space was founded on the idea of increasing the number of rooms for this service. The design team believed that those environments could be smaller than a "standard room" (10.5m²) in the hospital and, that therefore it would be possible to increase the number of service environments for the blood collection.

They also believed they could exploit the service environments' flexibility of use, with characteristics that could meet the demands of medical consultations and blood collection, and thereby be more adaptable to the volume of patients and the kind of service.

Based on these premises, the designers introduced the concept of a "cubicle", taken from the Accident and Emergency department, which could be used to collect blood and for medical consultations.

However, when users move to a new built environment, as well as their experience, they also take with them their belongings (furniture, equipment and instruments). In the user's first contact with the environment, the experience interferes in the way of perceiving it as "adequate or distorted", "good or bad", "right or wrong", which are relationships that depend on the user's own references (Merleau-Ponty,
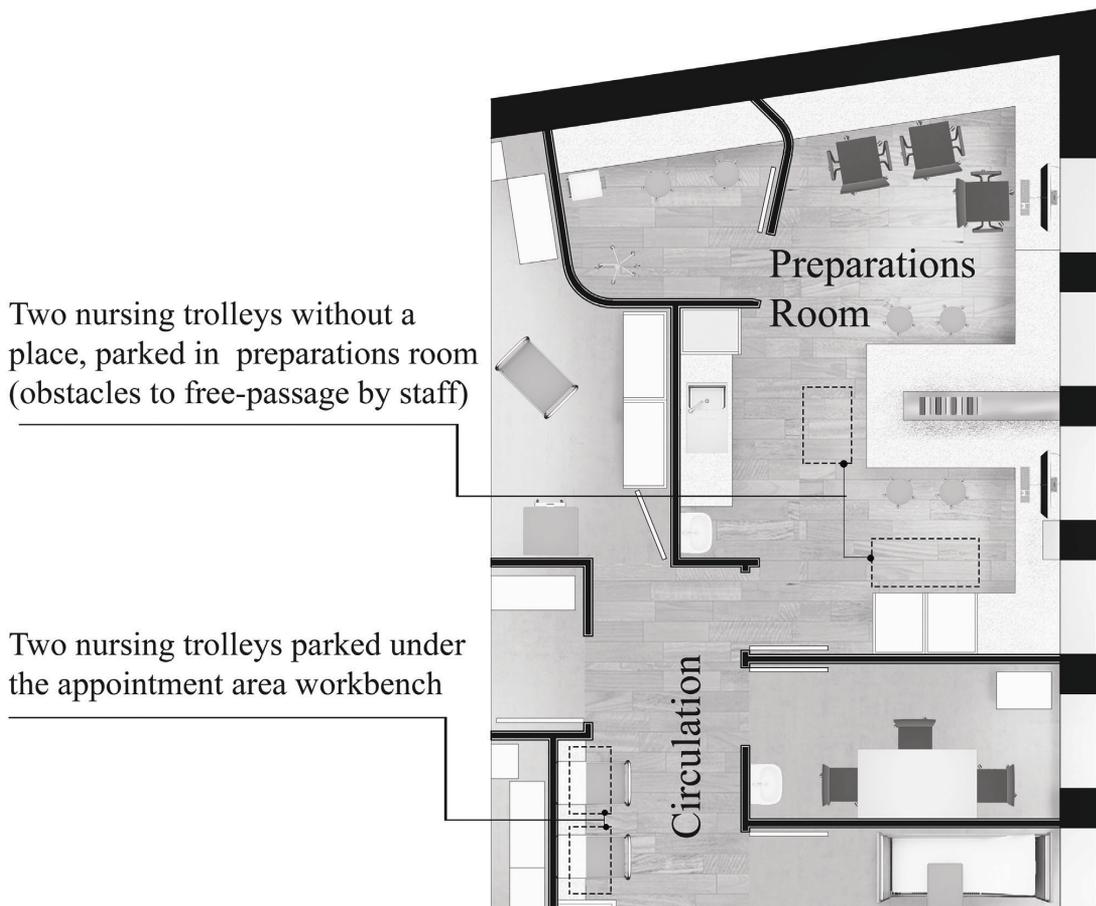

Two nursing trolleys without a place, parked in preparations room (obstacles to free-passage by staff)

Preparations Room

Two nursing trolleys parked under the appointment area workbench

Circulation

Figure 2. Change of position of the nursing trolleys from the preparations room to the circulation.

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1971). Those aspects of the environment considered positively or negatively by the user can be explained partly through their memory of the experience (Tuan, 1983).

