Developmental Process of Interface Design Evaluations

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Abstract. User Centered Design (UCD) Process facilitate the approaching to people in order to determine use and design requirements throughout applying diverse techniques for obtaining qualitative and quantitative information, including social, emotional physical and cognitive user's characteristics, as long as system interface requirements. User Interface Design (UI), Interaction Design (IxD), Design of Experiences of Use (UX), and the Ergonomic approaches aid design teams clearly define objectives to be met, knowing the level of development they have got in an specific stage of the design process, and ensure during the process goals do not change but instead, evolve according to emerging information that arises from Users interaction. Iterative processes along design enable implementation of formative and summative assessments through the use of prototypes in order to evaluate interactions and allowing the process feedback. As a systemic approach UCD has recursive characteristics which in some stages of its process, like Inquiry and Evaluation, are of paramount importance to adequately accomplish tasks of problematisation and assessment, by diagnosing whole system in which Users are immerse. By giving Users voice during the design process, being either novice or expert Users, Inquiry and Evaluations stages of the UCD process, aids accurately reflecting detailed characteristics the Interface must have, and at which degree Design goals have been reached out.

Keywords: User centered design · Ergonomics · Interaction · Interface

1 Introduction

The objective of this proposal is to contextualize the importance of the development of User Centered Interface Design Process, which may facilitate the approach to people in order to determine use and design requirements along the whole Design Process but specifically during the stages of inquiry and evaluation of the integrated interfaces design process.

To promote the participation of the real Users allowing their voice to be heard, collaborating from their experience and giving opinions on the development of alternatives that help to make decisions in the design process.

To focus Design processes and results on the end User given not all communities are equals, it is important to include real Users along the process of product development.

The User Centered Design (UCD) process can be conceptualized as a methodology that:

- Has a systemic perspective
- Its different process stages are iterative
- It evaluate the resulting product of its conducted process.

On the other hand, UCD considers some philosophical basis by stablishing as central axis of its processes inclusion of real Users, mainly on inquiry and evaluation stages.

Of particular interest are the stages where inclusion of Users in the UCD process is of highlighted relevance: Problematisation and Evaluation (Fig. 1).
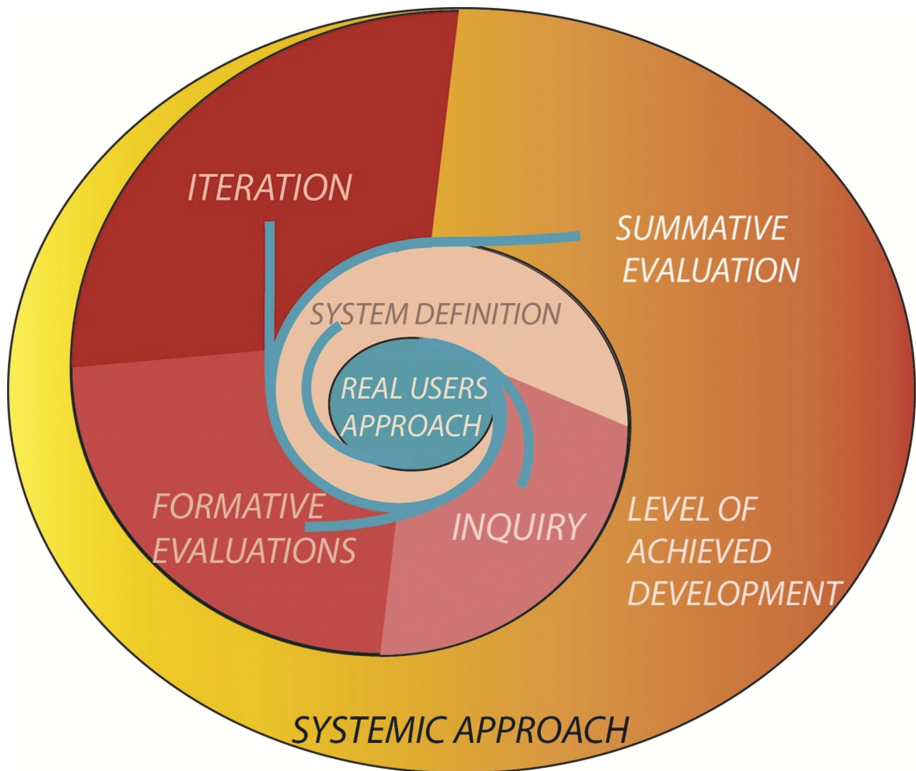

Fig. 1. Representation of real Users involvement through the User Centered Design Process

2 Ergonomics

Ergonomics is an auxiliary user-centered discipline in the process of design.

