

Design, Innovation & Entrepreneurship

Title: User-Inspired design. User needs vs. mass customization

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User-Inspired Design can be defined as the discipline relating to a new idea of what innovation means today. This idea derives from the consciousness that innovation does not just relate to high-tech fields. Innovation affects also - with different methodologies – products and services, public and private bodies, factories, research centres and universities, which all aim to renewing and be competitive in their own fields. Three different kinds of innovation have been determined: price-driven, research-driven, user-driven. Companies, sometimes, use a combination of these three types of innovation. Most of the times, price-driven innovation is used in developing countries, in order to conquer the market through a low cost policy, while, research-driven innovation is used in higher-cost countries. It seems clear that research in high-tech does not take you straight to high innovation in the performances of products and services that relates to them. So, there is a new idea that focuses on users needs. Because of the unlimited offer and availability of goods on markets and especially on the internet, we do not crave for what we “see” anymore, but for what we “want”. This so called “sophisticated” request is an important driver of innovation. Bodies, companies must meet users needs – not just the explicit ones, but also the implicit ones - in order to be competitive.

Alternative analytic methodology help you point out these needs, and users must be involved in this process. User-driven innovation is a strategy that points out – by using an analytic methodology – a complete knowledge of users needs.

This discipline is inspired by and meet the analysis from the psycho-physical wellness of human beings point of view, and is formulated according to an approach based on User-Centred Design (UCD). The UCD approach considers the relationships and the interactions users have with products while using them, and is developed within disciplines not properly belonging to the field of design. At the beginning of last century, with studies in psychology (1899) and semiotics (1913-16) the way was opened for the analysis of everyday objects from a systemic point of view. Within the production scenario, modern industry transforms any materials into working and functional objects, but later on, having crossed the absorption threshold, and with production surpluses, the trend will be to reconsider the objects, endowing them with deeper psychological meaning.

The psycho-physical sphere of man – machine relationships grows up to the dimension of users taking part in the choice and the orientation in the concept of product-service, up to distribution, consumption and clearance phases. User-driven innovation's methods enable you monitor latent users needs and put them in co-creation strategies in mixed planning groups, on which the creation of User-inspired design products and services is based.

New paradigms. The New Human Factors

The new interpretative paradigms of reality give rise to systems of thought and action able to reconfigure and reorient themselves in a strategic way. The previous economic model was characterized by possession, keeping and conservation of goods, but contemporary modernity makes space for immediacy, understood as acquisition, that is the use and the immediate understanding of things and processes that are behind them. Actions overlap and mix. They are carried out with the purpose of boosting the satisfaction of individual needs in close connection with collective ones. In this way, new planning references are generated: rational technological systems, behaviour flexibility and recognisability of artefacts.

Applied research, to make innovative technologies immediately available for industry, has filled the world of human activities with cross-reference sophisticated relational visions. Solutions like bus networks allow for a new type of technology and control of installations. Computer and communicative systems become ever more necessary for organization needs in action contexts, conferring a degree of external connection and access to services once not imaginable. Fertile territory, like the area of household activities, is pervaded by technology and high connectivity with domotics (home automation), which spreads very easily. This sets the user free from the tasks of organizing, planning, carrying out and understanding household activities, delegating these tasks to a central computer system, which, of course, can be programmed and managed at a distance thanks to the network of services provided by the enterprise. In this scenario, the goal consists in making the processes that are behind the activities of the environment more transparent. Up to now, these processes had only had the aim of satisfying in an average, neutral way, the needs they are meant to fulfil. But by directly involving users in choices, by making them willing to understand and spot the processes between outgoing and ingoing actions in the system of objects, better results can be obtained, both on an emotional and a strictly functional level. Active involvement has a double meaning, “educational” and “playful” (Gilmore & Pine, 2000), in reference to managerial choices regarding the surrounding environment. It leads to the complete modification of the role of the users, no longer doomed to be passive, lacking interest in the processes and activities that surround them, largely self-generated to fulfil or foresee their requests. Starting with these considerations, the object is to focus on the use of the product by the user, in order to analyze the user's performance, rather than that of the product itself. The quality of the industrial products has, up to now, taken into account safety, durability, reliability, design of the object, and, when it is put on the market, the right price/quality ratio. All these qualities mainly refer to the services provided by a given product to the people who buy it. The main feature is founded on objective parameters that are valuable for everyone, not offering specific services requested by individual users. The characteristics taken into account in order to assure the above mentioned qualities derive from the Human Factors (which originally were the basis of ergonomics). They are founded on the interaction human-products and services and include physical, social, cognitive, organizational and environmental characteristics. Later on, because of markets saturation, consumers' movements and environmental awareness, the marketing re-orientes its strategies. It focuses on the consumer and creates the so called “silent designer”. Meanwhile the consumers request changes; from passive users, they become active and aware users, like *silent designers*. The overcoming of usability as functionality, use and performances, takes place when you think of the more individual and subjective features of the user-product relationship, especially in relation to the “pleasure in use”, which deals with psychological-emotional features of the relationship user-product. These features gather in the research and experimentation of the New Human Factors. Users' intentions and expectations are the basis of this research. Obviously, the products and services must be easy to spot and understand, so that it can highlight the results in the communicative-interactive space of the relationships that stretch out from one user to the whole system of users.