This means that, subconsciously, users will judge the environment based on their experience, when the environment does not meet their needs. In this case, the concept of a "cubicle" became an "innovation" in the HIV day-hospital built environment and the different physical characteristics of the previous situation modified the way nurses behaved when collecting blood. In the prior situation, they had been accustomed to move around the patients' bed or armchair and put the nursing trolley in the position that best enabled the procedure. The cubicles however, reduced the nurses' mobility, as the space was more limited and they felt enclosed, and in addition there was a bed along the wall.

The features of the new spatial configuration heightened the risk of nurses accidentally coming into contact with contaminated needles and, therefore, the nurses' first reaction was to refuse to work in the cubicles. Figure 3 illustrates the possibility of the cubicle door being opened by a staff member pushing in a nursing trolley, and potentially colliding with the nurse during the blood collection and, consequently, injuring the patient or causing an accident for the nurse with the infected needle.

After the nurses' reaction and their rejection of the cubicles, they began to only be used for the

medical consultations, and the blood collection was undertaken in other rooms. This inversion did not last long, due to the discomfort of the cubicles, not only because of their size, but because they were so claustrophobic: they did not have any windows and the consequent lack of natural light left users feeling confined. The cubicles were almost abandoned by the staff and were only used as a last resort: only when there were a large number of patients to be attended to. They did take on secondary roles, such as for patients to wait to be seen, when they did not want to wait in the waiting room with everyone else.

3.2.3. Patient waiting room

In the HIV day-hospital, the patient waiting room was a problem for patients who felt uncomfortable waiting in the corridor to be seen. To transform this situation, a waiting room was designed for the new day-hospital based around the concept of user-friendliness.

With the intention of humanising the service and minimising the particular conflicts that had existed before, the ergonomist introduced an idea from the main hospital that was already familiar to members of staff of the day-hospital, for the architect to include in the project. It was founded on the idea that a user-friendly environment can stimulate dialogue and the exchange of experiences between patients.

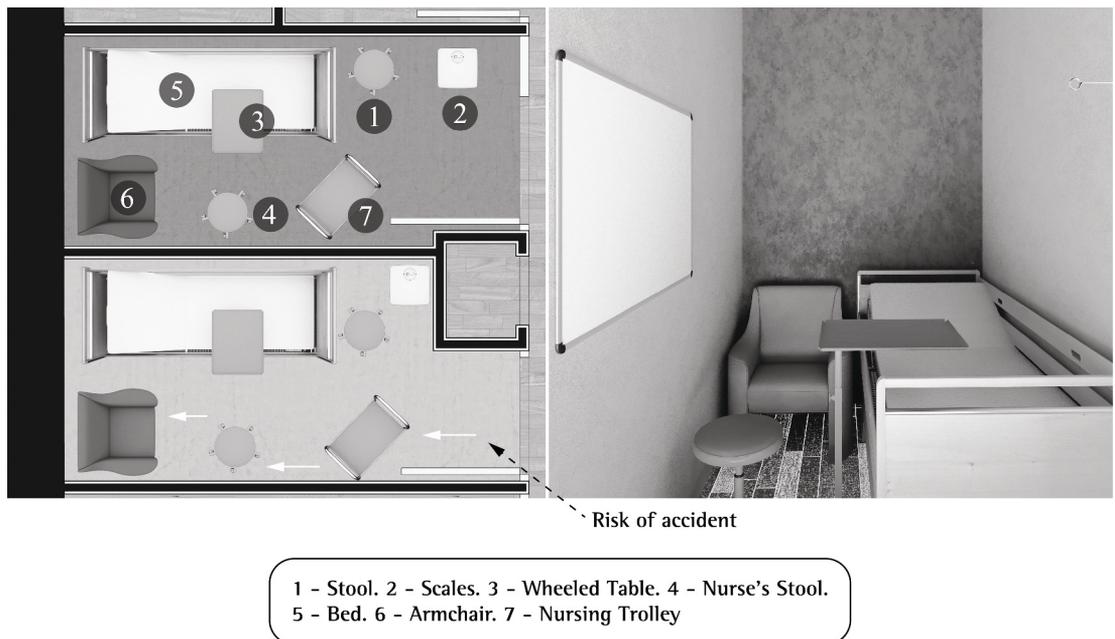Therefore, the architect and ergonomist for the HIV day-hospital design proposed a room that would

Risk of accident

1 – Stool. 2 – Scales. 3 – Wheeled Table. 4 – Nurse's Stool.
5 – Bed. 6 – Armchair. 7 – Nursing Trolley

Figure 3. Risk of accident in the cubicle.

