ANALYSIS OF THE PERCEPTION OF FUTURE DESIGNERS ABOUT USAGE SCENARIO INTEGRATION IN PRODUCT DESIGN (SIPD)

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Abstract

It is expected that in the near future new products that would be able to adapt to different usage scenarios in order be more used will increase. For example, nowadays new modular smartphones are being develop that will be able to adapt to future needs of the user reducing the frequency of substitution of an old product for a new one. The authors argue that this approach could be applied to more products and it could be extended in practice with the appropriate knowledge and methods. The aim of this communication is to analyse the perception of future designers about the advantages of these products.
To assess this a workshop has been done in which a smartphone is compared with a modular mobile phone, a new sports bag that adapts to be used in winter and summer is conceptualised and an opinion questionnaire is asked in different phases of the workshop. The conclusions obtained show that they perceive the products that adapt to different scenarios as better in terms of frequency of use, use and saving of materials and adaptability. So, providing appropriate information about this approach opens the designers' minds and make them start thinking about products that can be more used.

Keywords: Scenarios integration, Sustainability, User-centered design, New product development

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Please cite this paper as:
Surnames, Initials: *Title of paper*. In: Proceedings of the 20th International Conference on Engineering Design (ICED15), Vol. nn: Title of Volume, Milan, Italy, 27.-30.07.2015

1 INTRODUCTION

This communication addresses the design of products considering multiple use scenarios in order to develop products that can be more used, increasing its frequency of use and avoiding under-use of materials.

From the user perspective, since the needs may change over the time, sometimes the user may feel a little bit unsatisfied because he/she needs to buy more products than expected due to the fact that not all the product characteristics are adjustable as it would be desired and one product is good for a specific use but not so good for a different use. By characteristics it is meant size, capacity, intensity, height, etc. Sometimes the user decides to use a single product for different scenarios even though it does not accomplish properly its functionality in all of them. The exploration of usage scenarios is itself a critical phase for the design of products for multiple scenarios and it is supported by means of user-centred design methods (Carroll, 2004).

From the point of view of the companies, producing products that integrate usage scenarios can lead to a higher customer satisfaction and therefore a competitive advantage. In the last years the responsibility of the companies during the use phase of the product life cycle is increasing (Iriarte et al., 2013), as for instance through the services associated to the product by means of the IPSO/PSS framework (Lindahl and Sundin, 2013). However, the spreading of the PSS in our society and economy is subjected to corporative, regulative and cultural barriers (Ceschin, 2012). Among cultural barriers several researches are analysing the consumers consciousness about a more rational and sustainable use of objects (Catulli, 2012).

The World Business Council for Sustainable Development (WBCSD), estimates that in 2050 the human population will require 2.3 times the present amount of natural resources in order to survive, thus emphasising the need to change the way in which materials are used. Integration of multiple use scenarios in a single product is accordance with sustainability, since a single product that adapts to different uses may avoid to buy additional products. Ecodesign strategies from the ecodesign wheel (Brezet and Van Hemel, 1995), such as integration of functions, a higher durability and reliability of materials or creating an emotional link between the user and the product help to increase the use of products.

A previous study analysed, by means of a survey, the consumer acceptance of products that extend their useful life which reveals that the “ownership-oriented” consumers are susceptible to strategies of prolonged use such as repairing, durable products, etc. For instance, customers agreed in a 90.9% to “preponderantly buy a high quality and durable products which can be a bit more expensive” (Hirschl et al., 2003)

Facing with the fact that in the coming years the number of products designed to be more used will increase, the aim of this communication is to analyse the perception of future designers about the advantages of these products. Designers are also users and customers, so, this analyses would help to know how far the users are ready to value these products during the purchase. Another objective is to analyse if the concern about it changes according to the information and training received.

2 METHODOLOGY

In order to know the opinion of future designers about the need to develop products which integrate several usage scenarios, 13 students from the last course of Bachelor in Industrial Design and Product Development were selected to perform a workshop.