User-Centred Design (UCD), the Usability-based Approach

The User-Centred Design is defined as designing products and services which the users can use both for a specific purpose and to carry out other operations and the tasks they request, with very little effort and great efficiency (Rubin, 1994). In addition to this, the UCD represents all the theoretical and practical tools available in order to get information about the users' needs and requests in a systemic and structured way. The latter are taken into account from the design phase up to the making of the product itself. More specifically, all the choices made in the design phase try adapt the development and the realization of the product to the users and the use it is addressed to. The term “usability” of a product or service, corresponds to the kind of interaction that the person establishes with it and its context. It depends on the kind and degree of relationship that the user creates with the product and the system of activities. Once the users have acquired knowledge on features, ways and terms of use, they move to the following stage; the stage of the perception of the product and its wide and shared use.

The features of the usability of a product are, above all, connected to the performances provided, and consequently to the ones typical of the cognitive usage: effectiveness, efficiency and satisfaction related to use and usability perception - traits of the psychological perception.

Usability is defined by ISO regulation 9241-11, as “(...) the possibility that a specific user uses a specific tool in order to meet specific targets in terms of effectiveness, efficiency, satisfaction in a specific use' context”. Effectiveness means; accuracy and completeness through which the user meets specific targets. Efficacy means; resources related to accuracy and completeness through which the user gets a specific target. Satisfaction means; a use context, which is easy and acceptable to the users. The User-Centred Design approach, a recent development of ergonomics that relates to the design approach, takes into account the relationships and the interactions that the users create with the products while they use them, according to the following criteria: usability of the system (effectiveness, efficacy and user satisfaction), understandability of the information available (including the language used), easiness of the programming and operativity of command and dialogue procedures, possibility of interactive dialogue after each and every procedure.

Moreover, the UCD doesn't focus only on the user – putting him or her at the core of the design and production processes– but also on the procedures, the methods and the processes that check products' and services' usability (usability defined by norm ISO 9241:1998). According to this norm, usability is defined as “the effectiveness, the efficacy and the satisfaction of a certain user with the purpose of getting certain targets within a certain use context”. This norm refers mainly to software use, but it can also generally refer to every context in which a user interacts with a product or service in order to get a specific target. The content of the norm ISO 9241 is the core of the UCD in terms of procedures and of analysis of usability.

User-Driven Innovation (UDI), the User Satisfaction-Based Approach

The acquisition of the users' needs can be analyzed from two points of view: the objective point of view, by using only measurable parameters, and the UCD approach, by taking into account also the users' expectations, preferences, feeling and judgments. Needs are identified by their priority to human's needs, related to a scale of values. On top of it there are the basic needs linked to surviving, and down on the scale we find the needs linked to safety, socializing and pleasure or satisfaction. Naturally, the product or service must fulfil specific requests. They must either be useful for specific purposes that are coherent with basic needs, or, if they take into account the feelings involved in using a product, create the “pleasure in use”.

Since the '80s -the birth of the UCD- it has become more and more important among the tools available for the designers and for research on users. In the past, these investigations were a kind of test to the design solutions in terms of product/service, and this phase was the final stage of the design process. Later on, the user research was used since the very beginning of the real design phase, in order to organize the whole process. This gives the designers more tools, in order to enhance the awareness of the opinions about products and services. The recent development of the

UCD provides the designers with effective research and development tools to search for enquiry techniques that suit best the design process. From the users' point of view, these enquiry techniques boost people to express their wishes, thoughts and feelings that, up to the birth of the UCD, hadn't been taken into any account by classic market researches.

