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► **To cite this version:**

Michael Fenker. Towards a theoretical framework for usability of buildings. Keith ALEXANDER Usability of Workplaces - phase 2, CIB report 316, CIB, 2008, W111 research report 978-90-6363-057-7. ⟨halshs-01290227⟩

HAL Id: halshs-01290227

<https://shs.hal.science/halshs-01290227v1>

Submitted on 17 Mar 2016

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Towards a theoretical framework for usability of buildings

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ABSTRACT

The issue of the conditions governing the reuse of previously developed knowledge during design activities and its effects on the process assumes considerable importance in the built environment sector. We link this with another issue, being the effects of taking into consideration social practices and user experience on the relevance of built products. We believe that the joint consideration of the two problems provides a better understanding of the interleaving between the relevance of the products and the quality of their production and management processes. Thus, by exploring theoretical and empirical studies that feed this understanding, we want to contribute to the theoretical foundation of usability of buildings. We argue that usability is achieved by the interplay of user experience, design and management processes, and buildings.

BACKGROUND

Like other activity sectors, the built environment sector is confronted by a growing number of uncertainties. These include, for example, technical uncertainties concerning the final use of built products and strategic uncertainties often generated by the divergent and differing final aims of the players involved in a building project. The difficulties resulting from these uncertainties increase the level of attention being paid to the operational, economic and social relevance of built products and raise questions concerning the capacity of organisational systems and players to handle new and more complex problems.

Over and above initiatives developed in individual project circumstances to meet these new requirements, players state the need to develop knowledge and ways in which to make it available. The difficulty of organising the reuse of knowledge developed in previous design and occupation processes during design activities is well known. This difficulty, on the one hand, makes reference to the connection between knowledge and specific building or urban project situations and, on the other hand, to the transmission and capitalisation of knowledge from one building project to another and between players.

Within this context, the issue of the conditions governing the reuse of previously developed knowledge during design activities and its effects on the process assumes considerable importance (Fenker, 2008; Evette et al., 2003; Spencer and Winch, 2002; Bonnet et al., 2001). We link this with another issue, being the effects of taking into consideration social practices and user experience on the relevance of built products (Alexander, 2006; Granath and Alexander, 2006; Fenker, 2004). We believe that the joint consideration of the two problems provides a better understanding of the interleaving between the relevance of the products and the quality of their production and management processes. In this understanding lies the theoretical foundation of usability of buildings.

USABILITY STUDIES

A swing in favour of taking social practices into account during the design process began around 15 years ago in the industrial sector. In this meaning, the consideration of social practices pursues different aims and takes a different aspect than the approaches developed in the sixties and the seventies, i.e. *Advocacy planning* by Christopher Alexander, *Participation in the design of workspaces* by Colin Clipson or work carried out in France in research programs, like *Design and use in housing projects* funded by the ministry of construction and housing (PUCA). Using approaches grouped together under the generic term of *usability studies*, social practices, generally subject to analysis, either prior to or following the design process, have progressively entered the design process itself.

ISO 9241-11, 1998 defines usability as: ‘the extent to which a system can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use’. The taking into consideration of social practices is considered as a factor that can result in systems that are easy and fast to learn, efficient to use, easy to remember, that allow rapid recovery from errors and offer a high degree of satisfaction to users. Besides the usability of the system's operation, the point of view of the user in regards to usability is considered as being equally important. An attempt to study the experience of a user is made by approaches that link usability and human emotion. These include both the attitudes and perceptions of the user in terms of satisfaction and control.

Measures attempting to mobilise usability concepts in the field of building design and facilities management are rare and there is little knowledge available. In this field, players traditionally consider the building to be a project, a product, and consequently appreciate its performance through technical and functional aspects (Granath and Alexander, 2006). A greater recognition of the concept of usability demands that professionals not only see users in terms of physical and cognitive aptitudes, but also, to increase the acceptability of a technical system, take account of the relationship that the user has with the latter through the values it conveys. An approach focused on social practices demands that all human, social, economic and technical aspects of the user's effective activity be taken into consideration within the social context of use.