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stimulate patients' sociability, where they would be able to swap stories and have access to a bar-style kitchen (cf. Figure 4). The idea came from a trend in the general hospital sector, which had already been successful, including in that particular hospital, with a cafeteria and garden shared by all sectors of the hospital. However, the HIV day-hospital had still not experienced this kind of patient space.

The analyses carried out in the start-up showed significant improvement to many of the functional, technical, behavioural, aesthetic and experiential factors of the waiting room when compared to those of the previous built environment. However, the expectations of the design team and staff members regarding increased user-friendliness were not fully met, as the concept went against the patients' desire for privacy: they did not want to be seen by other patients and did not want their conversations with nurses overheard.

Despite the fact the waiting room provoked new sensations for the users brought on by stimuli that were not present in the previous waiting room, the patients' position in relation to their condition as patients remained unchanged. The stimuli of natural lighting, the colour composition of the different elements of the space and the smell of coffee from the kitchen created a lighter atmosphere that positively influenced users' moods, but it was not enough for them to feel sufficiently at ease to talk with other patients. They continued to prefer to wait alone in the cubicles or rooms until they have received medical care, than to wait with other patients. The nature of the illness and the prejudice associated with it were barriers to the success of this kind of proposal.

The concept of user-friendliness was added to by offering a space for patients to eat together. According to Alexander et al. (1980, p. 617), "[...] eating food together has played a vital role in nearly every human society as a means of bringing people together and increasing a group's sense of unity." The comfortable, pleasant, and spacious conditions were valued by both members of staff and by patients. However, a number of patients continued to prefer to eat alone in the cubicles with greater privacy.

3.3. Discussion: evaluation of the solutions and their restrictions

The greatest difficulty the team faced was to reconcile the project and its requirements with the space the hospital had provided. The project included five zones: (a) service, which includes the reception and patient treatment areas; (b) work, where staff prepare for treatments and undertake administrative tasks; (c) support, bringing together spaces for staff support; (d) patient waiting room and (e) circulation.

The areas of those zones altered in relation to those prior to the project, and changed over the creation process from the initial plans until its conclusion. The initial plans were drawn up by the hospital's own engineering department in order to verify whether the new space could actually accommodate the project as defined by the staff. The final plans were founded on ergonomic practice and were drawn up by the project team. Table 1 shows the proportions of the space for each zone in relation to the day-hospital's total built environment for each of the three phases, remembering that the area of the new environment was 67 m^2 greater than the previous built environment.

The greatest difference between the area distribution before the project and the final plans was the reduction of the work zone to allow for a waiting zone. The areas of the remaining zones did not undergo any significant alteration. As previously, patients had to wait in areas adapted from the circulation space, designers created a specific waiting zone, in order to

Figure 4. Plan and perspective of the waiting room with the bar-style kitchen.

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Table 1. Evolution of the area distribution between the different zones in the HIV day-hospital.

Area distribution			
Zones	Prior to the project (%)	Initial plans (%)	Final plans (%)
Service zone	29	36	31
Work zone	34	25	22
Support zone	12	8	11
Waiting zone	-	6	13
Circulation	25	25	23
Total	100	100	100

provide greater comfort and sociability. These plans for a specific waiting area resulted in the reduction of the work zone. With regards to the initial need to increase the service environment, the designers managed to achieve their aim of doubling the number of environments without having to increase their actual area. However, these decisions made in relation to the size and division of the environments led to problems for users which only became manifest after the new space had been occupied.

All three of the typical situations presented (nursing procedure preparations, blood collection and patients' waiting) led users to find solutions to problems that were hard to predict, but that questioned the need to rethink ergonomic intervention processes, not only during conception, but also throughout the use of the built environment.

The solution to the problem of the lack of a nursing procedures workbench in the preparations room, which was to use the nursing trolleys and transfer the preparations for blood collection procedures to the appointments corner led to another problem. It was not possible to successfully combine the blood collection with appointments. When making appointments, the nurse needed to be fairly close to the patient and to have a flat surface on which to write. This became impossible in the appointments corner as there was not enough space on the workbench for diaries and the trolleys made it hard to get close to patients. Therefore, the nurses reintroduced appointments to the waiting room, where they had been in the previous circulation area of the day-hospital, which perpetuated the issues of privacy when booking consultations. In both waiting rooms (the previous and the new), communication presented an emotional and mental cost for the individuals involved, which influenced the social activity (Fischer, 1981). The prioritisation of one solution to a problem, which then led to another, was based on the nurses' experience. In this case, the experience from the start-up period reveals that when users are faced with a variety of problems, they tend to find immediate solutions for them, despite knowing that the solution means returning to something that

did not work very well. Users' experience may help them to assess the worst of the problems and which one needs an immediate solution. If they are already aware of the ways in which the problem manifests, they make quick decisions, and are aware of their consequences.

