Interacting with the Customers through New Technologies

Having a better understanding of the user's experience

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Abstract— **Nowadays, new technologies and information systems are important tools to carry out many different activities in daily life. The use of these new technologies is also a means for getting information on the users' experience. This paper aims at giving a brief review of how users may participate in the development process of products and services, and how they communicate their needs and suggest their preferences through these new interactive tools. This is a preliminary study, which focuses on how companies may incorporate the concept of *Co-design* into their proposals, in order to add customer value. Our first findings show that, consciously or not, users are participating more in the development process. Thanks to the use of new technologies and tools, their involvement has increased - and so have their expectations and their perception of feeling empowered. It is argued that a direct relation exists between the interaction of users and their experience of the products or services.**

Keywords- interactivity; virtual prototypes; user experience; product development; user satisfaction.

I. INTRODUCTION

Nowadays, having information from users' experience and their interaction with products and services is an important aspect for companies and designers. The concept of user experience is becoming a key term in the world of interactive product design. The term itself lacks proper theoretical definition, and is used in many different, even contradictory, ways. Models and frameworks on user experience, as shown in Figure 1, have emerged in the last ten years [1]. In the first stage of this preliminary study, we review ideas to better understand why it is important for the user to collaborate and participate in the development of the product or service from the first stages. This paper aims at discussing the areas in which users act through usability tests and interaction tools. These new tools facilitate and increase collaboration between users and companies. Hence, companies seek to analyze the results after collaborating with users because they can provide greater knowledge on the users' needs. There are some case studies demonstrating that a lack of understanding of the users' needs results in a reduction of production. So, it is essential that the interests of users are taken into account. It is taken for granted that customer satisfaction occurs when an experience meets or exceeds the customer's needs or wants of a service [2].

Based on these premises, the new process of interaction can lead to increased user loyalty. This is possible through the new interaction tools used by companies to obtain valuable results, which they later interpret and study. Thanks to the rapid advances in new technologies and to the development of information systems, more interactive and participative innovation has taken place in recent years. User experience evaluation has become a useful tool to analyze how a firm can design and create new products, services or interfaces which respond to the characteristics and needs that users would like to see fulfilled. Furthermore, authors like Sang Lee, David Olson and Silvana Trimi [3] discuss the strategies a firm uses to focus on innovation and the use of new technologies. These authors seem to suggest that innovation is directly related to the creation of value. They justify that this has been possible because users are present in the new development process, and they take part in it.

Internet plays an important role as an interactive, multimedia technology for mass communication, which is also low cost [4, 5, 6]. It allows consumers to have a wide variety of virtual experiences with new products, and it allows interaction between producers and consumers. With more than one billion users [7], the Internet currently offers an enormous pool of knowledge, which is impossible to find elsewhere. According to von Hippel [8], users found in online communities are a promising source of innovation. Hence, the emergence of the Internet has facilitated unique and inventive opportunities to capitalize on the innovative potential and knowledge of users, resulting in what has been termed as virtual customer integration [9].
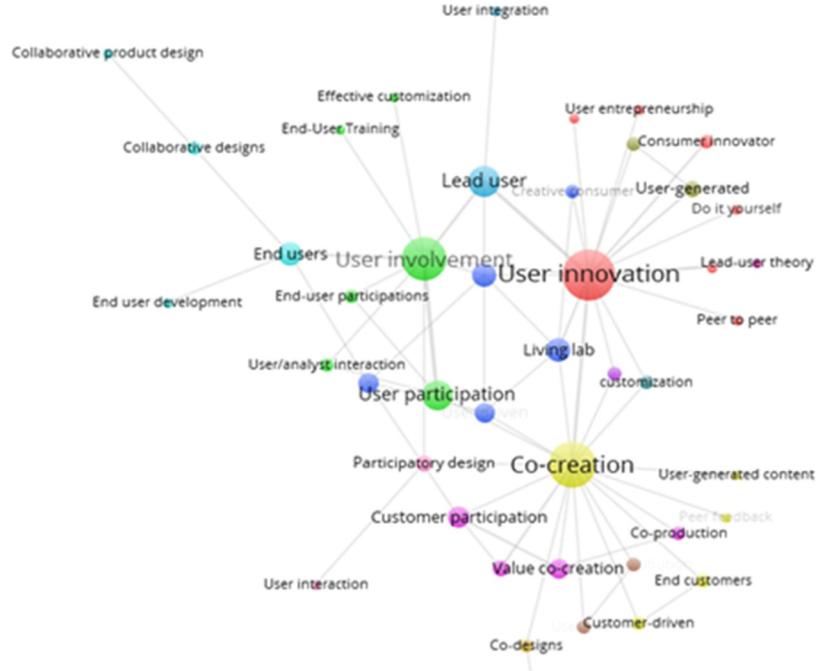
Figure 1.   Network representing co-occurrence of users' keywords around innovation