It analyzes, in a systemic and interdisciplinary way, the interaction of the system composed of the user-object-activity-environment (UOAE) subsystems, taking into account the User's cognitive, affective, social and physical capacities and limitations, as well as their relationship with the factors of the environment of use and of the object involved in developing an activity. The scope of ergonomics promotes the optimization of interactions between its components.

A systemic perspective implies that in the development of design processes, it is necessary to define precisely who the Users are, what do they need to solve, what mediator objects will do it, and in what physical environment the object will be used to solve the need. For this, the inclusion of real users in the design process is extremely important, since these give Users a voice and focus the processes on them, and not on the designer or the involved technology.

Recursive iteration between the stages of investigation, development and evaluation allows obtaining arising information throughout those processes, giving feedback on the advances in the design process and aiding in decision making.

2.1 Inquiry Stage

The first stage of the design process is the one of inquiry, which delimits the system, that is, the User's characteristics and the delimitation of the activity, which will allow establishing the requirements that the resulting product must comply with according to the Design of Interaction and experience. Such requirements arise in the combination of the user-activity subsystems.

It is necessary to establish requirements to determine the characteristics of the product to be designed. The requirements serve as a guide to define the design attributes that a product must possess. According to Design, among others must be observed several types of technological, functional, aesthetic and of use requirements. The latter, those of use, determine the characteristics of the interface of a product; those are strongly linked to the interaction and must be observed from the user experience and human factors.

In order to identify the requirements in a given product and its impact on the design of the interface, it is necessary to resort to several instruments that help to identify the emerging information in the system, and translating it into interface design features, and interaction, seeking to promote user satisfactory and effective experiences.

In the field of the applied ergonomics to Interface Design (which considers people, activities, mediating objects of these activities and the environment of use) it is been an increasing interest to integrate real Users during its development process.

2.2 Evaluation Stage

The evaluation process is inherent to User Centered Design methodology. In case of quantitative assessments, it starts from the definition of objectives, success and metrics criteria; in case of identifying patterns in qualitative observations, it is possible to obtain information to feedback the whole design process by formative assessments, or define the level of development that loosens the process in overall or summative assessments.

The evaluation allows comparing and contrasting the advances of a system, which provides with analytical information that allows comparing the scope of a system in relation to the objective of the project. Some of the main characteristics of evaluation are:

- Through an evaluation it is feasible to determine the extent to which a goal has been achieved, which helps identifying the successes and shortcomings of a project, and provides sufficient knowledge and value to guide decision making
- Evaluations consider a specific attention focus, so clarity is needed in the objectives of the project
- Has defined scope, being necessary to carry out partial evaluations that allow to have feedback on the development of the design process
- Promotes an active participation of real Users
- Uses low and high fidelity prototypes.

To carry out a systemic assessment and identify the impact that some variables exert on others, it is necessary to establish the characteristics of the systems:

- The system has a common goal
- Systems are composed of subsystems, each having its own goal
- The variables impact each other
- The variables are interrelated
- New information emerges from the interaction of the variables.

The ergonomic system can therefore, be represented by stating that:

- It is necessary the active participation of the Users, for it is important to establish the capacities and limitations of these Users
- Users need to solve a specific problem
- To solve a problem Users use products to get help
- These products work optimally in spaces with specific physical environmental characteristics.

In order to observe the above within the process of Interface Design, it is necessary to carry out evaluations in which are applied tools and techniques that allow observing the relation of its variables.

- Instruments used should allow for quantitative data measurements; however, it is also important to consider instruments that reflect Users opinion and attitude
- Identify the requirements of use to establish what conditions should be reflected from the object to the User (cognitive, physical, affective) and the User's demands on the object (response times, performance, capacity).

Apply instruments to observe the goals, desires, knowledge and skills of users related to the Interface Design.

