DESUMERS as Ideators in New Product Development

Dr. Aziza Maher Ahmed Abouelsoud

Lecturer in product design Department-Faculty of Applied Arts – October6 University

aziza.maher.art@o6u.edu.eg

Abstract:

Studies confirm that, successful products must be based on understanding users through direct communication with users during product development process. Users may have less to offer during product development than expected, due to limited abilities to describe what they expect from the product (Christensen and Bower 1996). There must be different ways to involve users, depending on which users and at which phase of the development process. Approaches and characteristics of users are still an issue of debate. Hippel's work concerning lead users plays an important role in this area of study, since then, there was a growth in user terminology, such as prosumers, and core users. This paper explores what is the term " DESUMERS ". The term is a portmanteau of the words (Designer and consumer) to describe users that would be enabled by the product designers to participate in creating innovative ideas or what is known as Ideators within the product development process based on the "Design by Approach" (M. A. Kauliu.1998). An increased number of companies call for innovative ideas, as in the case of Ikea. These companies aim to detect innovative ideas that could increase its position in the market. Such calls can last for short or long times and a substantial number of Ideators would respond, this naturally would lead to enormous numbers of ideas that consume lots of effort and time in order to revies, and because it's an open call; creative and uncreative ideas would appear. This paper suggests involving Desumers as Ideators in the ideation phase, of design process based on certain characteristics they own. The novelty of this approach would enrich the sub takes gained for the designer while help Desumers get benefits (financially and socially).

<u>Research problem:</u> The "Design by" approach used among designers should gain better outcomes in a shorter time and less effort, this may not be achieved unless the targeted users have certain creative characters, this would be achieved by building standards in the form of characters of those creative users coined, Desumers. The research seeks achieving this through answering the following questions:

- Who are the suggested users coined" Desumers"?

- What are the characteristics of Desumers'?

- Could Desumers help designers gain better ideation when involved?

Research aim: Introducing "Desumers" who can participate successfully in design process based on Design by Users' Approach &defining their characteristics, as a new term that refers to users with higher level of creativity than lead users.

Keywords:

الملخص:

أكدت الدراسات أن المنتجات الناجحة يجب أن تكون قائمة على فهم احتياجات المستخدمين بواسطة التواصل المباشرمعهم. قد تتسبب قدرات المستخدمين المحدودة في التعبير عما يتوقعونه من المنتج في تقليص ما يمكن أن يقدمونه (Christensen

(and Bower 1996)ولذا يجب أن تتنوع طرق الإستعانه بهم بناء على المستخدم، وعلى مرحلة تطوير المنتج التي يتم الإستعانه به فيها. لا زالت مدخلات الإستعانه بالمستخدم وخصائصهم موضوعاً خصباً للدراسة. وتلعب مؤلفات Hippelفي دراسة ال Lead users دوراً هاماً في هذا المجال من الدراسة، وتلي ذلك تطورت استحداثات مسميات المستخدمين مثل ال " prosumersمستوحاة من المستهلك/ الإنتاج" والمستخدم الأساسي Core user.في هذا البحث يتم دراسة مقترح لفئة من المستخدمين" Desumersاستوحته الباحثة من مصطلحي Designer/ consumer يمكنهم المصمم من المشاركة في وضع الأفكار فيما يعرف باسم واضعي الأفكار Ideatorsوذلك من خلال تطبيق مدخل التصميم بواسطة Design by approach (M. A. Kauliu (1998)).إن عدد الشركات التي تدعو إلى مشاركة المستخدمين في وضع أفكار جديدة لمنتجاتهم في تزايد مستمر، وتستهدف تلك الشركات إيجاد أفكاراً جديدة تساعد على تحسين وضعها في الأسواق، ولكن تلك الدعوات قد تأخذ وقتاً طويلاً، ويكون عدد الإستجابات هائلاً مما يستغرق وقتاً طويلاً في دراستها وتحديد الجيد منها، ولأن الدعوات تكون مفتوحة فالجميع قد يستجيب سواء بأفكار ابتكارية أو غير ابتكارية، ولذا يدعو البحث إلى الإستعانة بال Desumersكفئة تحمل مواصفات ابتكارية في مرحلة وضع الأفكار. ستثري حداثة هذا النهج ما كم الأفكار الجديده التي يحصل عليها المصمم بينما يحصل ال Desumers على فوائد ماليَّة واجتماعية.

مشكلة البحث:

يجب أن يتم مدخل التصميم بواسطة المستخدم بفعالية أكبر في وقت ومجهود أقل، وهذا لن يتحقق الآ إذا كان المستخدمين ذوي خصائص ابتكارية محددة. وهذا يتحقق من خلال وضع خصائص لل Desumersويتحقق ذلك من خلال الإجابة عن الأسئلة التالية:

- من هم الDesumers ؟ وماهي خصائصهم؟

- هل يمكن لهم مساعدة المصممين في وضع أفكار أفضل عند الاستعانة بهم؟

هدف البحث:

يهدف البحث إلى تقديم مصطلح المستخدم/ المصمم Desumers كواضع للأفكار عند استخدام مدخل التصميم بواسطة المستخدم، و تحديد خصائصهم كمستخدمين ذوي مستوى أعلى من الإبتكارية.

الكلمات المفتاحية:

التصميم بالتعاون- المستخدم الرئيسي- المستخدم/المنتج- تطوير المنتج- الزفكار الكامنة- واضعي الأفكار.

1- State of Art /literature Review

The literature review covers two areas of research: First, studies in user involvement in NPD in order to understand the different roles played by users, this will include Lead users, core users& prosumers. Second, Ideation phase in NPD, in order to build an image of users that can play the role of ideators.

1-1- Studies in User involvement in NPD

Consumers are in search not only for products and services that fit their needs, but also products and services that surprise them and generate a total experience. This emotional side of consumer behavior has been documented in the experiential model of consumer behavior "Robert W. Veryzer, et al (2005)". Most users will not care about technical details of how the product is manufactured even if this product plays an essential part in their lives, for the wide base of users it must be usable, functionable, and for some, trend- able, and/or affordable as well. Certainly, that would vary according to the type of user we are talking about. The topic of user involvement in product development has been an important subject of research activities, Von Hippel studies on lead users (1976-1978) paved the road for the study of involving users in the process of industrial product Design. In 1999 Hippel published a study titled lead user analysis in which he announced the term he coined "lead user" (von Hippelet al 1999). Hippel studies were reflecting business perspective in general, in 1998 published a book in which he discussed the