Regarding the innovative introduction of the cubicles for blood collection in this day-hospital, users were particularly taken aback by their dimensions. User expectations were that the area of the new HIV day-hospital would be bigger and, would therefore have a greater number of more spacious environments. But the reality did not live up to this expectation.

During the design of this new environment, the designers used intermediary objects (Alexander, 1976; Jeantet et al., 1995; Jeantet, 1997; Schon, 2000; Campos, 2002) in the form of technical drawings (plans and perspectives) in order to ensure that users understood their proposals. However, these representations are not easily understood by laypeople who are unfamiliar with the kind of language used by designers to express their intentions. This meant that they were unable to discuss the quality and suitability of the projected environment. The lack of understanding of what the space would actually be like is exemplified by the fact that they decided it was unnecessary to acquire the furnishings deemed necessary by the project team, exchanging a reclining armchair for a bed and a seat, and thereby reducing still further the area of circulation inside the cubicle.

The consequence of this lack of comprehension was that of the six cubicles, five were rejected for blood collection, and only one was able to be used for that purpose when it was empty. This meant that the nurses' first impression was of having regressed regarding the number of spaces available to perform the most frequent procedure of the HIV day-hospital. Prior to the new building, the day-hospital had had five spaces (four bedrooms and a living room) that could be used to collect blood; however, after this it then had only three (two bedrooms and a cubicle). Since it was impossible to extend the area of the cubicles as the construction phase had already been completed, the solution to the problem involved considering other uses for the cubicles, the main criterion for which was not to have any procedures with needles.

In this case, the experience over the period of the start-up reveals that the environment is put into "quarantine" until it is given another purpose: (i) when the required environments and objects exist, but do not function well due to false perceptions caused by intermediary methods; or (ii) when the introduction of an "innovation" based on the experience of the

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project team places users at risk, and there is no opportunity to transform the environment.

Regarding the patients' waiting room, the proposal for a more user-friendly space was incompatible with patients' desire for privacy. The patients had harboured the hope that they would no longer have to wait with other patients for medical care not only through fear of being recognized outside the HIV day-hospital and being labelled as sick or as HIV positive, but also because they were uncomfortable with visible manifestations of the disease in each of them.

Even though the patients had created a frustrated expectation about greater privacy while waiting to be seen, the project still brought considerable improvements. Prior to the new building, when everyone was waiting in the corridor to be seen, patients' experience showed their discomfort in being able to hear everything that was said in consultations in other rooms in the day-hospital, even with the doors closed. This meant that the patients' silence in the corridor was a loaded one. In the new day-hospital, the division of the spaces and the creation of a waiting room were considerable factors in improving privacy.

Users' vision of their own environment is very different from that of a visitor or occasional user (Tuan, 1980). This explains the differing viewpoint of the doctors and nurses, and that of the patients.

There is another positive aspect of the waiting room of the new space: in spite of the patients' desire for privacy through a certain amount of isolation, it was very useful for staff members to have visual control of the patients. Visual control helped the staff to keep tabs on patients' physical and mental states: whether they were agitated or down, depressed, hungry or well. Depending on the state of each one, the staff-members sought to make their wait to be seen a little easier. Some only needed a little attention, a brief word, or a meal; others needed to be moved to separate rooms. According to Bentham's classical concept, which was taken up again by Foucault (2008), a hospital building tends to be organized as a tool of medical action, which makes it possible to observe the patients carefully to keep them under control; however, here it also serves to plan and to coordinate care.

Prior to the new building, as all the hospital environments led straight off the corridor which was the waiting room, the principle of omnipresence (Bentham et al., 2008) was established. This ability for staff to have an element of control over patients was diminished with the new waiting room because it no longer directly communicated with all the other spaces.

In this case, the experience over the start-up period showed that the repetition of solutions for environments of similar natures can clash with the specificity of the context, even when everyone involved in the project believes in their respective benefits. For the case under discussion, the underlying concept of user-friendliness was not perceived positively by patients, but keeping them together in the same environment did actually benefit the quality of care given them.

Analysis undertaken over the start-up period shows that some solutions given by users to failings in the design of the built environment are immediate and others leave the users to live with deficiencies for months, until they manage to find solutions for them, and leave still others that may never be resolved.