The aim of the workshop was to know if they consider that integrating usage scenarios in product design is interesting and if they think that this approach would be successful. The workshop was organised following the scheme shown in Figure 1.

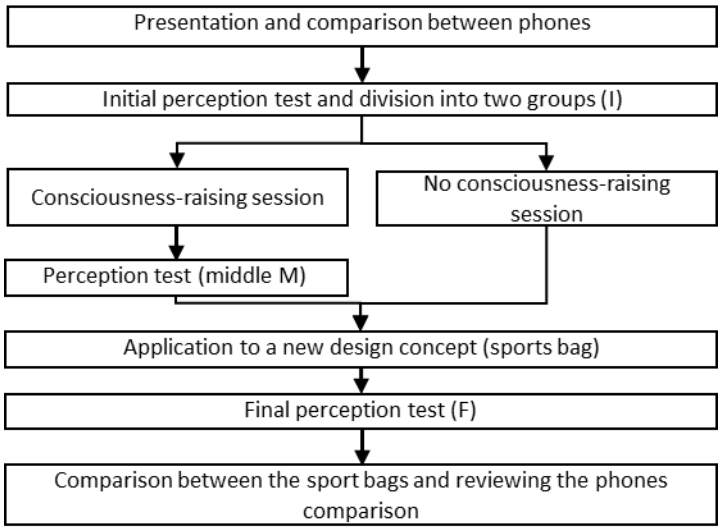
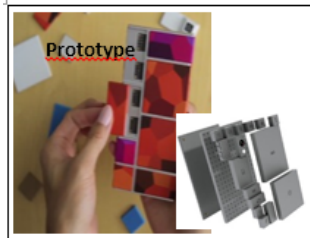


Figure 1. Scheme of the workshop to assess the perception about usage scenario integration in product design

2.1.1 Initial perception about the approach

In this stage the initial perception of the future designers is analized by means of two questionnaires. The first questionnaire asks about the comparison of two products, one designed to adapt to different usage scenarios and the other one which is a conventional design.

The products compared are smartphones, a conventional one and a modular one which can be modified in order to adapt to different needs, such as enlarging the battery, improving the camera quality, etc., keeping the same smartphone. The participants are asked to compare them in terms of aesthetics, customization, usage adaptation, use and durability, lifespan, saving materials, environmental considerations, cost and willingness to buy. They have to answer if he/she perceives that both products are equal for each one of these characteristics or, contrarily, if he/she thinks that one of the two designs is a little bit more, quite more or much more aesthetic, materials saving, durable, etc. (Figure 2).



Much more	Quite more	A little bit more	Equally	A little bit more	Quite more	Much more
			Aesthetics			
O	O	O	O	O	O	O
			Easy to customize			
O	O	O	O	O	O	O
			Adaptable to different uses			
O	O	O	O	O	O	O
			Number of uses/Durability			
O	O	O	O	O	O	O
			Saving of materials during the life cycle			
O	O	O	O	O	O	O
			Environmental friendly			
O	O	O	O	O	O	O
			Perception of a costly product			
O	O	O	O	O	O	O
			Willing to buy			
O	O	O	O	O	O	O

Figure 2. Comparison of conventional and modular smartphones questionnaire

Once the two products are compared an initial perception test (I) is applied, in which they are asked about products designed with a modular or use adaptation approach both as future designers and as users. They are also asked how far they agree with nine sentences about the integrating usage scenarios approach (Figure 3). The amount of time for this stage is 15 minutes, 5 minutes for the comparison of smartphones and 10 minutes for the perception test.

Name: _____

In this moment of the workshop,

As a designer...¿do you think that products designed with a modular or use adaptation approach (as the modular phone) is interesting and even revolutionary?

Mark with an (x) the option that better matches your opinion

No, it will not work	I do not know **?**	**Yes,** it should be promoted

As a user...¿do you think that buying products designed like the modular phone is interesting?