technique of engaging users in the design process, in 2002 he published an article titled Customers as Innovators, A New Way to Create Value, in which he and Stefan Thomke discussed the fact that some companies give their customers a chance to design and develop some goods like coffee flavors and computer chips. Biemans (1991) discovered that there were many elements related to user engagement, including, phases, and outcomes and aims of engagement at various phases of the new product development. Tomes, Armstrong, and Clark (1996) stressed on the fact that meeting with users would be a source for good insight for the information needed when developing new products. Intensity of user engagement in new product development in the German machine tools industry was the topic of a study done by Gruner and Homburg (2000) conclusions of the study confirmed that involving users during the stages of idea generation, screening, prototype testing, and launch had great positive effect on the outcomes of theses stages of the development process. Sanders explained involving the users through understanding their experiences which she referred to as Design for Experiencing but as a social scientist she wanted to access the experience of people through accessing their routes of experience (Elizabeth B.-N. Sanders 2002). User involvement in the product development can increase the way we understand their values as stated by Sari Kujala (2003). Even if products are developed for a wide audience of users and they may not be motivated to play an active role in product development, it is essential for product developers to be active in gathering information and feedback directly from representative users and understanding their needs and values (Tuunanen, T. 2000). Sari kujala points out that if the developed product does not reflect users 'needs, it won't be of benefit but in the same time, the involvement of users should be simple enough to be practical (Kujala.S, 2008). Tang studied the theory and method of rapid response to product customization (Tang Z. A,2005). Robert W. Veryzer, Brigitte Borja de Mozota (2005) explained that Dealing with the user-designer relationship is not something new, as many designers have emphasized the importance of this relationship, including Henry Dreyfuss Ellen Lupton (2014). Put yourself in who you design for 's shoes, an old say addressing product designers and, as old as it is, it is still applicable but, this is not enough anymore, users are seeking more creative & personalized products. Dai introduced an emotional design method to personalized product design, which allows personalized product to better meet consumers' personalized requirements (Dai J.,2007). Users should not be passive informants as, in spite of the good intentions of the developers, they have different values concerning products and their use. In 2009 Von Hipple published an article (E, Von Hippel,2009), in which he discussed studies and analysis of user-oriented innovation explaining the reasons users would find it useful to be a part of NPD and what benefits users would get from revealing their creations and innovations. Sun Y built an information flow model to study the involvement of individuals and groups in product innovation [Sun Y.,2012]. Wang described the key role of the user participation in product development and innovation through two companies, Xiaomi and Quirky (Wang Y.,2013). Although most industries realize the importance to meet user personalized needs (Tseng M, Jiao R, Wanga C.,2010), the available products are extremely limited, such as using different colors for the cell phone back covers. OAP is one of the Design Approaches that encourage the customization of products which could encourage the design skills of users, but for industries that plan to produce machines using the OAP concept, efficiency in development or improvement of platform modules and personalized modules are very low due to the lack of a user involvement platform [Mamaghani NK, Barani M.,2010].

Current methods for design of OAP mainly focus on the integration of traditional design methods (Zhao C et Al,2013), such as the analysis of functional requirements based on the axiomatic design (Peng Q et Al,2013). Zhenyu et al (2015) referred to user involvement into two patterns, the indirect pattern that focuses on the user for the evaluation of the product's function without being involved in the design or production process and the Direct involvement that happens as a solution for designer's misunderstanding for the users' needs. Taha, Zahari mentioned that the NPD is defined as a process intended for the manufacture of physical products. Development also encompasses the entire process of identifying market opportunities, creating a product that appeals to the identified market, and testing, modifying and improving it. According to Ulrich and Eppinger (2000), product development is defined as the series of steps or activities a company uses to conceive, design and commercialize a product. Zhang and Doll (2001) mentioned that the early stages of the NPD process are defined as front-end activities including conception, market, technology, competition assessment, product definition, and action planning. Recent research shows that many organizations value user engagement. User engagement acts as a pilot or vehicle to spark ideas and support development progress. Schilling and Hill (1998) found that one way to improve the match of new products to users' needs, for example, is to involve users in the NPD process. According to Taha, Zahari (2011) the involvement of users in the design team or discussing the initial design with them would improve customization of the product to their needs. Nambisan, S. (2002).

Within the process of PD through user centered Design (UCD), users are not really part of the design team meanwhile social scientists are, Elizabeth B.N. Sanders explained that as she tells her own experience as a social scientist when she was selected in 1980 by user centered design as a human factor practitioner, her job was to understand users then, turn this understanding into a language designers use easily. Her focus was on the product, making sure to find the best way to make users' needs come true. She stated that social scientist/ researcher serves as a link between users and designers and that is because, he or she prepares the criteria that designers can interpret (Elizabeth B.-N. Sanders et al, 2008). Participatory design methodology was a game changer as the user became a Design team member. This has developed in a big way in Co Design, as the user is not only expressing his needs, frustrations and hopes, but also suggesting solutions that is why, when it comes to involving users in the design process as co designers the main characteristic we're looking for is creativity. There are Four levels of creativity that could be seen in people's lives: Doing, adapting, making and creating. Depending on the kind of activity and the motivation behind doing it, these levels would appear but characteristic of the user, and his expertise would add its effect to the whole image (Elizabeth B.-N. Sanders et al, 2008). Despite the consensus that co-creation with customers is beneficial, there is a lack of agreement regarding how and why (Witell et al., 2011).

In the case of using social scientists as human factor practitioners, understanding users may not require direct involvement, designers want to design better products that are intended for human use, they need to have a good understanding of the people who are or will be using their products (A.Wallisch and K. Paetzold2020). It is difficult to ask users to fully design a product, no matter how creative or innovative they are. User involvement does not have a standard way or method to apply, as till now there is no certain mapping for how it goes, or when it should take place, and should we target certain type of users or leave it random, it could be a design activity for example (A. Wallisch and K. Paetzold 2020). The only fact that is clear in all the studies, is that

the detailed image of the design process would vary according to the way the user is involved, and how the designer is able to translate what he/she receives from the user. Some of the authors often use a specific terminology, some only refer to a specific design approach, while others may use different terms synonymously. Different approaches, activities and their classification by the corresponding researchers are even larger. For example, personas were used within one single conference (ICED 2017) being referred to as being a method, a design methodology, a theory, a template, and a generative tool (Hansen, Jane et al, 2017). Fain, Nusa et al (2010) discussed the role of users &society in NPD and reflected the importance of modifying the Triple Helix that includes only Government, university, and industry into a fourfold Helix in order to add the user at the center, regarding the importance and effect of users. Yang, Q (2019) analyzed the HUAWEI cellphone community to explore different participations of online users, he divided users into: Core users, active contributors, passive contributors, information acquiring users and divers. Paying attention to their behavior characteristic, the user samples were classified based on four metrics to creating a classification model of users: Knowledge level, Both in/out degree centrality, and creativity.

Table 1. Users' participation according to Yang, Q (2019)

No.	User type	Description
1.	Core users	- Play a leading role in the NPD process. - Minimum number of participants - Active communicators within the network. - Provide a large number of promising ideas that receives a lot of attention
2.	Active contributors	Generate a certain number of ideas and contributions and help drive innovation. - Actively communicate with others about all aspects of the NPD process.
3.	Passive contributors	- Get the knowledge about the product and its parts - Submit ideas and contributions to their respective issues. - They rarely discuss their ideas with others
4.	Information acquiring users	- Can grab attention of the members with just a few ideas.
5.	Divers	Seldom involvement in NPD process, no persistent motivation, and tends to be a bystander.