Nowadays, market researches focus on the analysis and fulfilment of heterogeneous user needs. They use a strategy centred on custom products to customers rather than (according to the traditional approach) on manufacturer-based innovators. From the point of view of the nature of the product-service, a new hypothesis of new typologies and especially new concepts of these with all their innovative power, which feature greater autonomy for the user, and the promise of constant interaction grows stronger. They are not just intelligent, but are also "sensitive". All they react to the environmental stimuli and are above all designed for dialogue with the user. They are Information and Communication Technology (ICT) oriented objects; their main characteristic is the communicative interface where the information exchange (which acts as an actual space of action) takes place. On the one hand, this leads to the introduction, in the consolidated typology of objects (electrical household appliances) of new use functions. On the other hand, a new concept of objects spreads: objects which perform many diverse functions.

The distance between multi-use and multi-function objects becomes ever clearer. In fact, if the multi-use object, even with its finiteness, can be continuously reinterpreted and adapted to unforeseen uses, the multi-function object has different functions working on the same level, integrated in the same object, among them those connected to interaction.

Therefore, they are not only objects that carry out more diverse functions, but an interaction with the user as well. They are objects conceived as "open structures" based on a certain margin of indetermination, and therefore of interpretation, allowing the objects to be sensitive to information coming from the environment. Of course, the intervention of man was based on an idea of organization that later on turned into the ability of programming the so called hi-tech machines. But the idea remains of "open structure" with "open technologies" that reconnects to the configuration of the objects as a concept, and which, even in their formal finiteness, is not completely defined by their use and content. An approach to better satisfying heterogeneous user need that is now being applied in a number of markets involves providing users with "toolkits for user innovation" that allow users to customize products for themselves. Even more computer programs employ such a toolkits approach in that it is "open source" software, designed to be modifiable by appropriately skilled users. Some examples of software respondents contains users that both do and do not modify standard software to create a better fit to their needs. When you compare responses from innovating and non-innovating users, we find that users that modify the standard product report significantly higher satisfaction levels than those that do not. You also find indications that innovations developed by users may benefit non-innovators as well. In other words, the "toolkits" approach used by new softwares do appear to be effective in helping their users to improve the fit between a product and the heterogeneous needs of individual users. To sum up, in order to guarantee the "satisfaction in use" - at the basis of the realization of a competitive edge - companies must think of some characteristics that are common to the methods of User-driven innovation:

- 1- strategic focus on consumer pull - producing what sells, rather than selling what is produced;
- 2- revenue-enhancing activities by developing solutions that better meet consumer needs - investing more skills, energy and resources on understanding consumer needs and developing solutions that are more specifically targeted to meeting these needs (often resulting in increased product introductions)
- 3- use of multiple skills and perspectives in the innovation process (e.g. adding ethnologists, anthropologists and designers to the scientists, engineers and business specialists) - combining not just the technical and business skills, but also incorporating competencies in a wide range of other disciplines (and knowledge from users in related industries)

- 4- more direct involvement of the user/consumer in the innovation process - either through observation processes, toolkits, user panels, or letting them do it themselves requirements for an open and collaborative business environment - countries where there is no tradition of openness and collaboration would likely not be fertile ground for these innovation methods; companies and national framework conditions (including education and IPR) also need to be more flexibly-structured to allow for increased usage of 'open-source' and multi-disciplinary methods. (source: Understanding User-Driven Innovation, TemaNord 2006, Nordic Council of Ministers, Copenhagen 2006)

User-Inspired Design Theory and Praxis: Design Toolkits

Traditionally, there are two main perspectives on user-driven innovation: the focus on the customer perspective, and the lead-user innovation perspective. These two 'schools of thought' derives from the researches and experiences of experiences of David Kelley, Tim Brown and Eric von Hippel.

These two perspectives are defined in two main areas - the use of different methods to understand not only explicit but also latent consumer needs;

- from the “structure of investments” point of view and more strategic focus on understanding and developing solutions to meet consumer needs.

The focus on the Consumer Methods points out the latent consumer needs, and employ what can be generally-termed “design thinking”. The term “design thinking” embodies two main elements:

the combination of different skill sets – using people (depth in one area; breadth in many)

the use of cross-disciplinary teams in a structured process of observation, brainstorming, prototyping, and reiterative testing and implementation.

This method is most-often associated with a pure product development focus, but has also been used in a more strategic manner to transform organizations (their strategies, structures, processes...). The product-service strategy and design start with understanding the user. The praxis involves the use of qualitative research methods that rely on direct observation of consumers' behavior (often conducted in their home or office). The research methods include:

Research and Analysis

This phase includes several stages. In the first stage the key stakeholders choose the action set that starts the project plan, which includes the usability tasks carried out by a multidisciplinary team of experts who spot the usability goals. The next phase focuses on determining the field studies, mainly by taking into account the products and by creating user profiles. The task analysis analyzes the user scenarios in order to document user performance requirements. The user scenarios show how people are likely to use (or misuse) new products and services. This approach is useful to know practical, emotional and social aspects of use for final evaluation. One of its tools is the bodystorming that captures the intuitive responses coming out of interactions. The user performance requirements (user needs) are based on observation, as latent needs, but the users can also directly express their needs.