Mark with an (x) the option that better matches your opinion

No, I do not see the advantages	I do not care	**Yes,** I would be very interested. I would like to buy them

Please, mark with an x when you are totally, quite or some agree with each one of the following sentences. If you do not agree, let the row empty

	Some agree	Quite agree	Totally agree
It is better to continue designing products as it is being doing so far			
I like it, but I think this could be non-profitable for companies			
Although I like this idea, I think that products would become more expensive and only a reduced number of users would demand them			
I think that users dislike products that increase their life and prefer to change them			
I think this is a great idea but applicable to specific products like electrical and electronic devices			
If the consumers were conscientious enough, this trend could be successful and make profits. People is being more critical with buying and throwing			
I would like to apply this but, as a designer I would need more training			
As a user, I would need more information about the advantages			
I think this is a great idea, it should be put into practice as much as possible			

Figure 3. Usage Scenario Integration Perception test.

2.1.2 Separation of participants in two groups and consciousness-raising

The answers to the initial perception test are analysed just when finished and four subjects are separated from the group in order to work with two kind of subjects: one group which will participate in a consciousness-raising session (9 subjects) and one group that will not (4 subjects). The four students are randomly selected but considering that both predisposed and non-predisposed people would be part of the two groups.

The group with four students is asked to rest during 35 minutes out of the class-room whereas the group of nine students stays in the same classroom watching a presentation that pretends to become aware about the benefits of designing products that adapt to different usages over their lifetime. This presentation consists of examples of products that are substituted even though if they have been used during less time than expected followed by a promotional video of the modular smartphone shown in figure 2 that can be used for the whole life (Phoneblocks project). Then a short debate takes place with the participants about the advantages and disadvantages of products designed to be used for a longer time or more frequently.

After this, these participants are asked to answer again the perception test, named intermediate test (M), (Figure 3) in order to register their opinion at this stage of the workshop.

2.1.3 Application of usage scenario integration in a product

In this moment the four participants that were separated during the consciousness-raising stage came into the classroom again. All the participants are asked to individually ideate a new concept that adapts to two usage scenarios in order to increase its frequency of use. The design problem was a sports bag with an adjustable capacity to be satisfactorily used in winter and in summer. The usual solution is to use two different bags, a bigger one for winter and a smaller one for summer, which lead the user to spend more money, or to use a big one and use it in both periods, which leads to less functionality and it can be a little bit unsatisfactory for the user.

This problem is selected because it allows the easy generation of ideas in a short period of time. So, the design problem is presented, and a template is delivered to them which showed a small and a large sports bags. They are required to generate a new bag with adjustable capacity, spending the lowest amount of material. To do this, they were provided with a laptop with internet connection for searching information during the ideation phase and paper sheets and pencils to support the ideation of a new bag. The final result was represented in the template with as many sketches as necessary and textual descriptions. They were also asked to indicate the most useful internet sources employed to inspire the new solution. Figure 4 shows an example of one of the solutions.

Once the new concept is defined they are asked to calculate a rough estimation of the bag capacity and the amount of material that it needs in order to estimate the saving of material dividing the total

amount of material of two bags (a smaller an a bigger one) by the amount of material of their own concept. The available time to perform this stage was of 50 minutes.