M. A. Kauliu (1998) classifies the relationship between product designers and users as explained in table (2)

Table (2) strategies for involving users in the product development as mentioned by M. A. Kauliu (1998)

No.	Strategy	Explanation	Comments
a.	Design for Users (DFU)	Designers are the leading actors. The customers, consequently, are more or less 'objects' from which it is possible to felicitate general requirements. The approach focuses on an initial diagnosis and a deductive transformation of these initial requirements into performance measures. Utilizing this strategy, the design process is guided by data on the customers.	Where the designer studies and consults the user as having experience in using the product, and here the user is considered a source of inspiration that helps the designer to deduce the needs and thus determine the path of the basic perception of the direction of the product design and that is considered the traditional approach for a good design.
b.	Design with Users (DWU)	different models or prototypes are shown to customers at different stages of the design process and are then revised. In these approaches, the customers react to product concept(s) presented, and the information feedback is delivered to designers. The 'design with' strategy is a way of maintaining a formal dialogue with the customers. Concepts and prototypes are developed parallel to and evaluated in relation to each other in systematic ways. The main differences between concept and beta testing are the degree of product readiness and the absence/presence of the use context.	Where the designer allows the user to participate in the formation of design ideas, and the user becomes an active member of the work team, and thus we find the designer cooperating with the user and benefiting from his specific vision of the needs and translating them into specific phrases, and the focus here is on devising ways and methods for how to work and use the product and that matches with user centered Design.
c.	Design by Users (DBU):	The designer becomes a facilitator who must enhance the user's chances of finding solutions to their problems, thus actively engaging customers in the development process.	The lead user method, consumer idealized design and participatory ergonomics belongs to this group. Where the designer plays the role of helping to enable the user to make his own design decisions, the designer here gives the user the opportunity to anticipate and define needs for himself, creating a vision of what may not already exist, and this is clearly used in participatory& Co-Design.

1-2- Lead users

A lot of studies paid attention to lead users, von Hipple (1986) defined Lead users as users "whose present strong needs will become general in a marketplace months or years in the future" and they have a strong motive as represented in the benefits they would gain when their needs are achieved. Hannukainen et Al, 2006 suggested that studying the needs of disabled users can lead to latent needs of others. Similarly, Ravi selvam et al considered older people needs as latent needs for the whole society. So, lead users could be a source for latent needs, which according to the Kano model would give the designer a new window for creative ideas to start with. The following characteristics has collectively appeared in some of studies related to lead users (Morrison et al.,2000; Morrison et al.,2004; Belz and Baumbach, 2010; Schuhmacher and Kuester, 2012; Lettl et al. 2006; Lettl et al., 2008; Span et al.,2009):

a- Being a head of trend: Such users think in an unconventional way, According to Blez & Baumbach (210:310) that is an important characteristic, as it helps to gain futuristic visions by the user to what could make the product standout& compete in the market.

b- Having High level of Expected benefits: When the user's need is not achieved when using the product, he would be motivated to participate by giving ideas about improving the product, hoping to have the product achieving what he needs (Schuhmacher and Kuester, 2012: 430).

c- Dissatisfied: The gap between how the user is expecting to find the product and what he really finds, may cause a feeling of dissatisfaction. A study by Belz and Baumbach (2010:310) stated that dissatisfaction, is a main characteristic to identify lead users.

d- Speed of Adopting: Lead users can be effective to other users while, adopting new products (Morrison et al., 2004:361). Schreier et al (2007) refers to Everett innovation diffusion highlighting that lead users make up the upper segment of innovation diffusion, that's why early adopters are a part of this segment. Schreier and Prügl (2008: 343) conducted research on 193 tech divers, 129 sailplaners and 139 kite surfers; the findings of this research demonstrate that lead users adopt new products faster and more intensely than other users

e- Product related knowledge: In a study for Lars Bo Jeppesena, & Keld Laursen (2009) ،they have analyzed knowledge sharing behaviors focusing on lead users considering them as problem solvers and their empirical study showed that, lead users, love to share knowledge and because of their tendency for Adopting technology, they have wider abilities to be more aware about the product and able to explain that knowledge.

f- Experience of use& openness to technology: Matin Dignell & Daniel Mattila (2007), see that a lead user often has an extensive technological background. Lead users make use of information in expertise more frequently than non-lead users (Lettl et al.2006، Marchi et al 2011). Lead users benefit from this knowledge while developing innovative ideas of new products or methods.

1-3- Prosumers

prosumers as coined by Alvin Toffler who claimed that they are a very specific market players, who produce products for their own concurrent or later consumption are not a new thing, as ancient civilizations were filled with similar people making tools for their own professions (Toffler 1980). Philip Kotler (1986), defines prosumers as a group of dedicated users who will go an extra mile to make changes to products to meet their needs. Prahalad, C.K., & Ramaswamy, V. (2004) in their work referred to the term during discussing value co-creation,

the term was also used by people discussing service-dominant logic of marketing (e. g. Stephen L.Vargo, et al. 2008). In a study of Asión-Suñer, Laura; et Al (2021) they conducted a survey that analyzed what the prosumer is like& their environment with the aim of knowing their main needs and interviewed experts and attendance of a maker event (Maker Faire Bilbao, 2019). Lin et al (2007) mentioned that Prosumers are motivated by relative economic benefits as in the case of lead users. Zhou, F., et al, (2015) stated that sometimes the product they need is not available. Wolf, M., et al, (2020) think that according to their characteristics the available products need to be customized. "prosumerism", refers to the consumer taking part in the design process of the services &/ or product. Nature of the service or the product would affect the need for customization. Some examples could be seen in software, sports' equipment and highly involved hobbyists and the Do-It-Yourself approaches that are basically designed to give users the chance to customize their latent needs. These are users who are independent and self-sufficient with sometimes even near professional level in customizing their products to suit their needs. Good examples of this are the 3-D printing industry and the open-source software movement. In both examples people can share and build on what others have created. Based on Xie et al. (2007) presumption is defined as value creation activity undertaken by users leading to the production of products they consume. Humphry and Grayson. (2008) argued that it is necessary to distinguish between co-creation for use and co-creation for the exchange of values (co-creation for others). Consumable co-creation is done by a particular customer for his benefit, while co-creation for others is geared toward other customers. While co-creation for use aims to enjoy the production process and its outcome, co-creation for others aims to provide an idea, share knowledge, or participate in the development of a product or service that is useful for may be being of value to other customers. Witel et al. (2011) argues that the customer has an important role to play in this process, not just as a source of information but as an active contributor with knowledge and skills. Being a prosumer, aims to prefer producing one's own goods and services therefor, both the same person practices production and usage, this is producing for use.