Another stage of research should focus on the development and implementation of virtual interfaces. In that regard, we found that is a useful tool to have a better understanding of the future product or service. Also, users could start to take part in the design and development process.

Regarding this issue, the involvement of the user is achieved thanks to the concept of co-creation, defined by Prahalad and Ramaswamy [10] as the process of creating an experience environment in which consumers can have an active dialogue and co-construct personalized experiences. They talk about how companies interact with customers, who feel loyalty thanks to the exchange of ideas to create a new product or service.

However, an aspect to analyze is the specific point in time, or stage, during the creation process, when interaction is most interesting. Anderson and Narus [11] analyze customer collaboration during the development stage, that is, in laboratory tests and with early prototypes. This is the stage when companies need to decide between several possible applications, and it would be the most interesting stage to analyze user participation.

After analyzing these applications, obtained from the collaboration between the company and the users, the company has to analyze, using a prototype or proposed model, if there could be advantages and benefits in the near future.

Authors like Johann Füller, Hans Mühlbacher, Kurt Matzler, and Gregor Jawecki [12] research how clients take part in the virtual co-creation process and how they perceive their involvement. They state that Co-production emerges as a new form of collaboration between consumers and companies, through the use of Information Technologies (IT). This way, consumers can take on new roles throughout the New Product Development NPD process. The empirical study showed how Internet-based tools and technologies contribute to the consumers' perceived empowerment through virtual new product co-creation activities. The conclusion was that the level of empowerment experienced depends on the design of the applied virtual interaction tool. Moreover, there was an associated enjoyment of the virtual interaction, the participants' task and their product involvement, as well as their creativity and leading-user characteristics.

After researching through different scientific databases, we can say that the experience of the users is being analyzed mainly in the areas of health care and new information systems. Thanks to this previous research, we can corroborate that there is a lack of understanding of user experience in the context of product design. Therefore, this is a subject that we consider relevant and merits in-depth research in the near future.

In the sections that follow, we explain the increasing role of interaction using virtual tools. We also introduce the relationship between user participation and user satisfaction, as these are concepts which are directly related. The paper is structured in the two sections, as follows:

In Section 1, we explain some interaction tools and user participation during the design process, making reference to some authors who support its importance. We also analyze usability and user experience goals to get a wide view of the interest of these methods to get further information about them. At the same time, we introduce virtual reality as a new medium for participation.

In Section 2, we explain how the use of IT opens up a "virtual" context and an opportunity for customer integration in the design process.

Finally, in the discussion, we insist on the main idea that there is a new landscape for design based on participation in the design process.

II.   INTERACTION TOOLS AND USER PARTICIPATION

In view of the above, there is a need to establish the concept of interacting tools because, as some authors state, user interaction and participation offers advantages to the firm. Recently, some case studies have shown that the new interaction tools allow increasing the value and loyalty of users via the Internet and the new information systems. In this way, users can fulfill their goal because they are getting involved, and they meet their real needs during the process of developing a new product or service. Johann Füller and Kurt Matzler [13] show how customers can be virtually integrated into a company's innovation process. New interaction tools allow companies to gain valuable input from customers via the Internet.