The widened perspectives we propose to investigate the concept of usability when compared with existing works concern two aspects: firstly, the object of our analysis specifically concerns the chain of actions and the knowledge that link the design and the uses of a location; secondly, the analysis needs to take into consideration all players included in the chain without developing an *a priori* ranking of the end-purposes they are seeking to achieve through the project. In particular, it is important to distinguish between contracting authorities and users and between a wide range of users, like top management, organisational units, end-users, etc. (Blakstad et al., 2008). Our proposal is built on previous work carried out by an international group of researchers and practitioners (CIB commission 111 Usability of workplaces), that has investigated the concepts and meaning of usability.

To this effect, as well as standing out from a certain amount of other research in the field of architectural and urban production, our analysis also widens the field of works trying to bring together the use of artefact and management practices. Nevertheless, some of these works, which have contributed to questioning management sciences, particularly in the field of “situated action”, distributed knowledge and resource management, will be analysed in the following part of the paper to provide a deeper understanding of the role of space in organised action, especially its appreciation as a symbolic and cognitive resource.

SOCIAL RELATIONS, SPACE AND COLLECTIVE ACTIONS

Mediating artefacts

For Vygotsky (1930), peoples relationship to the world, rather than being immediate is, on the contrary, mediated. In other words, we exist in the world, understand and intervene in it through the intervention of cultural tools (physical, e.g. a hammer, or psychological, e.g. language), that are available and passed on from one generation to another. These cultural tools are social pre-constructs defined as artefacts, in other words things resulting from human activity and which are susceptible to being incorporated into social practices.

Lautier (1999) positions the notions of space and physical settings in relationship with each other. “One can speak about space as a system of social relationships, mediated by a physical organisation.” Space therefore refers back to the diversity of positions in social relationships between occupants of a place. For Lautier (1999, p.214), “[space] is the representation which organises the perception of this setting for a (collective or individual) subject.”

In addition, given that they are designed for one or more activities, the artefacts are bearers of a set of possibilities and constraints as well as, most importantly, activity and social practices models. Characterising socio-technical systems as artefacts creates an inversion when compared with currently accepted definitions, with the technique defined in terms of activity rather than simply as a result of its intrinsic characteristics.

Human activity appears to be shaped by the use of mediating artefacts while also transforming them through use, thus contributing to the renewal of cultural acquisitions. This dual movement of people being transformed by the cultural tools represented by artefacts, and of culture being transformed by people through their social practices and appropriation of artefacts, operates on the productive aspects of the activity – achieving objectives in real situations – and in terms of the constructive nature of the activity – aiming to develop resources for the individual in the future. This definition of an activity in terms of “productive-constructive” links makes it possible to envisage relations being created between operating in concrete and day-to-day situations and development based on stabilities acquired in carrying out the activity while simultaneously giving up the latter to construct something new that meets changing requirements, whether they come from the individual, activity situations, socialisation settings or others.

Social practices and meaning of artefacts

The issue of social practices and the interpretations that the occupants have of artefacts introduces the concept of meaning. It also introduces important difficulties: not only are the relations between artefacts and meaning multiple and uncertain, but meaning also remains largely implicit in social practices.

Ledrut (1984) writes that having an object is not sufficient to understand the meaning of this object. A meaning is given arbitrarily to a form, even though we might feel that the relation is occasionally “natural”. The same meaning is given different forms, much in the same way that different meanings can be given to a same form. These relations are conventions based on a certain temporal stability of socio-cultural practices. Ledrut considers that “form takes precedence over meaning and in no way implicates it. This analysis underlines the fragile or unstable nature of the relation between form and meaning as socio-cultural practices vary from one moment to another, from one setting to another and from one social group to another. Form is not simply the materialisation of the project, it is also as a vehicle for the meaning developed in earlier situations. It is also reinterpreted according to the situation.

Stability of social practices and collective memory

The idea that a place can convey the stabilised and shared meaning of a group has been particularly developed by Halbwachs (1997) in his work on collective memory. The meaning that the group gives its activity is conserved in the objects surrounding it; collective practices subject objects to an encoding of meaning that simultaneously make them intelligible to the group members. For Halbwachs, one of the characteristics of places and objects is the fact that they provide group members with a way of being common to the entire group; the duration of the place creates the image of the continuity of their representations. Each aspect and each detail of this place has its own meaning which is only intelligible to the group members, because each part of the place occupied by the group corresponds to an equal number of aspects of the structure and the life of their society or at least to what is the most stable within that society.

The collective memory retained by the group by perpetuating practices allows the transmission of the meaning that they attribute to the relationship between their activity and the place. The stability of practices contributes to assuring the stability of meaning.