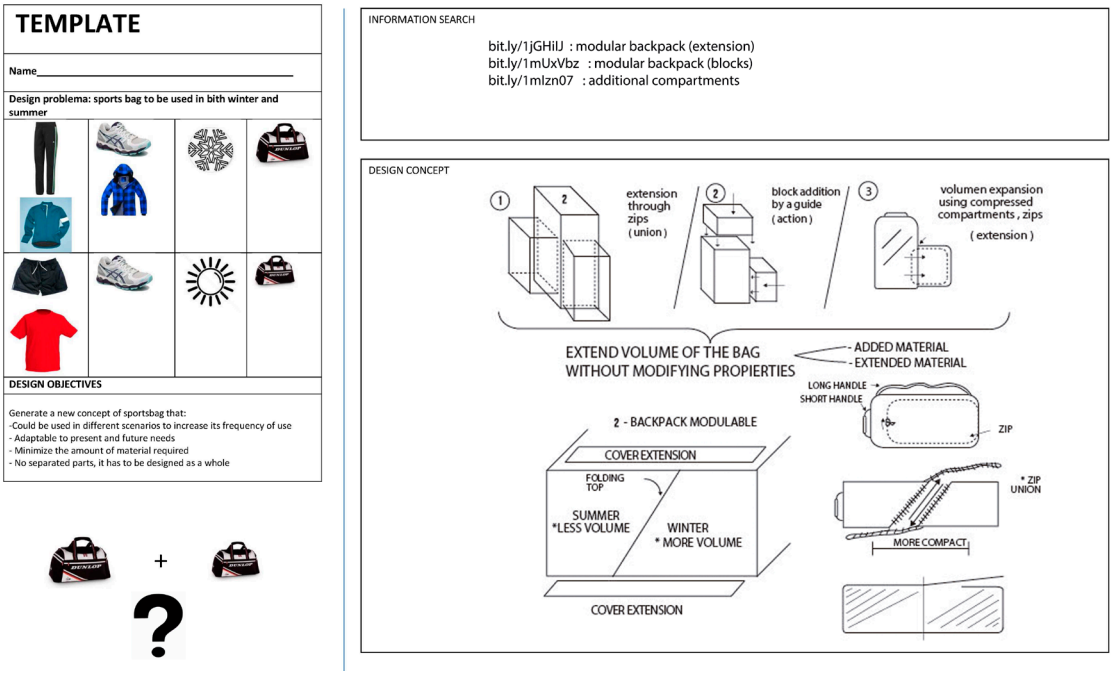


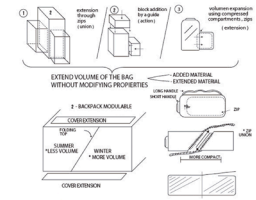
Figure 4. Template for the ideation of a new sports bag and example from one.

Finally they are asked to fill in a final perception test (F) (Figure 3) in order to register their opinion at this stage of the workshop, once they have experience the generation of a simple product that adapts to different usage scenarios.

2.1.4 Analysis and evaluation of the new concept generated

So far, the participants have already done the workshop and have generated a new concept which can save wasting raw materials. The last stage takes place two days after the workshop and it consists of reviewing the answers of the questionnaire which compared the two smartphones in order to check if their opinions keeps the same or it has changed in some way. At this moment they also answer a questionnaire which compares two sports bags with the one that they have generated about aesthetics, adaptability to different needs, durability or usage of materials among others (Figure 5).

PRODUCT A



PRODUCT B: designed concept

Much more	Quite more	A little bit more	Equally	A little bit more	Quite more	Much more
			Aesthetics			
O	O	O	O	O	O	O
			Comfortability			
O	O	O	O	O	O	O
			Adaptable to different needs			
O	O	O	O	O	O	O
			Frequency of use			
O	O	O	O	O	O	O
			Durability (years)			
O	O	O	O	O	O	O
			Use of materials			
O	O	O	O	O	O	O
			Perception of a costly product			
O	O	O	O	O	O	O
			Willing to buy			
O	O	O	O	O	O	O

Figure 5. Comparison of two sport bags with the one generated during the workshop.

3 RESULTS AND DISCUSION

3.1.1 Perception about the advantages of a modular phone

The results obtained from the questionnaire depicted in Figure 2 show that the modular smartphone is better evaluated for its customization, adaptability to different uses, time to be used, saving of materials, environment and willing to buy it. So, the respondents have understood the advantages of this phone in comparison to traditional ones.

Aesthetics and perception of a costly product have been better evaluated for the traditional smartphone. This could be expected for aesthetics, since the modular phone was a prototype at the moment that this experience was done. The fact that the future designers perceived the modular phone as more costly makes us think that they saw it as a very technological complex product and they associate this to a higher price in comparison to a traditional phone.