Needs are present during the entire development stage of a new product or service, because they are considered as the "desires of users". In connection with this, it can be of interest to mention the KANO model [14], often used to identify customer needs in new product development. Matzler and Hinterhuber [15] help to explain why customers have difficulties expressing their needs. The model shows that it is difficult for customers to express their latent needs, as well as those which they take for granted. As a result, it is interesting to develop an adequate environment in which users can express their real needs and participate in the development process. Regarding this, we could state that new virtual interaction tools and virtual product experiences help to overcome these problems and enable customers to transfer their explicit and implicit knowledge to innovation teams.

A.   Usability and user experience goals

The concept of usability has become important in recent years, due especially to the important role of the user in the process of development and design of products and services. The goals of usability and user experience in today's society have a great impact on new information systems and new devices. We find numerous authors, such as Pharalay and Ramasway, who have already studied this phenomenon in multimedia mobiles and what kind of involvement or interaction takes place.

Authors like Kathy Brittain White and Kwasi Amoako-Gyampah [16] examine some contingencies of user involvement and user satisfaction. User involvement has a potential impact on the success of systems, and results are obtained through a survey questionnaire to show that user perception of their level of involvement has a direct, positive and significant impact on user satisfaction. Therefore, we could say that when users take part in the development of an interaction tool, their level of satisfaction improves and they bring relevant information to develop a new product or service. However, the impact of user involvement in system development and implementation is still an issue under considerable debate.

In the same direction, research shows that there is a direct relation between user participation and information systems, and it shows that the strong participation of future users in the design of information systems (IS) leads to successful outcomes in user satisfaction.

In this respect, M. Mengoni, M. Germani, and M. Peruzzini [17] state that, during product development, usability tests allow to investigate product performance also in terms of effectiveness. For instance, Virtual Reality (VR) systems provide new modes of Human-Computer Interaction (HCI) that can support usability testing in the early design stages by adopting virtual prototypes to simulate product experience.

Usability tests generally allow assessing product performance in terms of efficiency, effectiveness and user satisfaction in order to reduce the gap between the perceived and the designed product quality. The main concern in the assessment of emotional usability is identifying product features that stimulate an affective user response and its translation into design requirements. Although usability tests can support innovation, companies seldom use them during the product development process due to the high costs connected to their implementation. In these cases, the measure of usability could be considered less relevant. But it has been shown that these tests improve the process of an enterprise and increase the value to its users.

The use of prototypes allows to include the sense of touch, which has a great importance in the emotional evaluation. It allows exploring products with the hands and collecting information about materials and shapes. Carrying out usability tests is not as easy as it seems in the beginning, but it is clear that it helps to know the needs of the user. The use of virtual prototypes allows conducting usability tests in the early design stages. However, an additional problem is that only a few usability aspects can be measured in the virtual environment, such as posture and occlusion parameters. User satisfaction in terms of pleasantness is difficult to assess, as virtual prototypes poorly support emotional and touch and feel analysis [18].

B.   Virtual reality and participation

As a consequence of integrating customers into the creation of value, new methods are needed to allow the active involvement of customers in new product development [19]. Especially, virtual product experiences enable customers to transfer not only what they want to know, but also their unknown needs. As recently shown by Matzler and Bailom [20], companies which are able to identify customer needs and align them with their core competencies are those that champion innovation. Such companies are more profitable than others. Nowadays, new product development cannot be conceived without powerful three-dimensional (3D) modeling software to help create products better and faster.

Taking this concept a step further, manufacturers may use virtual prototypes to integrate customer ideas and needs into new product development via the Internet. Thus, customers can get their hands on innovations long before the design has been finalized, when changes to suit their

opinions and wishes can be done quickly and at low cost. However, in recent decades there has been a debate about which are the correct tools for testing prototypes. In response, Dahan and Srinivasan's [21] show that virtual prototype testing online provides almost identical results as using physical prototypes, and is easier and cheaper. In connection with this, we conclude that virtual reality and virtual prototyping are fully relevant tools. Today the prototype is an interesting tool, which is possible thanks to the rapid advance of new technologies and information systems.