2.3 Interface Design

The interface is considered as the common space or the means in which a user and an object establish a reciprocal relationship through the interaction, that is, an interchange information in a bi-directional, round-trip way, so the user requires the interface is useful and ease to use when mediating such interaction. On the other hand, the object (computer or computer system) demands the user certain skills and knowledge in the use of

technology and knowledge in the use of codes with which the product responds to the user, promoting through an Interface Design products should be suitable for Users, reaching satisfactory, pleasant and effective experience of using a product.

Interface Design is an interdisciplinary design project. Increasingly, various areas of Design are involved in the development of electronic products with interactive digital interfaces. The development of this type of interfaces is strongly linked to the technological development in a wide variety of human activities, either recreational, necessary or for learning purposes, taking advantage of the different possibilities of sensorial interaction with products.

In the areas of User Interface Design (UI), Interaction Design (IxD) and Design of Experiences of Use (UX), it is essential to analyze the human factors that, through various techniques for obtaining quantitative and qualitative information, more accurately reflect the User's profile and how he or she will relate or interact with the products.

UI, IxD and UX can be observed from various disciplines that focus their design processes on the user. Among others, these perspectives can be human computer interaction, usability, design of experiences or ergonomics; the methodological perspective that permeates this document is Ergonomics, because at a methodological level, it allows, among other things, to clearly identify the human dimensions of the User, and how these, at a systemic level, are interrelated with activities, objects and environments of use.

3   Users, Activities, Objects and Environments of Use

Starting from the ergonomic model User-object-activity-environment (UOAE Ergonomic System), in which each of its elements is a subsystem, capable of being analyzed in an individualized way, it is evident that in the Design of Human-Computer Interactions (HCI), the first three subsystems - the User, the object, along with the activity - are the most outstanding in the analysis and definition for this type of design; On the other hand, the environment of use is fundamentally ubiquitous, cause varies greatly from case to case and with this, it is difficult to predict; Notwithstanding the above, it is feasible and necessary to establish the minimum environmental characteristics that must be met to promote appropriate interaction.

As for the object, given the increasing variety or typologies of devices or platforms by which the interaction can be made, be smartphones, tablets, laptops or desktop computers, or other devices, both planning and evaluation of Interaction must be performed for each identified category, since the characteristics of data processing as well as the characteristics of the physical interface of the device in question are fundamental to facilitate, or not, the activity that Users will perform. Just imagine the marked differences involved in reading texts in a Smart Watch regarding a Smart TV or a conventional desktop computer.

By paying attention on the activity subsystem, it is extremely important to fully describe what these activities will be. For this purpose, one of the main characteristics that can be analyzed is type of activity, which differ if the activity is primarily performed

by the User, primarily performed by the computer or somewhere between the two possibilities.

One of the extremes of this typology would be, for example, activities such as reading a text on screen, where User is mostly the one who performs the tasks or sequences that complete the activity. The opposite end could be to observe a video clip, where the user "only" is a spectator, while the system performs multiple tasks and even feedback of the gestures done by the User (as in some smartphones that pause the video if the User's eyes do not point towards the screen). Such situations turn out to be key factors from the User's cognition and decision making, as that affect their ability to direct the process itself of the activity, to modify or not the rhythm in which it is carried out, as well as other fundamental aspects of the interaction.

Another important characteristic for analyzing activities is that these are usually complex, that is, they need to be sectioned in more elemental parts called tasks, and frequently these in subtasks, in order to identify fine aspects of the interaction, making it possible to identify situations in which the device is not easy to use, is not useful for tasks development and prevents the User to feel satisfied with the device. Those findings has to be attended from the design itself, either through the improvement of the object or its interface, by adapting the activity in a better way, or by seeking more favorable environments of use; all in the direction of improving efficiency of interaction.

Returning to the example of reading text on a screen, such an activity would contain at least, tasks such as forward or backward text as it is being read and adjusting the screen zoom to facilitate readability of the text. Subtasks of these could imply User must locate the commands that allow to perform such tasks, as well as to actuate each one of the icons, either by pressing them, dragging them or making some type of specific gesture.

The reader has most likely faced similar tasks and situations. This is the same case many designers or design teams face on a daily basis since they possible are novice or even experts Users, in addition, they see the dynamics of interaction even more profoundly insofar as the interface, the activity or the object have over the target User.