One can note that the cause of the problems from the three situations are familiar to design practices, these being underestimating size and space, laymen's (users') difficulty in understanding the project through the technical representations, the risk of accidents, innovations introduced by designers not fitting the precise needs of specific users who share the same environment. However, the knowledge of the reasons does not mean the problems are anticipated by the project team.

Over the two-year period, from the end of the architectural project (that signalled the end of the ergonomist's activities) to the project handover, users fuelled their expectations, started to discover new requirements and several other functions were incorporated into the service of the HIV day-hospital. There are several examples which suggest that the project should be reconsidered after this two-year period: epidemiological research has progressed tremendously in the sector; it is no longer a sporadic service and is now something that is permanently offered by a team of professionals; nurses saw a demand for therapeutic education consultations for patients, which had not existed before; the constant increase in patient numbers required more space in which to store their files; the changing rooms had no more space for the lockers needed by the growing number of staff. The distance between the design phase and the start-up, taken together with the separation of the team members, did not enable the project to evolve in accordance with the new demands of the users and the service. Considering what has been shown in relation to the move-in phase, these problems are not resolved even when the project relies on the previous support of ergonomists. The results suggest that ergonomic interventions should be distributed over the course of the project and the construction, and also over the use of the built environment, right from start-up.

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4. Conclusions

This case study illustrates the limits of ergonomics in the light of the knowledge at the time of the project's conception, and which only became clear at the start-up. These limits are in relation to substantive knowledge (such as these particular patients' behavioural specificity, which does not fit within the general concept of sociability) and methodological knowledge (what can or can't be predicted in the planning phase). Even though there was contact with those users who were to be involved in the future project, it was difficult to predict how they would develop their activities and make use of the future space. It is hard for the users' observations and comments on the activities undertaken at the conception phase of the project to encompass every future requirement, and it is particularly hard to describe spatial attributes that work well. Our experience with space is essentially corporal, and it develops tacitly; this means that inadequacies are more easily perceived than positive aspects. These however, are immediately noted at the start-up through their absence!

Ergonomic accompaniment of the start-up period makes it possible to suggest solutions for failings in the built environment, together with the users, before they go ahead with their own more or less creative, and not always suitable, adaptations. In methodological terms, the start-up period brings up elements to understand how an architectural design process develops, in particular regarding the inter-relations between users, architects and ergonomists, all of whom are agents in a participatory process.

Some of the problems highlighted in this phase lead one to seek answers in the design process so as to understand what took place, what were the determining factors of each solution, and to identify problems that may have been unforeseen or that were impossible to predict. In the three cases presented in this article, the experiences of those involved can be capitalized on for future projects. The start-up allows one to store experiences that may not be accessed at any other time, and justifies analyses, whether POE or EWA, during this phase of occupying and appropriating a built environment.

Both these methodologies provided complementary information, as while POE was useful in evaluating a range of aspects of the built environment that would not have been noted with EWA, the latter gave information on the activities and operations of the HIV day-hospital that would not have been observed using POE. The tools of POE made it possible to collate a large amount of information on the built environment, showing positive and negative elements of the space that could be examined by analysing the activity. EWA provided information on the activities which influenced the way the data collected using POE was interpreted, as it enabled an understanding of the link between users' desires and needs and the requirements of the activities.

In the long term, accompanying a start-up enables one to capitalize on users' experience in a more continuous fashion, and allows the experience of design specialists, familiar with design principles and concepts, to be used for future projects. Through reflecting on the result of the transformation and how it was developed it is possible to create an information bank that can guide new actions.

In this sense the design must fail in order for future generations to be able to define its progress (Ingold, 2011). However, the situations analysed in this article put the start-up phase in a different light from that of the authors cited at the beginning of this article: it is not merely about more or less pessimistic evaluations, nor about imposing a limit on ergonomic interventions, which always have tight deadlines, to control a moving context, and is neither a simple problem of acclimatisation or habituation. Analysis in the move-in phase not only allows one to evaluate the results of the ergonomic intervention in the design phase, it is an intervention in itself that should take account of the specific experiences of the users at the time, so as to produce knowledge that enables ergonomics to play a role in redesigning and facilitating the appropriation process. Beyond this immediate result, in tandem with the POE methodology, one can also produce systematized knowledge that can continue to feed the design in a permanent way.

Although these results come from only one case study, the diverse situations under analysis seem to be consistent enough to suggest another way of positioning ergonomic intervention, one that should be less specific, and that should extend to all phases of a given work situation, and in this case of a built environment. If design ergonomics start at the initial design stage, continue through the construction phase and recognize redesign during the use, it is now time to invest in this specific stage that is the move-in phase or the start-up.

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