Design Process

Brainstorming design, concepts and metaphors are at the core of this phase. In order to find a range of published information about customers, competitor and political, social and economics trends, Research and information are used.

There are different research methods: the “Cultural probes” is a research technique which probes attitudes and inspirations among different cultural groups; the “Diary studies”, are completed by user groups - usually according to a format - and cover topics specified by its usefulness to provide context for interviews and observation; the “Observation” is an immersive research, where the designer observe people carrying out tasks in their own environments and asks about their actions, thoughts and feeling; the “Ethnographic” is an observational research developed in a context of people and tasks targeted in a design project (the design concepts are improved by working with paper and pencil to get to the first step of the low-fidelity prototypes); and “Prototyping of simulations of design concepts” is a technique which moves from written scenarios through

sketches, on-screen demonstrations or physical models, to fully interactive working simulations. Prototypes are essential for user feedback: people are allowed to reflect on their appropriateness or try them out so that their ease of use may be evaluated. The usability testing on low-fidelity prototypes includes the “User evaluation or user testing”. Prototypes of new products and services (or the products and services themselves) are tested by the people who will use them to check how much they fulfil the users' needs, and how usable they are. If good results are obtained, the next step is the creation of the high-fidelity detailed design and prototypes. In this case, the Iterative Design may be a User-inspired approach that iterates through prototyping and user evaluation (or testing) to deliver products and services that are tailored to the users' needs.

After usability testing, finally, a Standards and Guidelines Document including *the design specifications* is written.

Implementation Phase

This phase includes the ongoing heuristic evaluations, which are, the evaluation of a user interface by a set of expert evaluators who judge its compliance with an agreed set of usability principles or heuristics. The last phase mainly relates to the delivery team as design is implemented. The conduct usability testing is carried out as soon as possible.

Deployment Phase

Surveys get users' feedback and field studies get info about the real use of the product. Finally, the real object's usability is tested.

The lead-User Methods is a great innovation compared with the previous one, which meets the urgencies of User-inspired Design (UID)

In the focus on the consumer' methods, the manufacturer identifying consumer needs and develops solutions themselves. In 'lead-user' methods, the manufacturer works with lead-users who develop solutions, or identifies (and commercializes) solutions which have already been developed by lead users. These benefits include:

higher 'hit rates' – as the products/services are already in use by lead users, who are generally a predictor of the broader market;

shortened development times (and potential for less expensive product development)

Some specific tools employed in lead-user methods include lead user search methods, user toolkits to assist and channel user innovation, and structured work with user innovation communities.

Conclusions

The idea of a Mass Customization (MC) seems to be very successful especially in marketing field.

The idea at the basis of MC is to create a web-based user toolkits that enables each and every customer to design a product which meets his or her needs and preferences. This is a product that exists exclusively for the customer. The MC represents a place where customers find their heterogeneous preferences and niche production is possible thanks to low production costs. In the MC system self design gains ground, and the demand is how and who creates value for the customers. Since it is a systems that limits expenditure, it does not create economic value, but use value through the benefits that it produces. Self-design delivers “superior customer value” with the MC toolkits that boost "aesthetic and functional fit" of products that derives from the possibility of self-customization. Another characteristic of these products is the “perceived fit”, considered as an added value and driver in self-designed products. The big and almost unlimited variety of products delivered from the MC system, not only does enable the users to rediscover his or her aesthetic, use and perceptive preferences, but also makes the difference between customers increase, thanks to the uniqueness of the product. The “perceived uniqueness” of a product becomes real with the MC toolkit, that makes creating specific products for each and every customer possible. As a matter of fact, every toolkit can produce an unlimited series of options.

On the one hand, you must understand, support and organize the recent innovation opened up to the whole cycle of products, not being linked just to the specific use of the product anymore (norm

ISO 13407). The lifecycle of the product or service includes the following phases: design, pre-production, production, sale and supply, maintenance, dismantling and recycle.

The user is neither the only one who uses the product nor the only one who the UID process is addressed to. The UID process includes the designer, the supplier of raw materials, the producer, the seller and supplier, the user and the ones who dismantle and recycle it (norm ISO/TR 16982:2002). In order to get the best results while interacting with the product, the UID plans a cycling check of the theory and the choices made. This cycle helps both improve information and reorient, in a sustainable way, the design process in every phase of the production and development of the product or service.

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