Unfortunately, such closeness of the designer to the analyzed problematic, given an specific interaction design, frequently promotes assumptions that actual users "must" have certain ability, kind of reasoning, or should response to a given stimuli; usually, this is far from reality. This situation demonstrates the importance of approaching real Users, which ideally will serve to describe and model it in the design and evaluation process.

3.1   Human Dimensions

Having made a brief tour of the object, activity and environment of use subsystems, it is in the User subsystem that several arguments emerge highlighting the importance of including this one, the User or group of "real" Users, in the design process of Human Computer Interaction.

Beyond what may be evident given the coined Human Computer Interaction (HCI), inclusion of the User as an active individual in the design process promotes substantive improvements throughout the entire development process of a given design, positively

impacting the length and breadth of the process, from planning and objectives definition, to goals to be achieved through interaction design, to the correct evaluation of each attribute embodied in the final development, and of course, in the truthful and detailed identification of the User or group of Users characteristics to which the interaction design is directed.

This particular point, that of veracity and depth of definition of human characteristics, should not be addressed a priori by the designer or design team, based solely on the experience that the designer has on the subject, meaning with it, how well the designers consider know how the target Users are. On the contrary, it is fundamental, in order to achieve an accurate modeling of Users, that preconceived ideas of the designer or design team are considered, but characterization of the Users are based on the inquiry done together with them, through techniques such as co-design, co-creation or participatory design.

Approaching to Users during the design process involves the search for knowledge related to the various human dimensions that characterize and distinguish them, to determine which functions, which interaction processes or what possible responses can be expected that the actual User has within a designed system (Fig. 2).
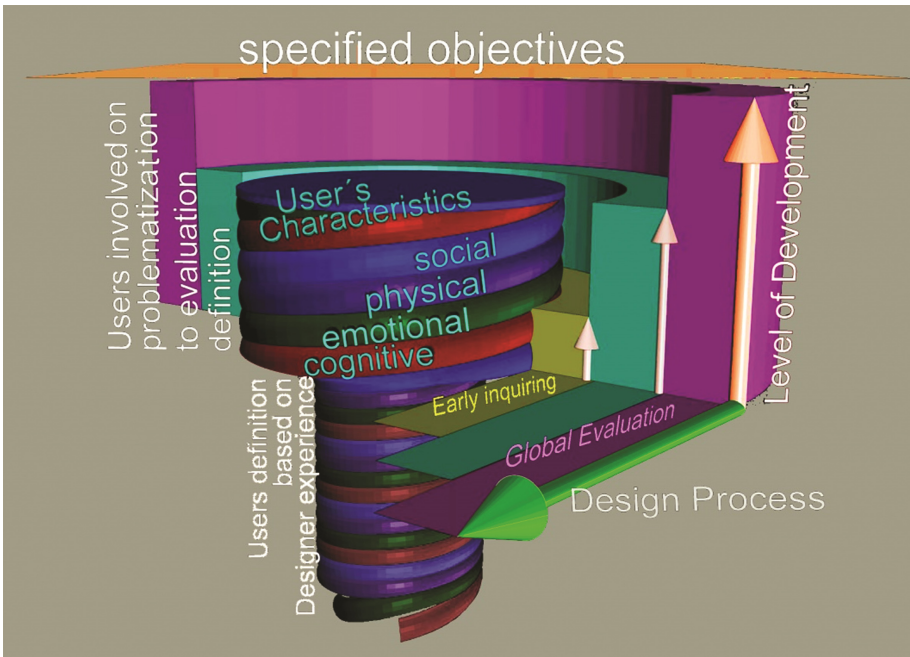

Fig. 2. User Centered Design Process representation, were user modeling, problematisation, objectives specification and evaluation of the level of development achieved are aided through real Users approach.

4   Interactive Systems Design

From a systemic approach perspective, delimitation of the system were interaction is taking place (context) is of priority interest, in which it is necessary to identify the characteristics (usage patterns, experience, knowledge) of the Users, the activities needed to be carried out to solve their needs, the characteristics of objects that should ease and satisfy during the interaction and the environment of use, promoted through the characteristics of the environment (temperature, lighting, noise, etc.), in which the activity is carried out; all that in an effort to ensure a pleasant use of the product.