1-4- Ideation

Jin Woo Lee et al (2018) in their study illustrated that Idea generation and development are important skills for creating innovative concepts early in a design process. In 1990s Elizabeth Sanders introduced a notion of "collective creativity", believing that everybody is the expert regarding their life and can contribute to the design process. For collective creativity, a designer plays a role as a facilitator who scaffolds a process where users are invited to the design process, envision desired futures, and generate ideas (Sanders & Stappers, 2008). Sanders introduced a set of generative tools with which users—non-designers—can express their experiences and generate innovative ideas. The new language is, however, visual, as opposed to verbal. Designers and researchers in current co-creation projects are confronted with two main challenges: firstly, whom to involve and how to open the process for those who are affected and secondly, how to scaffold the setting for fostering people's collective creativity. These are crucial challenges for designers and researchers as current co-creation projects deal with more complex problems and stakeholder relations. Current practices to cope with these challenges are often situated (Suchman, 1987). Designers and researchers plan and conduct the co-creation project by responding to the very local context of the project and contingencies that emerge at

any point of the project. They choose, develop and modify methods for co-creation as situated practices within the project. There is then a lack of shared, systematic understanding of what kinds of dimensions co-creation projects are built on. What kinds of contingencies should the project consider? What information could support the selection and development of methods? This lack of systematic understanding also makes it hard to evaluate the co-creation projects. Idea generation requires a high degree of integration between internal / external and among customer, concept, product and production considerations (including suppliers) to generate a promising set of ideas. To that end, human-centered design helps to improve ideas in three keyways: Conceptualization, form refinement, and transformation of design challenges. Designers seeking to integrate technology and functionality into product form rely on insights gained from customer research and market analysis. Robert W. Belliser et al. (2005). Designers are important intermediaries between the possibilities of technology and the needs of users. It is primarily their job to "translate" and interpret the functions and mechanisms they provide into a "product" in the context of the overall development effort. Brita Schemman et al. (2016) Contribute to a better understanding of public involvement in NPD through online idea crowdsourcing in their research. Motivated ideators who suggest substantial number of ideas may not generate promising ideas mean while Ideators who only suggest one or a few ideas may do. The internal passion of the ideators to contribute ideas to a crowdsourcing platform does not have to lead to the generation of 'good implementable ideas. Findings of Bayus (2013), who found that those ideators who suggested two or more ideas to the Dell Idea Storm platform were more likely to suggest valuable idea to implement than those ideators who created only one idea. These different outcomes are related to the fact that open idea call for IT goods and services might attract a different kind of crowd than an open call for other products' ideas. probably the IT Ideators are more likely to have special expertise than the users of other products. Franke and Shah (2003) think similarly in the case of ideation in sports crowed sourcing groups among athletics. While not every ordinary user might be able to produce innovative or valuable ideas, the crowd of ordinary users is collectively capable of identifying those ideas that are valuable for the company. There are so many examples for companies seeking ideas from their customers using crowed sourcing. In 2018, IKEA launched 'Co-Create IKEA', a digital platform that seeks new Ideas. This is a strong incentive for designers and talented users, and for Ikea it was a source for many new Ideas. This is considered a win-win co-operation as, creative thinkers and/or technically talented users are discovered, meanwhile the company gains creative modern designs, other companies like Sodexo, Dewalt, BMW are adapting similar approaches to harness new Ideas and discover creative Ideators.

2- Methods& materials

This is an interpretative paper depends on analytically disclosing literature that highlighted different user participation in NPD, User/Designer relationship and the related known terminologies referring to users, and their characteristics, to specify a kind of users who can play the role of ideators in the design process giving them a new term DESUMERS. The investigation begins with the separate analysis of user involvement in NPD process, and the strategies of involving users in the design process. Compiling the methods was carried out in both cases through review articles of user involvement in NPD& involvement strategies. For the users, the focus was on Lead users, Prosumers& core users. A part of the research stated

Advantages& disadvantages of involving users to define the characteristics of the suggested Desumers. To search for ideation phase, I started from previous academic works developed in this line of search that focused on involving users and prosumers. During my search I was introduced to ideas that helped in expecting how to Identify the suggested Desumers, like (DIY as prosumers- OAP" Open Architecture products"- latent needs- crowed sourcing- J.P Guilford test for creativity). Studying& analyzing the three mentioned types of users along with understanding advantages& disadvantages of involving users, helped to come out with a description of the needed characteristics for users that can enhance the ideation phase in product design process. Understanding the kano classification of needs as applied by Karl Ulrich was a base for understanding latent needs concept. A detailed description was given to semester 5 product design students, Faculty of Applied Arts, 6th October University of the targeted kind of users and how to find them through needs then, ideation was approached in two different ways, one in group A& two, in group B, group A was the control group, the students did the ideation by themselves. In group B, Desumers were chosen according to observing any of the suggested characteristics &were given a blank paper with a drawing of the main features of the product and asked to write down their ideas directly on each part of the product. Then students were asked to study the ideas suggested by the Desumers and filter them. Students finished their designs and prepared the model of their final design. A questionnaire was distributed among group B students to see how efficient was Desumers 'ideation. Questionnaires were analyzed and students 'work was assessed by professional panel and final scores were recorded.

3- Advantages and Disadvantages of user involvement in design process

User involvement should bring future or end-users' visions into the development process. This can solve a key problem in innovation, which so many projects suffer from, and that is 'lack of sufficient market input, failure to build in the voice of the customer, and a lack of understanding of the marketplace' (Cooper 1999). Furthermore, it has been noted that lack of adequate market research is a key factor of failure of innovations (Panne et al. 2003), all the previously mentioned, would certainly lead for example to, a problematic translation of engineers' desires into customer's needs. User involvement is considered a way to obtain important input from end-users (Kujala 2003), on the quality or speed of the research and design process; on a better match between a product and end-users' needs or preferences; and on end-users' satisfaction (Kujala 2003). I can brief the **advantages** of involving users in NPD as follows:
- Studies has shown more understanding of users' values.
- Helps to avoid the problematic translation of designers' desires into users' needs.
- Meeting with users could be a source for good insight for the information needed in NPD.
- Involving users during stages of Idea generation, screening, prototype testing and launching have great positive effect on outcomes.
- Designer's requirement user information is of utmost important.
- Building a clear image about user needs.
- Source of market sufficient input.
- Succeed to build the voice of users.
- Involvement of users with diverse needs may help for a better design for all.