Instability of social practices and adjustment processes

Reynaud (1997) proposes a dynamic vision of the relations between players and the socio-technical systems surrounding them. His work on rules and adjustment processes reveals the instability of collective practices. Rules represent the organising principles for all social systems and cannot be subtracted from the tastes, preferences and interests of the involved participants. They impose an external constraint on individual decisions. Nevertheless, rules are not intangible; they often need to be reiterated, clarified and negotiated. Transgression is “normal”. Consequently, social reality is not the presence of rules, but rather the exercise of their constraints. Constraints are naturally drawn from standards in force and thus the systems they define, but they are also assumed by the players who test them, breath fresh life into them and occasionally create them through the social exchange process itself. It is this process of creation, application, transformation or elimination of rules that characterise the adjustment process.

Reynaud (1977) claims that adjustment processes are inseparably linked to an end-purpose, to an intention pursued within the collective action, to what the author calls a project. Adjustment processes do not simply constitute the forming of a group, they also govern the way the group operates and the relations between several collective players. There are as many adjustment processes as there are collective actions and participants. The relations between individual or collective players are governed by a complex decision-making process: adaptation or conflict, negotiation or arbitration, agreement or domination.

A large number of mechanisms, whether within or without the social system, contribute to adjustment processes. Reynaud (1997) is particularly interested in the adjustment processes applicable during action. For him, each player contributes to creating adjustment processes through his participation in the action. Naturally, this participation can take a number of different forms: formal or informal, explicit or implicit, through the design of the work or by the adaptation of the work to the given situation.

The collective player reaching agreement concerning a project by creating adjustment processes also reaches agreement concerning the meaning of the project. As expressed by Reynaud: “creating the rules for a system means creating a rationality shared by those inhabiting the system”. Similarly, the invocation of a rule determines the meaning of the considered events; it makes it possible to evaluate the meaning of an action. Operating adjustment processes means giving meaning to the collective action and, like the adjustment processes themselves, the meaning is questioned and transformed during the action.

Organisational learning and technical systems

How can dispersed knowledge be interlinked during the action and used for structural cohesion? What place is occupied by technical systems, including buildings, technology, and other artefacts in the coordination processes taking place between players? An answer is to be found in the fact that knowledge incorporates a social and inter-individual dimension.

We support the idea that the link between individual learning processes and collective learning processes is based, on the one hand, on an interaction with the technical system and, on the other hand, on players working with one another. This type of relational configuration is made available with the aim of accumulating and transferring knowledge. Primarily, it is the organisations themselves that provide the foundations for the support using operational schemes, lists of procedures, technical systems, etc. that could also be defined as “collective cognitive systems”. However, each group appropriates these types of organisational artefacts for their day-to-day activities: depending on circumstances, individuals decide on the meaning to be attributed to the rules and the way in which they are used (or not used). We underline the dual nature of collective cognitive systems given that they are both supports and objects of coordination within and at the service of an interactive learning process.

The coherence of the reasoning goes hand in hand with the hypothesis concerning the heterogeneity of individual behaviour patterns which dispenses with the definition of representative agents. Crozier and Friedberg (1977) propose the idea of a dual organisation: all

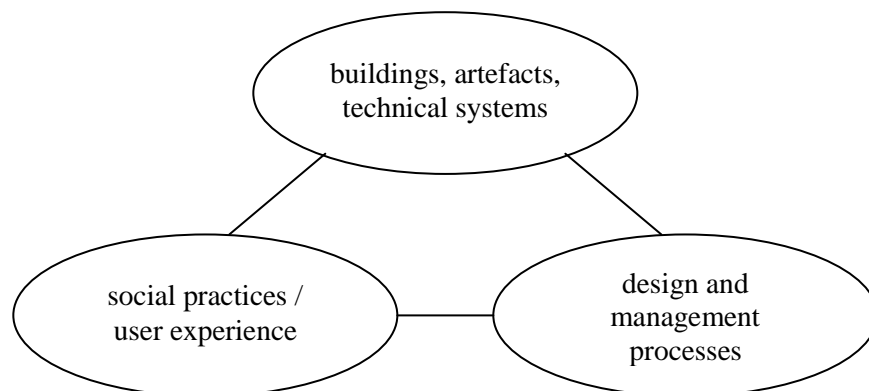
collective action structures – and, by extension, all organisational actions or decisions – are both restrictive because of the formal structure, rules, imposed referents, etc. that characterise them, and empowering due to the reinterpreted capacities of collective cognitive systems through players, the selective mobilisation of referents, etc.