3.1.2 Perception about integrating usage scenarios during the workshop

Figure 6 shows the results of the two first questions asked in the questionnaire depicted in Figure 3, that it is "As a designer do you think that designing products that adapt to several uses (as in the modular smartphone) is interesting and even revolutionary when compared to how many devices are designed now?", and "What do you think as a user?" The graphic shows the answers obtained at the beginning (I), in the middle of the workshop, after the consciousness-raising session (M) and at the end, when they have practised with a new sports bag concept (F).

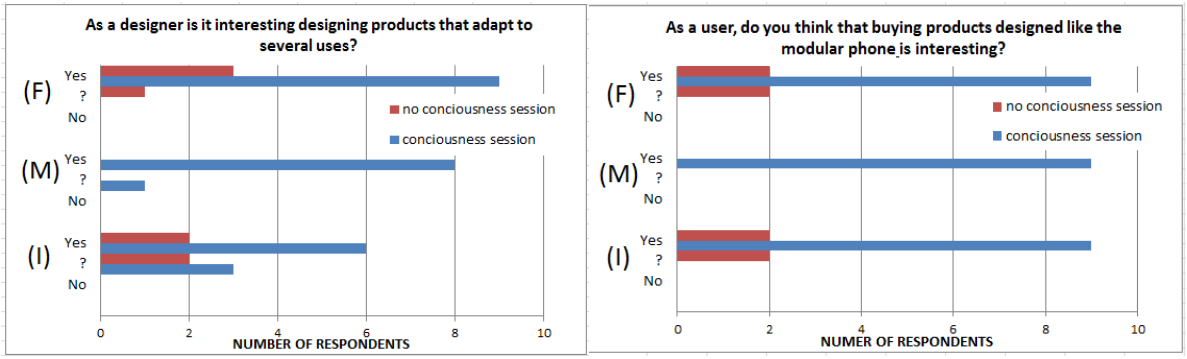


Figure 6. Evolution of the perception about products with a larger usage as both designers and users in the initial (I), middle (M) and Final (F) stages.

The results show that the perception as designers is mainly that designing products that adapt to different usage scenarios should be encouraged. The amount of indecisive people decrease during the workshop, thus increasing the number of positive opinions. Everyone who participated in the consciousness-raising session agree with designing products for multiple scenarios at the end of the workshop, whereas among those who did not there is still one sceptical person at the end of the workshop.

When adopting the role of users, eleven students stated that this kind of products should be promoted and only two of them, both belonging to the group that did not received the consciousness information have doubts. The perception as users keeps the same from the beginning to the end of the workshop.

Figure 7 shows the results about how much those who participated in the conscious-raising session agree with the sentences included in the test depicted in Figure 2 distributing their answers in four levels: total agreement, quite agree with, some agree and disagree. Besides, Figure 7 shows the evolution of the answers from the beginning (I, initial), through the middle of the workshop just after the consciousness session (M, middle) to the moment when they have applied the integration of scenarios to a conceptual design (F, final), thus allowing to analyse if the perception of the future designers changes. Questions from number 1 to number 5 present critical arguments against the success of integrating different scenarios in product design and therefore, as bigger the percentage of answers that disagree with them, the most propitious the perception is. Contrarily, questions 6, 7, 8 and 9 bring positive arguments for this approach so, the higher the number of answers that agree with these, the higher the support is.