One of the negative sides of involving users may be caused by reasons related to being careful when translating end- users utterances mentioned by Van Kleef et al (2005): End-users may not be aware of their needs; they may not be able to articulate their needs; and they may not be willing to speak about their needs with an interviewer. Panne et al. (2003) stated that involving consumers into the innovation process has its own negative side as well and their point of view could be summarized as follows: When the innovator works regularly with customers, they may become prejudiced about their customers' needs, and users are always looking for solutions available in other brands similar to the product to be developed and this may give innovators clues about what the solution is. Hekkert and Van Dijk (2001) highlights another negative side believing that focusing on end-users' needs may decrease the role of the designer explaining that this would limit their creativity. Stewart and Williams (2005) warn for over-emphasizing the findings from a study with a few end users as this would end up with a product that fits some customers while ignoring the needs of others, but even with all these negative sides it is still important to understand need of users). I can brief the **disadvantages** of involving users in NPD as follows:

- Limited abilities to describe or imagine what they expect from the product.
- Users will not pay attention to technical details.
- Users' involvement doesn't have a standard or method to apply.
- There is no certain mapping for how it should go.
- It is difficult to ask users to design a product no matter how creative they are.
- The detailed image of the design process would vary according to the way users are involved.
- The gathered needs of user involvement have shown to be demanding.
- How the designer can translate what he receives from users is considered difficult.
- Having a social scientist as an interpreter may be a source of confusion if not done well.
- Innovators can be prejudiced about users' needs when they solve users regularly.
- User involvement can bias innovators towards imitative innovations.
- Users may be not willing to speak about in their needs with interviewers.
- Paying too much attention to users' needs may lead to an over customized product that will not interest all users.
- Paying too much attention to the users may erode the role of the designer.
- Each user may not be able to speak reliably about their future needs.
- Designers would never be able to satisfy all users.
- Some users' needs could be misleading or hard to achieve.
- Some user needs are not applicable.
- Average users are not suitable for developing novel products attributes as they cannot accurately determine future market needs.

Understanding the types of needs stated by the user would improve all these negative sides "kano model" (Elmar Sauerwein et Al,1996). A successful product development needs a collaborative work from researchers, designers and end-users together they can make it all come true.

4- Who are the Desumers?

Desumers are users that have applied creativity skills (notion of applied creativity was used by Allahdadi, Marzieh et Al. 2015). Majaro (1988) uses the term idea as a synonym for creativity.

Being creative means the capability to create and combine ideas, when the design team can apply those ideas in a form of a product that makes a change then, creativity leads to innovation. Suggested Desumers are creative people in Design (Allahdadi, Marzieh et Al. 2015 divides creativity into 3 categories: Art Creativity, Scientific creativity& Design Creativity). Although Desumers are selected from different groups, they all share one characteristic which is their passion for finding creative solutions that serve the different aspects of their lives within available limitations, they have a vision that extends beyond what is, to what should or could be (from must have needs to latent needs), and they are passionate about the idea of design and creativity, which makes them a privileged group as users to participate in NPD, who are able to ideate for products or services they are consuming with Designers. The study depended on understanding the three user's types mentioned in literature (figure1), according to the study and the analysis of the 3 user types.

Desumers believe in the unlimited power of creativity, there is an inner voice inside their heads that they will find a creative solution.
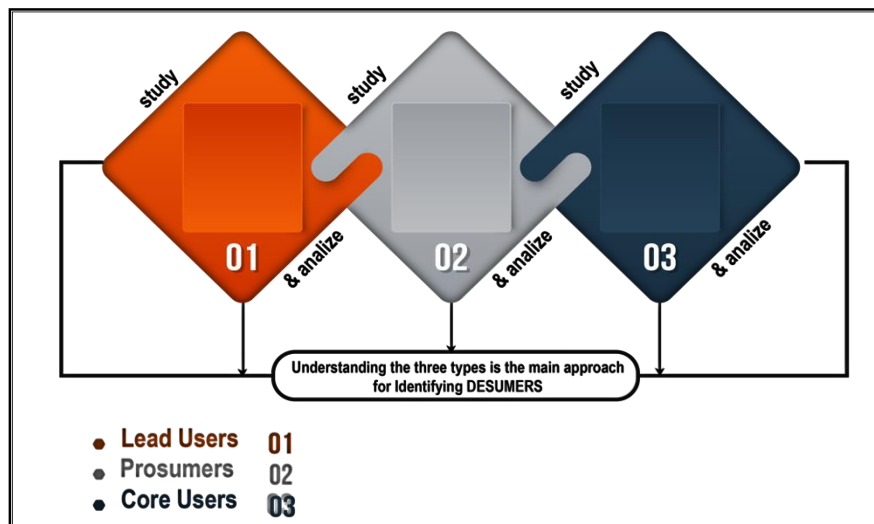

Figure1: Approach for building an image about suggested DESUMER

- Desumers are creative users (Based on J.P Guilford test for creativity1986):
 and they could be:

1- Sensitive toward problems (being aware of things that do not work or fit together, and they are curious to find out why).

2- Able to aspire to creative needs (able to speak reliably about creative needs).

3- Able to get lots of Ideas that are new and innovative.

4- Flexible & able to shift between different perspectives.

5- Able to view a problem from different angles and branch into new channels of thought.

6- Able to think in a synthesizing way- organizing ideas into larger more inclusive patterns and as part of it they are Analyzed to see the relevant and interesting aspects.

7- Able to observe details others can't observe. (noticeable observation skills)

8- Able to see beyond the obvious limitations of the product& repurpose it.

5- Design by Desumers Approach

For this research; two product design student groups were selected to conduct different design projects in semester3 at 6th October University, Faculty of Applied Arts. There were 10 product design students, each group consisted of 5 students.

<u>Projects given to Group A students were:</u>

Yogurt making machine, waffle maker, electric massager, toaster& shaving machine.

<u>Projects given to Group B students were:</u>

Air fryer, Dremel, Jigsaw, Mortar concrete mixer drill and the multi tool cutter.

<u>The applied Design process consists of 3 phases:</u>

a) Discovery & analysis phase (Know how- product scenario- Persona- Brands customer review- Brands Design analysis- needs lists- needs classification & Design requirements) (5 weeks).

b) Creativity phase (Idea generation (where Desumers are involved)- concepts Design- final concept Design) 4 weeks.

c) Modeling & assessment phase (students make a final model that reflects most of their creative new design and seek feedback from users and other stakeholders to assess their product) in 5 weeks.

Students were given a detailed workshop about the concept of Desumers during studio time, and it was up to them how to choose those users. Calling for users participation was up to the students after considering the suggested characteristics mentioned earlier, some of them looked among their colleagues in other university faculties, others looked among their families& friends, others used social media but they were asked to prove the characters they looked for in choosing the Desumers (there were no restrictions related to sex, age, education, physical abilities), after that it was explained to them to filter the chosen Desumers according to the creativity they reflected in the needs list they have been given.

<u>Group A and B applied the same design process, the users' roles could be briefed as follows:</u>

- Interviewed for product scenario& persona studies.

- Writing down Brands customer review (cons& pros) for a quick & general feedback (brands were decided according to the users' own experience).

- Writing down needs list according to their own vision& circumstances.

- After needs were delivered, students in group B decided with the researcher who are the final Desumers that would participate in idea generation according to fitting the profile upon a questionnaire answered by the users.