The design of interactive interfaces is characterized by the convergence of three facets that run parallel in the design process of interactive systems, such as Interface Design, Interaction Design and Design of Experience. From the perspective of UCD, these processes are interrelated since although for the purposes of each their planning are taken into account characteristics of different scopes, the system together has common objectives, such as User satisfaction in using the product or effectiveness and efficiency of the User to object relationship (Fig. 3).
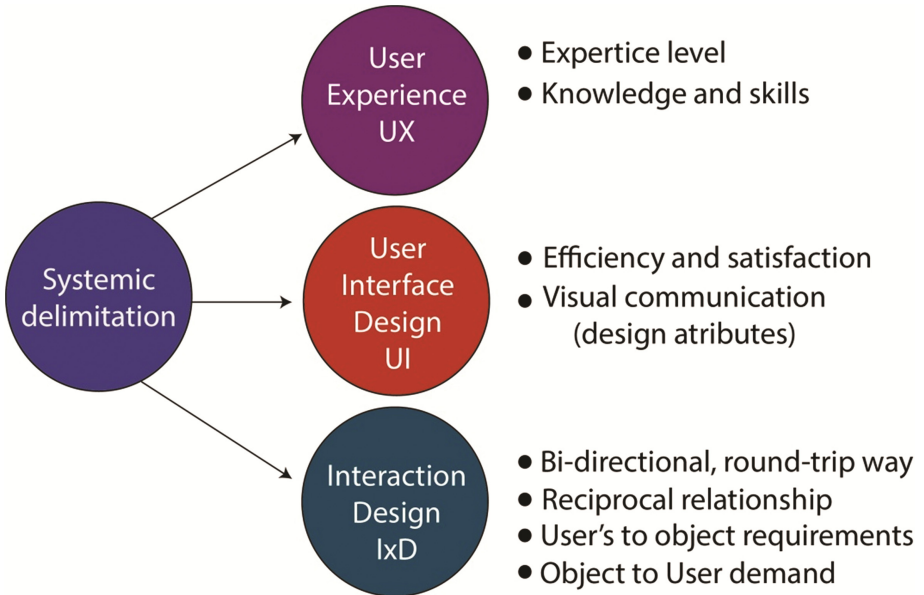

Fig. 3.   Systemic delimitation of UCD process

By User Experience Designing it is necessary to consider the implications of the concept of experience. This concept states that the experience of one person cannot be experienced by another in the same way, because each individual interprets situations differently based on previous experiences he has had.

It is possible to say User Experience Design considers experience refers to:

- The knowledge or skills that a person has developed, define a User's level of experience and how it solves the problems of using a product.
- The way a person conceptualizes a situation that has occurred to him or her when interacting with a system, carrying out activities in which have used objects as means to solve said necessity in a specific use environment, in which the characteristics of the environment affected him or her, positively or negatively, in a cognitive or physical dimension.

Interface design involves the development of visual communication elements through which Users would be able to communicate with the object. These elements involve the User's experience regarding:

- The use of elements of composition that allows information to be in order, hierarchizing the most relevant data, positioning the elements to facilitate their location, their easy identification and clarity of meanings.
- Typography, color, dimension and location of the elements allow the transmission of visual information regarding the actions that User must perform in order to use the system.
- Cognitive processes are activated during the use of an interactive system through its interface. The processes of attention, memory, perception and language allows to identify information, to focus on a certain trait, to identify a sign and to remember how to follow an instruction; To aid this process, Visual Communication Designers develop interfaces for Users easily identify information through good contrast of colors (figure-background) and nice readability of displayed information.

Design of interactions will allude the User experiences:

- During the use of a system; as the User demands the object certain answers to their requests and the object demands certain actions to the User.
- Since the system must be easy to use, functional and useful from User's perspective. To achieve these, Users must have control over the system and the system must feedback the Users on its status to confirm such control.

5   Conclusion

As stated above, the Design processes, when centered on User, must consider the knowledge and skills of the people to which products are intended to, designing the contents and the level of complexity that the product must present.

To do that, Design of Interfaces should not only observe, but include in depth the User's experience in the interaction process, allowing the development of interfaces that meet User's characteristics with task requirement, achieving the development of satisfactory and efficient products.

By leaning on User Centered Design processes, design and developmental teams of interfaces allow the insertion of formative evaluation processes between each stage of development, thus avoiding the application of only summative evaluation at the end of

development and with it, that iterative evaluation processes should produce systematic results, which will facilitate the assessment and relevance of the intervention.

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