The learning process for players is developed through daily practices and simultaneously contributes to the production (and reproduction) of social systems (A. Giddens, 1987). Within this framework, each player mobilises his particular reference points (words, gestures, artefacts, etc.). These types of supports are necessary inasmuch as they bear witness to a history of mutual commitments and can be subsequently mobilised again in different circumstances – “thus assuring the continuity of practices”. At the same time, a certain amount of ambiguity is inherent in these coordination objects as, by definition, they serve the local/global link: they are footholds, transitory social artefacts that have been selectively reappropriated by individuals through their relations to others and to the technical system.

Like E. Wenger (1998), we see this latter artefact as a vector for developing knowledge placed at the service of structuring cooperation and as an agent able to optimise its operation. This stands at the crossroads of practices, organisational identity, contextual experiences and structuring dynamics. At the same time, individuals mobilise technical systems, rules, procedures, etc. during their actions, actions that, in turn, will generate the design of their tools.

* *

We maintain that a technical system and its usefulness for collective action is neither the manifestation of timeless structures that are not subject to history and have a permanent and universal nature, nor the result of a historic succession of unforeseen events and disruptions. It is the product of a continuous process of construction whose course needs constant corrections. Following the theoretical development presented above, we argue that usability is achieved by the interplay of user experience, design and management processes, and buildings.



LESSONS TO LEARN FROM A USABILITY PERSPECTIVE

The design and management of buildings is not simply a problem resulting from a strategic decision to adapt an organisation to external events or to create an event that might generate a

competitive advantage. The design and management of buildings is also confronted with the dynamic of the action and the deeply open nature of compromises between participants during the action. Consequently, adaptation is not simply the result of an intervention on the technical system or the management of an understanding of relations between the aims of the organisation and the buildings criteria. Adaptation also results from the construction of meaning and the compromises made by the participants during the action taking place on the location (concrete examples can be found in the appendix).

Usability has to deal with the fact that buildings and the workplaces they provide are at the crossroads of at least two different logics, or two different levels of considering their usefulness: local and global, working situation related and intra/ inter-organisation related.

The theoretical development presented in this paper underlines the situation and context related aspects of usability. Usability cannot be assessed without questioning for whom, for which purpose and in which action the usefulness is required. A (management) situation presents itself when participants are brought together and, within a given time frame, must carry out a collective action leading to a result submitted to external judgment. The notion of situation also implies the uncertainty of events which is not just maintained by the changing context but also by the very open nature of the compromises worked out between the players. These types of compromise take into consideration not just the appropriateness of the means used to achieve the result, but also their appropriateness given the various other objectives being pursued by the participants. And we understand now that buildings with their technical, cognitive and emotional aspects are part of these means.

The notion of context refers to the interpretation of the situation; it provides information as to *what is currently taking place?* The context is represented by all the knowledge, whether or not explicit, that the participants mobilise to interpret what is being said or what is taking place. Both, the situation and the context have an effect on the appropriateness of the available means.

Consequently, usability should be understood as a process, a process during which the players can learn from earlier situations and the range of experiences that they have insofar as the adaptation between action and space is concerned. The object of usability studies should incorporate an approach that aims to objectify the eminently tacit relations between technical system and users. This approach could have the effect of rendering “visible” contradictions that might exist between organisational and managerial objectives and the space-activity adaptations perceived as being relevant for users.

CONCLUSIONS: USABILITY STUDIES RAISE NEW ISSUES

The incorporation of social practices in the design process in order to enhance usability is linked to a series of issues that extend far beyond the building sector. They result from the interleaving between the incorporation of these social practices and the mobilised knowledge of social groups during a design process or any other organised action bringing them together. Three fundamental issues concerning the incorporation of social practices bear mentioning:

The productive issue: the acceleration of the speed of innovations and the importance given to the quality of the design process refer back to the diversity of social practices and their development potential. The user's "information feedback" throughout the product's life cycle appears to be an essential factor for improving performance, both in terms of the process and the object to be produced (relevance, cost, quality, completion time). The incorporation of social practices is particularly translated in processes where players constantly evaluate the ease of use of future products and the development of interactions that will be based on these same products.