- Students in group A, Did the Ideation for themselves but, they Identified users' needs using the design for, and the design with approach. 2Desumers in group B were asked to write down their new ideas on the sketch of the product prepared by the students.
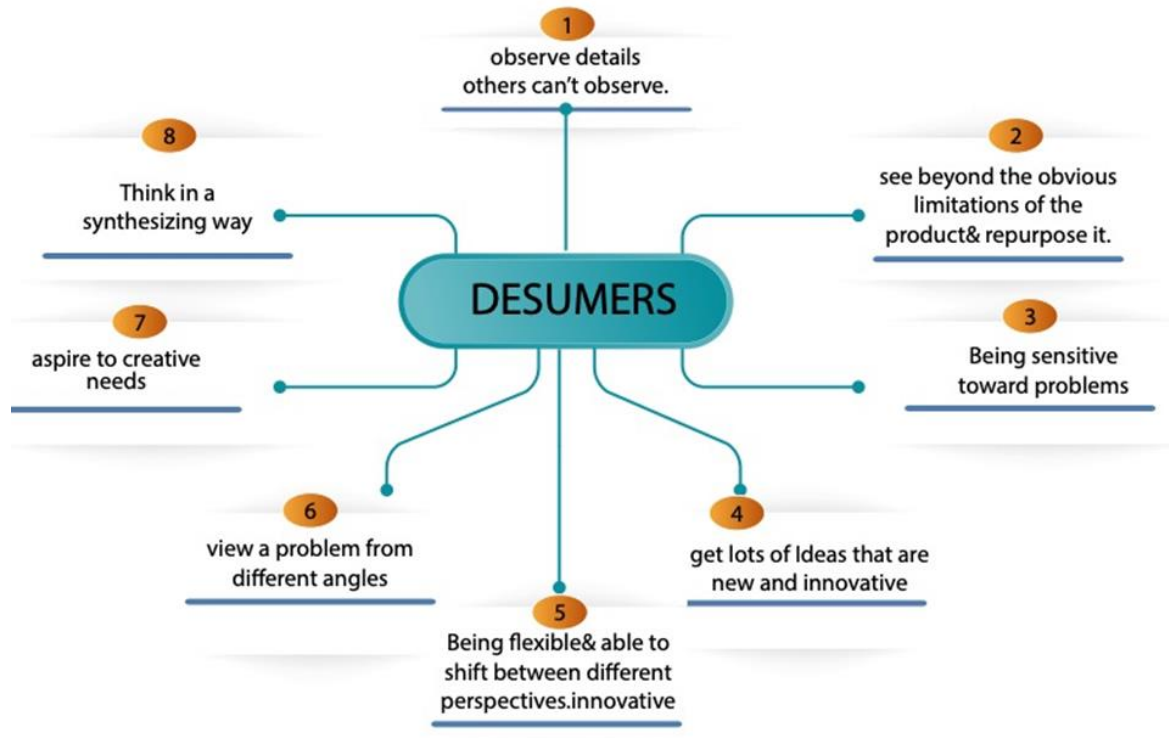
Figure2: Mapping Desumers' characteristics that help in choosing and finding them.

<u>Desumers were chosen according to:</u>

Choosing the users with the most important needs was first level of choosing the Desumers. In level two the students focused on the creative characteristics as mentioned by J.P Guilford test for creativity.

- The chosen Desumers were asked about the problems they were facing with their products and their answers reflected advanced understanding of the issues related to the product, and whether the product parts are helping or not helping the harmony of the product usage (character1).

- the chosen Desumers reflected self-esteem and great ability to discuss the product scenario (character2).

- The chosen Desumers proved a great ability to create things in different fields as some of them paints, others practice crafts, some has projects in DIY others recycled, and some find easy & unexpected solutions for technical problems facing them (character3).

- During the Interviews the chosen Desumers reflected reasoning in discussion that reflected great ability to accept logic and not to be possessive of their own opinions (character4).

- The way they wrote their needs reflected many linear needs that reflects synthesizing way as they organized needs that can add value to the product & ability to see the problems from different angles (character5&6).

- The users were asked to write down observations about their products and the most successful ones gave a sign of a Desumer (character7).

- Users who can put the one function product into a multifunction product reflect a creative way of thinking (character8).

Table 3: Group A projects

| Project No.	Project title	Number of users	Creative Ideation suggested by students and appeared in the final design
1-	Yogurt maker	8	- Using the product as a dough leavening area. - Adding a small mixer to mix yogurt with milk.
2-	Waffle maker	10	- Kids famous characters engraved on waffle. - Measuring cup to suite the size of waffle.
3-	Massager	9	- Extension to reach the back easily. - Have manual massaging tools as part of the same product.
4-	Toaster	12	- Space saving by a shelf accessory. - Form inspired from toast shape.
5-	Shaving Machine	20	- One power source for couples. - Bee head and body for the product form.
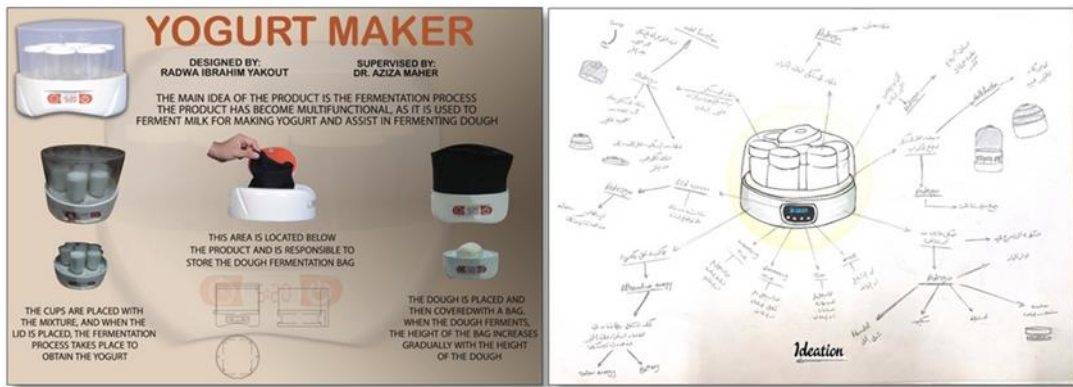
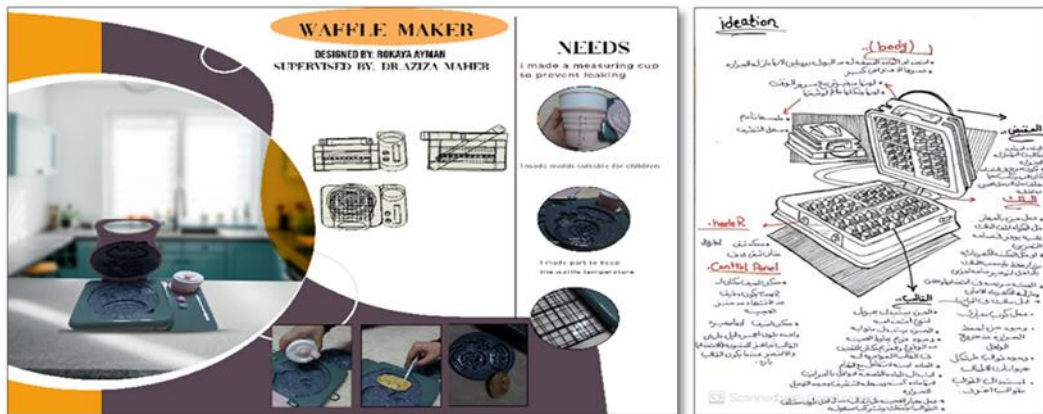**Figure3: Final design of the yogurt maker and student Idea generation**