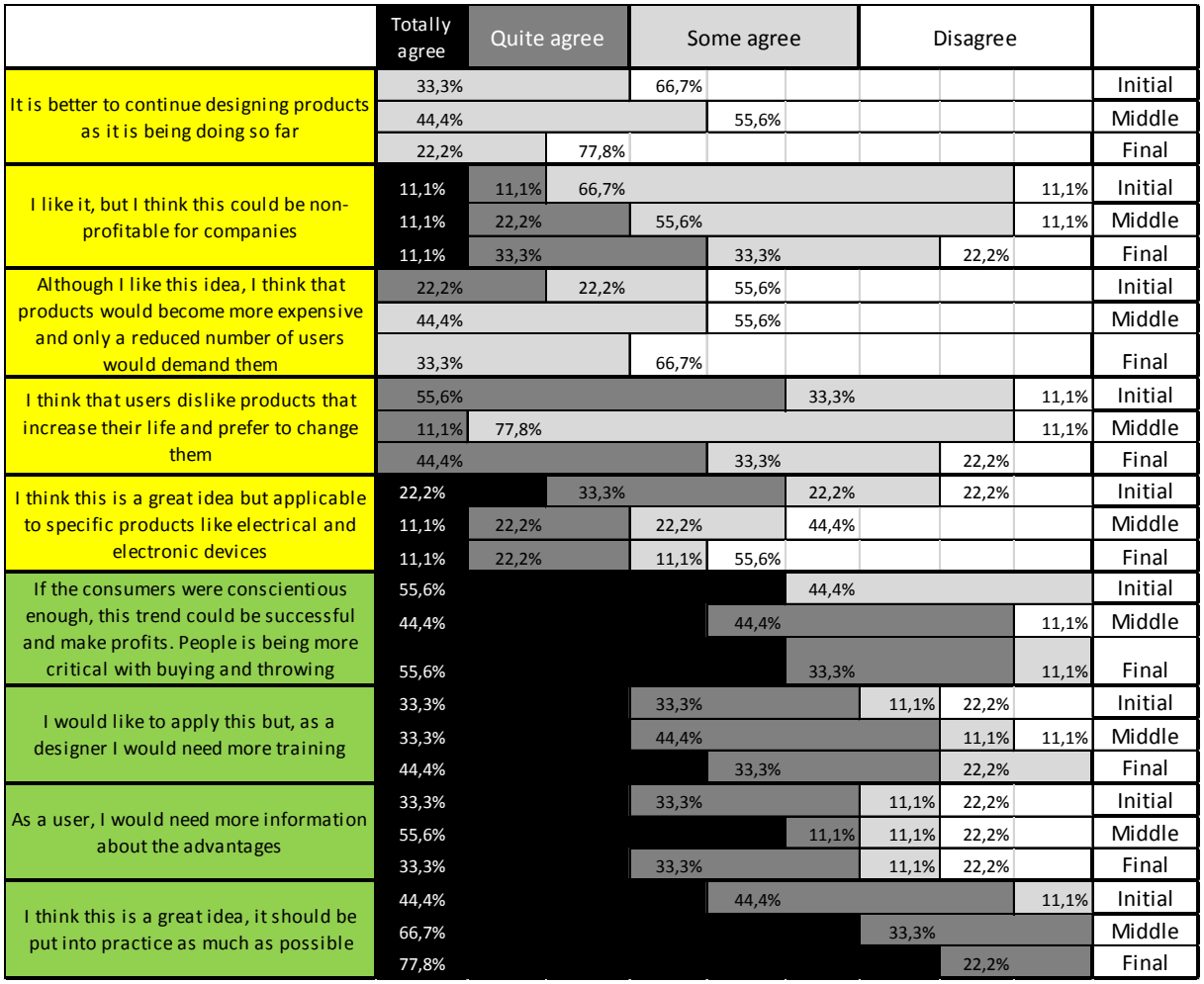


Figure 7. Evolution of the perception of the group that participated in consciousness session about the scenario integration in product design.

The results obtained from Figure 7 show that:

1. Most of the respondents do not agree that it is better to continue designing as it is been doing so far. At the beginning, one in every three respondent show some agree with designing devices in the same way, this is, without adapting the devices to future changes. At the end of the workshop this number has decreased to two respondents, however, after the consciousness session it has punctually raised to four. So, it can be deduced that the workshop has slightly helped to change their perception, although the consciousness has not had a positive influence in this question.
2. Most of them agree (totally, quite or in some level) that this approach could be non-profitable for the companies (66%), leading them to earn less money. Only one person disagree with this, number that turns into two persons at the end of this experience. There is one respondent that agree with this and does not change his/her opinion during the experience. It is also remarkable that the number of respondents that feel quite agree with this sentence changes from one to three at the end, so at the end the distribution of responses is more differentiated, obtaining a higher percentage of people that are quite agree and more people that disagree than at the beginning.
3. Most of the people disagree with the idea that products designed to be used in more scenarios would be more expensive (66%). This amount has increased slightly since the beginning, whereas two respondents who felt quite agree have changed to just some agreement. So, from the point of view of the cost supported by the user, the future designers think that this would not be a handicap in products that integrate different user scenarios. Probably the reason to think like this is that they realised that considering the whole life cycle users would need to buy less frequently with this type pf products.
4. It is also relevant that all of them except one (89%) think that users dislike to use the same product for a large period of time and would prefer to substitute it (33% some or 55% quite agree). Only one more student changes and disagree once the experience finishes. Curiously once