The information and learning issue: learning is a key aspect to question the effects of the design process experience on users. of this point. The types of appropriation and learning processes for new systems concerned by design can be decisive insofar as the quality of future social practices is concerned. Reducing divergences of understanding between future users or anticipating mediation between various modes of operation can become an important subject of social practices analysis during the design phase. To this end, the design process, given the objectives being sought, is occasionally considered as important as the production of a product itself.

The political issue: the occupant of a space, by shifting from his role as guinea pig or "simple" source of information, becomes user, client, patient, etc. His position as player also implies that his specific end purposes be recognised. Process management cannot simply be reduced to technical choices or unilateral strategic decisions. Unless discussions take place, there is no point in aiming to take social practices into account.

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APPENDIX

Examples of situations where adaptation between players, built environment and collective action happens:

The first case refers to a standard situation to be found in companies. To take a break, employees stop work and gather around the table. Each person sits down on his chair in a different way, some even change place. The employees adjust the occupation of the room to meet the needs of the new action and the changing role that might be associated. The chief is no longer quite the chief, and the chief's chair is no longer exactly his chair. A few minutes later, the employees can return to the previous action and reassume their former role. The effect produced by the adaptation between players, technical system and situation is not necessarily great. It might even have led to the creation of inter-personal relations. The amount of accepted adaptation is minor.

A few years ago, we had access to a second, more far-reaching example of adaptation, by spending several days in the head office of a German bank. The office layout grouped together 30 individual partitioned work stations on each floor level. These were laid out around an open central area set out in a way that permitted different types of meetings to be held. The separations between the individual work stations and the central area were fully glazed. The occupant of each work station was able to see both the central area and the individual offices lying opposite. Contrary to the wishes of the management for frequent communications between several people

together at the same time, the area in the centre of the floor level remained largely unoccupied. Users revealed that the majority of meetings, be they for functional or relational communication, took place inside the individual offices and brought together two to three people.

Discussions with the occupants made clear that the logic having guided the layout did not correspond to real uses. The layout in the centre of the floor levels served *to assert* a type of communication that did not exist in the way that the management envisaged. Since the moving in, the management had continuously stated the existence of communication in the central area; this had been relayed by a certain number of department managers. For the personnel, the fact of designating the centre of the floor level at least partially replaced real communication. With this adjustment between players, technical systems and working situation, employees were free to determine whether or not they wanted to engage in this so-called communication:

Each employee had his own way of interpreting a non-existent communication; such as the person who told us: “I believe that exchanges linked to the activity take place in the central area, but I work on the principle that I will be kept informed if something important takes place” (Müller, whose colleagues stated that he always kept his door closed). Another person said: “I don’t go there, it’s a real chicken coop. To communicate, my door stays open 95% of the time so that I can stay in contact” While there is movement across the centre, it is to go from one office to another or to the printer, but nobody stops to talk. The irony was that a breakdown in the computer system was needed for the central area to be used by a large number of occupants in the way that the management had always wanted. A user explained to us: “While the computers were down, all the people on the floor came out of their offices to find out what was going on. For nearly half an hour we talked together, firstly about the breakdown, and then, as time went by, work problems in general and, finally, about life outside the workplace”.

The office door had a highly particular role in this environment broken up by glazed partitions. The role changed according to specific situations. Having previously worked in an open-plan layout, the occupants had to first learn how to use the doors. A person described the installation period to us: “For the first few weeks, we asked ourselves if we shouldn’t be making phone calls, drawing up lists to group questions together or invite colleagues to join us in the central space. Each person established his own particular way of meeting others and having exchanges”. Paradoxically, having previously worked in an open-plan office, everyone felt that they were being observed, and this represented a considerable problem. Called the aquarium effect during an interview, users felt “exposed” by the glazed walls. Time was needed to normalise the situation. However, the doors continued to represent an adjustment problem. Several interviews confirmed that a person telephoning from his office often needed to find an arrangement with a person looking at him from outside the work station if the closed door indicated an absolute refusal to be disturbed or simply a way to filter out persons who were not welcome.

A department manager had fewer doubts as to the significance of his behaviour insofar as co-workers were concerned. He stated: “My colleagues have learnt what it means if my door opens after a phone conversation. It means that I am – once again – available to them. They even understand that after a very long phone call, the open door means that I’m available for a chat”.