Figure4: Final Design of the waffle maker and student Idea generation as mold
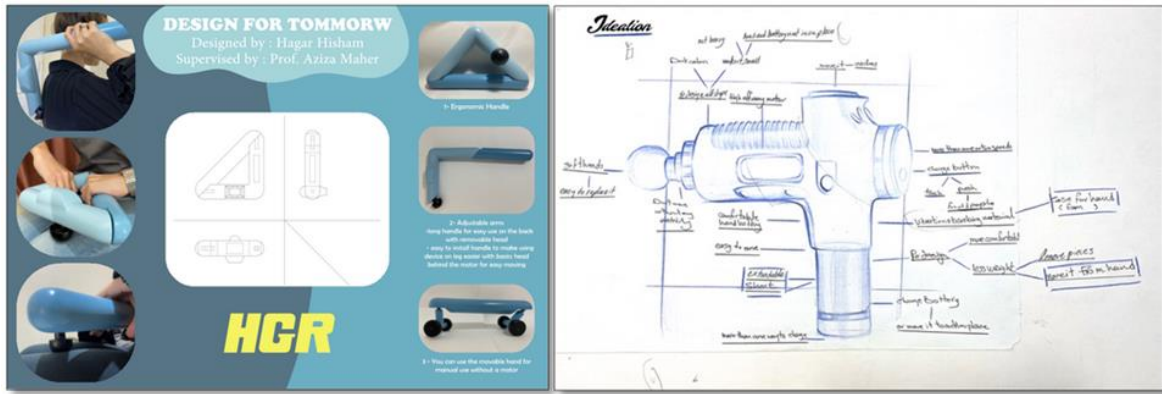
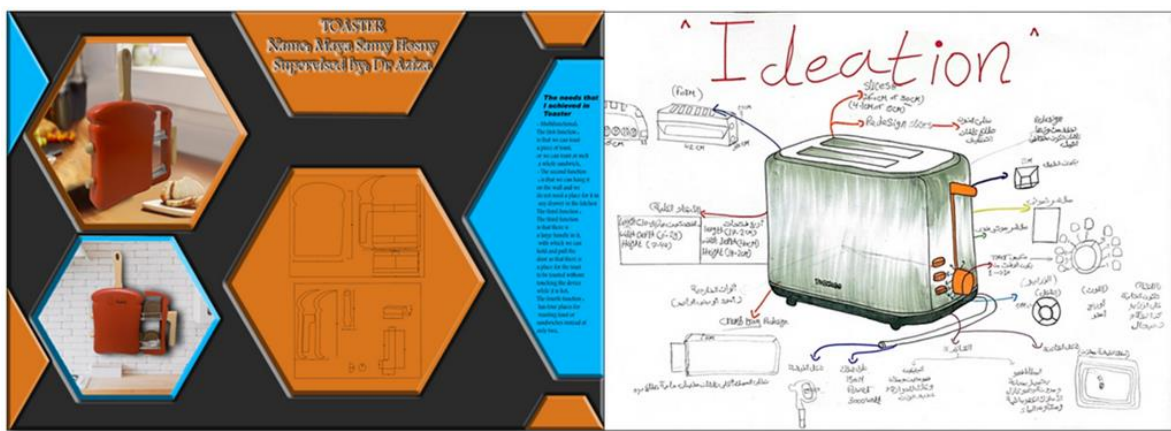**Figure5: Final Design of the massager and student Idea generation**

Figure6: Final Design of Toaster and student Idea generation

Figure7: Final Design of Shaving machine for men& women and student Idea generation

Table 4: Group B projects

Project No.	Project title	Number of users	Desumers No.	observation	Creative Ideation suggested by desumers and worked well for the designer
1-	Air fryer	8	2	Users documents all the brands they studied details attachment (1)	- Can roast coffee beans. - Could be divided when needed. - Potato cutter could be added in the design parts. - Could be used for making pop corn
2-	Dremel	10	2		- Tools to help cutting circles -Organized storage. -Texture for better grip
3-	Jig Saw	9	2		- Extension to reach the back easily. - Have manual massaging tools as part of the same product.
4-	Mortar concrete mixer drill	9	2		- Illuminated finishing colors to be recognized in dark work environments on the road. - Sound isolators - Light alarms for dead batteries.
5-	Multi tool cutter	8	2		- Wireless charger attached securely. - Alarm lamps for charging level - Removable handle secure when attaches. - Stability when left on the working surface.

Figure8: Air fryer final design and the Ideation done by the chosen Desumers.

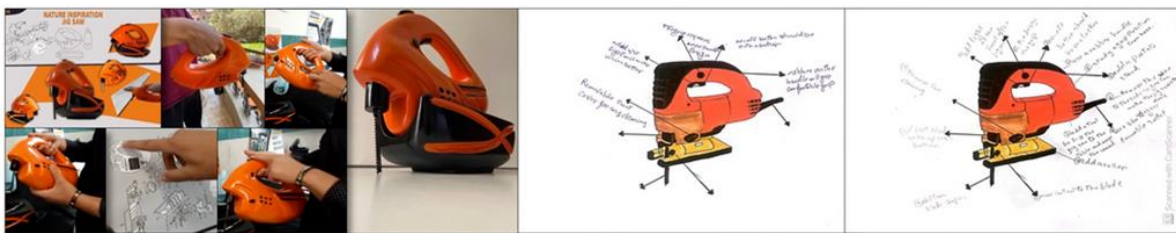**Figure9: Dremel final design and Ideations done by the chosen Desumers.**

Figure10: Jig saw final design & Desumers Ideation.
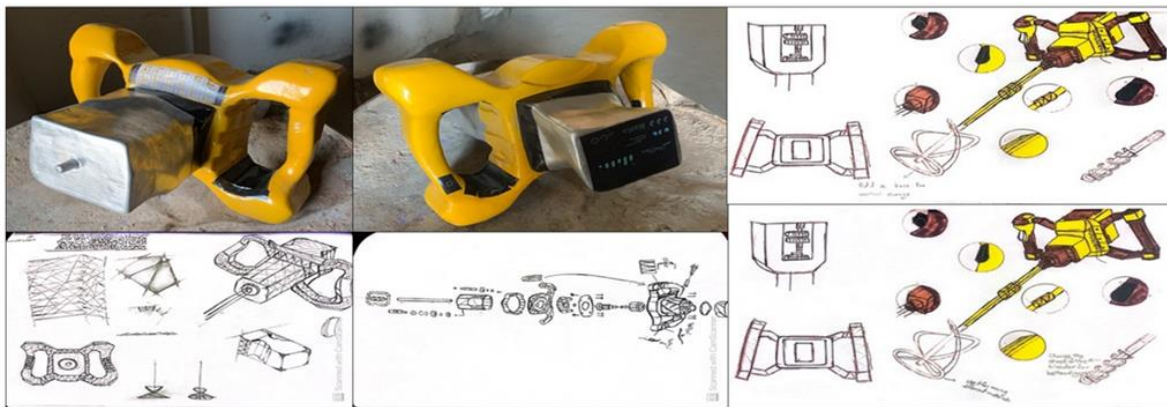

Figure11: Mortar concrete mixer final design & Ideations don by the chosen Desumers.