they have watched at the presentation about the advantages of the modular phone and after a debate, some of the participants who mark quite agree at the beginning have changed to just some agree. However, once they have applied this approach to the design of a sports bag three of them changed again their opinion and felt quite agree. Although this result could be different depending on the type of product analysed, it reveals that, in the respondents' opinions, for customers it is important to buy new devices that substitute the old ones. If their perception matches with the reality it could be important to give information and educate people about the environmental benefits of reducing the buying and throwing behaviour. Therefore, companies that design products which can be used for a longer period of time or more frequently, could take this results into account, for instance, by creating new emotional links between the user and the product.

5. The 55% think that this is a good idea that could be applied extensively to many products. This percentage has increased during the workshop, since the beginning, with only a 22%, to the end. So, the information provided and the conceptual design of a new sports bag has helped to open their minds. However, there is still a high proportion of opinions that agree that this approach is suitable just for certain products such as electronic an electrical devices.
6. Almost all of them (55% and 33% totally and quite agree respectively) think that if a good conscious-raising is done, designing products that adapt to different uses would success and produce benefits to the companies. This opinion has improved a little bit since the beginning, but in overall it is very similar in the three stages of the workshop.
7. An 89% of the future designers totally or quite agree that they would like to apply this approach, but more training about this would be needed. This percentage has increased during the experience and it is remarkable that two persons that initially disagree with this have finally change to some agree. Therefore, a guided training would help the designers to consider this approach when designing.
8. As users, they also would like to have more information about the advantages of this type of products. Only two persons think that they do not need more information about this products. So, if companies want to emphasize the advantages for the user it would be interesting to plan and design strategies to reach an effective communication that might change the user's behaviour. Strategies like product labels or user experience based communication tools, among others could be useful for this.
9. Finally, the number of participants that agree that this approach comes to be a great idea that should be put in practice as much as possible grows from a 44% to a 78% since the beginning to the end of the workshop. The remaining 22% quite agree with this. So, from the point of view of the future designers this approach is a good idea, and the workshop experience has helped them to increase a favourable opinion.

The same results have been analysed for the four persons that did not participated in the consciousness-raising session (Figure 8):

1. All of them think that products have to be designed in a different way.
2. They think that this approach is non-profitable for the companies.
3. Most of them (75%) do not think that products would be more expensive applying this design approach.
4. Again, as in the results depicted in Figure 7, they think that users prefer to change old products for new ones.
5. They think that this products could only be interesting for specific types of products, and this opinion is reinforced at the end of the experience.
6. Their trust about promoting a consciousness strategy to make these products more successful is lower than in the group of students who participated in the consciousness phase. In addition, this trust gets weaker at the end of this experience, so they think that people's behaviour about using and throwing would not necessarily change by means of a consciousness.