III. VIRTUAL CUSTOMER INTEGRATION IN CO-DESIGN

Virtual customer integration represents "one of the most promising areas of development (…) that the new virtual customer environments make possible" [22]. In a virtual environment, consumers communicate their knowledge through an electronic interface, with no direct personal contact with the product or service. They do not get immediate personal feedback. Thus, the virtual environment must be created in a way that enables and motivates consumers to play an active role in New Product Development (NPD), and to make them participate in further NPD projects. Information Technologies (IT) enable new forms of producer-consumer collaboration in NPD processes. Rooted in collaboration through the use of IT, the co-production mode has emerged as an important and growing production method. Customers can assume a number of different roles in the NPD process [23]. In the ideation phase, customers can be a resource through interactive multimedia tools, virtual brainstorming, or virtual focus groups. In the design and development phase, customers can take on the role of co-creators, and tools such as Web-based conjoint analysis, virtual user design, Internet-based design competitions, tool kits, and so forth, allow users to express their preferences and to design their own products. In the test and launch phase, IT tools such as virtual concept testing can help to provide valuable feedback on products, services or interface.

Such co-creation tools enable consumers to realistically experience virtual prototypes in real-world usage scenarios, long before they actually come into existence [24]. Displaying design and feature options, engineering constraints and price effects in real time, with easy-to-use and drag-and-drop options, support consumers in creating their ideal product.

Technologies and interaction tools enable consumers to engage virtually in meaningful and challenging NPD tasks to effectively share their knowledge with producers, making them feel like they are autonomously contributing to the collaboration. Also, if they believe that their input will be seriously considered, these tools may provide consumers with a sense of mastery. Thus, participants in virtual co-creation may feel empowered.

However, there is a lack of case studies shedding light on how to virtually integrate customers in practice. The detailed missing information is: how to identify qualified customers on the Internet; how to motivate them and how to interact with them, and under what conditions are users are willing and able to share their knowledge with producers.

Thus, it remains necessary to focus on the work of design in this field, in order to identify which are the interactions that are useful and give some guarantee of higher success both for users and for the firm. The research show that virtual customer integration provides valuable input for new product development. A number of new tools to interact virtually with customers can be found in the literature [25, 26].

Other authors suggest that, by integrating users of virtual worlds into an interactive new product development process, companies can tap into the innovative potential of customers using the latest technology [27]. They argue that the latest advances in information and communication technologies enrich the interaction process and can improve the new product development process.

DISCUSSION

This paper has sought to offer a perspective on the breadth of the concept of getting information from users by taking advantage of the new communication tools. The development of different virtual environments is promising as they give users an active role in NPD. In this article, we argue that user participation increases user satisfaction because users feel that they take part in the co-creation process.

In view of this, it is of interest to develop an adequate environment where users can express their real needs and are able to participate in new development processes. Nowadays, there are new interacting tools that allow interaction between users and companies, and generate valuable feedback. Virtual interaction and virtual product experiences help users know what their real needs are. Usability tests, play an important role in narrowing the gap with the "perceived quality" of the designed products. Therefore, usability tests increase the value that users give to products. When users take part in the development process through interactive tools, they improve their level of satisfaction and bring relevant information to the companies. As this paper shows, user involvement has a direct, positive and significant impact on user satisfaction.

As a summary, this article shows how new technologies offer a perfect setting for users, due to their variety and interactivity, and this experience provides information. For this reason, it is important to work on systems that allow greater communication with users to let them have greater participation in the design process. Some companies have seen participation in design as a new way to engage customers and achieve their loyalty.

In this sense, in future studies we will perform case studies that allow us to analyze the feasibility and effectiveness of this client-company communication.

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