Figure12: Multifunctional cutter final design& Desumers Ideation.

Findings:

Findings were primarily based on documents from the questionnaires with the students. Choosing users was based on finding the suggested characteristics that were based by itself on J.P Guilford test for creativity, product design students filled out a questionnaire about what

they experienced in working with the suggested Desumers within the design by approach. The observations show that users' contribution to the design differs according to the phase of the design process; for example, all users are effective when it comes to product scenario, persona & needs documentation "linear and latent needs helped to filter the users for ideation depending on how creative they were). The approach of design for and design with would be effective in these phases. When it comes to Ideation, the design by approach would take place. The Desumers with creative characters were observed to be able to add good new features to the final product. According to the students' assessment panel that consisted of three design professors it was assured that group B's work had great potential and good level of creativity. Creativity level among group A wasn't as good as group B members. The suggested characteristics that worked well and were preferred to the designers in group B were:

- Able to aspire to creative needs (able to speak reliably about creative needs).
- Able to get lots of Ideas that are new and innovative.
- Able to observe details others can't observe (noticeable observation skills).
- Able to see beyond the obvious limitations of the product& repurpose it.

Questionnaire Results of Students

To explore the awareness of the students on the Design by Desumers approach, a small survey with both open-ended and close-ended questions were prepared and asked. The five product design students answered the questionnaire after finishing the projects. Questions are as follows:

Table 5: Questionnaire content

1	I understand the design by Desumers approach.
2	Users were useful for building product usage scenario.
3	Users were useful for building product usage Persona.
4	Users were useful for building final list of customer brand review.
5	Desumers are useful for ideation.
6	I want to keep doing projects with Desumers.
7	Desumers can play an important part in the design team.
8	Desumers are experts of their product experiences.
9	People who are not educated in design could be Desumers.
10	Experience with the product is a must for Desumers.
11	Do you think of any other characters that can help choosing the Desumers? If there is any, write it down in the comments area below.
12	How did you choose your Desumers?
13	What characters did you focus on?
14	Desumers involvement eroded your role as a designer.

Questions 1-11,14 are answered by degree of agreement or disagreement" 1= disagree, 2= strongly disagree, 3= agree, 4= strongly agree and Questions "12,13" are answered by a √ and students are allowed to choose multiple answers.

Table 5: Questionnaire results

Question no.1	Three out of five students chose "strongly agree, 2 students chose agree.
Question no.2	Four out of five students answered "strongly agree, 1 student chose agree.
Question no.3	All five students chose strongly agree.
Question no.4	Three out of five students chose "strongly agree, 2 students chose agree.
Question no.5	One out of five students chose strongly disagree, 4 students chose "strongly agree.
Question no.6	One out of five students chose "strongly agree, 3 students chose agree, and one student chose strongly disagree.
Question no.7	Three out of five students chose "strongly agree, 1 student chose agree, and one student chose strongly disagree.
Question no.8	One out of five students chose "disagree, 1 student chose agree and 3 students chose strongly agree.
Question no.9	1 out of five students chose "disagree, 1 student chose agree and three students chose strongly agree.
Question no.10	Four out of five students chose "strongly agree, 1 student chose agree, suggested characteristics included.
Question no.11	Four out of five students chose "strongly agree, 1 student chose agree. Suggested characters by Students were: People with high IQ- People who can paint- people who like to fix broken stuff at home- product maintenance and fixing professionals.
Question no.12	Sources for choosing the Desumers varied equally among family members, friends and social media, one student depended on communities of disabled people along with social media.
Question no.13	Students focused on most of the characters that reflected easy proof to being creative like 2,5,7,8.
Question no.14	Four students saw that Desumers would not erode their role, as they only suggested ideas but they themselves as designers decided how their designs will be and what kind of ideas to work with and what not to, even the ideas that were adopted have been turned into real design features by designers not the Desumers, one of them commented that he would only seek using Desumers when his ideas are blocked. Only one student rejected the design by approach and expressed that he didn't get a lot out of the two Desumers he worked with.

As seen in Table 5, students' answers reflect their positive attitude towards having creative users through the ideation phase, the questionnaire results also show a general need for user experience during discovery phase, especially in product scenario, persona, brand customer review & needs documentation. In assessment phase Desumers would give better feedback as

they already have more ability to express their opinions about the product. According to responses, users had positive contributions in all phases, meanwhile this did not erode the designer's role.

Limitations and Further Research:

This paper has limitations and raises questions demanding further research based on the present results. First, the research focused on finding the characteristics that would distinguish DESUMERS from other user types then, tested on students of product Design, future experiments on designers from industry level would enhance the results. This paper is exploratory in nature, the Desumers selection may need in-depth future research. Crowed sourcing as a source for DESUMERS could be a rich topic for further studies. Scenarios for Ideation done by DESUMERS needs to be structured. User's personal attributes, such as age, gender, location, cultural level, etc., has not been included in this paper.

Conclusions

This paper introduces Desumers (portmanteau of the words Designer and the word consumer) as a new term that could refer to users with higher level of creativity than lead users that can participate successfully in design approaches based on Design by Users' strategy through drawing the connection between the Product designers and people who can show different images of creativity. A study and analysis were adopted on lead users, prosumers & core users to look for key features of the suggested DESUMERS that can have direct involvement in NPD. DESUMERS must have different characters and skills to be an advantage not a disadvantage. Eight characters were selected to help Identify DESUMERS as a result for studying the three terms referring to users. Desumers can be a part of CO-Design approach that depends on collaborating with users as co designers. Level of creativity and imagination is essential to improve the outcomes gained from ideation. This study provided an opportunity for undergraduate students of product design to work on a design project in collaboration with experienced users of the product with high creativity levels. Third-year product design students, none of whom have experienced design by approach before, were able to practice the design with approach in product scenario, persona& brand customer review in previous projects (the design phases were put together by the researcher with her students from Sem.1). At the end of the experiment students have gained good experience related to communicating with real users. This study proved that users could provide a critical success factor as a useful way to improve the benefits resulting from the use of users in the stage of developing ideas in the design process by developing specifications of an innovative nature that assist in their selection process. The characters focusing on creativity finding helped in narrowing the number of users doing the Ideation.

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