	Totally agree	Quite agree	Some agree	Disagree	
It is better to continue designing products as it is being doing so far	100%				Initial
	100%				Final
I like it, but I think this could be non-profitable for companies	25%	25%	50%		Initial
	25%	25%	25%	25%	Final
Although I like this idea, I think that products would become more expensive and only a reduced number of users would demand them	25%	75%			Initial
	25%	75%			Final
I think that users dislike products that increase their life and prefer to change them	25%	50%		25%	Initial
	50%		25%	25%	Final
I think this is a great idea but applicable to specific products like electrical and electronic devices	25%	50%		25%	Initial
	50%		25%	25%	Final
If the consumers were conscientious enough, this trend could be successful and make profits. People is being more critical with buying and throwing	25%	50%		25%	Initial
	25%	50%		25%	Final
I would like to apply this but, as a designer I would need more training	50%		25%	25%	Initial
	25%	75%			Final
As a user, I would need more information about the advantages	50%		25%	25%	Initial
	25%	75%			Final
I think this is a great idea, it should be put into practice as much as possible	25%	50%		25%	Initial
	25%	25%	25%	25%	Final

Figure 8. Evolution of the perception of the group that did not attend to the consciousness session about the scenario integration in product design.

7. As in the other group, they totally or quite agree that they would like to apply this approach but more training would be needed.
8. The results are very similar when they are asked about the need to provide more information for the users.
9. Finally, they are less convinced about applying this approach in practice in comparison to the group who assisted to the conscious-raising session.

In overall, it has been observed that the integration of use scenarios in product design has a favourable support and the future designers are able to think about it more extensively. They agree that these products could success and they do not think that they would necessarily be more expensive. They also think that more training for designers and conscious strategies for the users would help to extend it.

However, a small fraction of the future designers think that this would not be profitable for the companies and that this can be applied to just specific type of products.

It has also been observed that the conscious-raising session has led to a higher support to this approach than when no consciousness has been done. Although a larger number of participants would be needed in order to deduce a significant conclusion, it seems that providing the appropriate information to designers makes them feel more aware and sensitive about designing products that can adapt to different uses. And probably, this could also happen when the users.

3.1.3 Perception about the concept designed

The results obtained from the questionnaire that compares the new concept of sports bag with two conventional ones (Figure 6) show that the adaptability to different needs is, as it could be expected, the characteristic which is better evaluated in the new concepts, followed by the comfortability, frequency of use, use of materials and willing to buy. This experience has helped to make them more aware about the potential of integrating several use scenarios in a single product.

The cost is perceived in a similar way in both the new concept and the two sports bags, which could be due to the fact that they value the new concept as more complex. Durability and aesthetics are perceived worse in the new concept, which may be explained as the fact that each one of the conventional bags would be used less frequently and so, the new concept will worn down before.

Since the design problem was to generate a sports bag with adjustable capacity, aesthetics has not been taken into account very much and this is why this characteristic has a low perception.
Finally, when the participants are asked to review the comparison test of the two smartphones (Figure 2) it is observed that the changes are very few and most of them have improved the perception about the modular one, although a few number have changed to a more negative opinion.

4 CONCLUSIONS

This study shows the perception of future designers about integration of use scenarios in product design by means of a workshop in which a smartphone is compared with a modular mobile phone, a new sports bag that adapts to be used in winter and summer is conceptualised and a questionnaire is asked in different phases of the experience developed in this research. The conclusions obtained are:

- It seems that when exposed to a consciousness session about the advantages to the user and to the environment of this approach, the future designers get more convinced about it.
- They think that a suitable training for designers would be needed.
- They perceive that users like to substitute old products for new ones and consequently a product that could be used for a long time will dislike them.
- At the end of the experience the opinion about applying this approach to different types of products against to just electronic and electric devices has increased from a 22% to a 55%.
- According to the perception of the future designers, the companies would reduce their benefits, but this perception has weakened at the end of the experience.
- The experience has been pleasant for them and they have been able to apply it to the design of a new concept for different use scenarios.
- They perceive that products that adapt to different scenarios are better in terms of frequency of use, use and saving of materials and adaptability.

Even though the population analysed in is study is small and therefore the results cannot be extrapolated, it seems to happen that providing appropriate information about this design approach may open their minds and make them start thinking about products that can be used more frequently. Considering the additional benefits of this strategy from the point of view of sustainability, it would be interesting to encourage designers and companies about this type of products.

ACKNOWLEDGEMENTS

This research has been possible thanks to the project P1·1A2013-04, “Interconexions between current design and art”, from the DACTIC research group at the Universitat Jaume I.

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