

Surveying the Perception of the Environmental Advantages of an Adaptable Product

Investigando la percepción de las ventajas medioambientales de un producto adaptable

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ABSTRACT

The aim of adaptable design is to create products that can easily adapt to different needs. The objective of this study is to analyze the effectiveness in communication to promote an adaptable baby stroller, in order to know the user perception of the advantages derived from its adaptability, as well as the environmental ones, and if there is correlation between them. It is also intended to determine whether age or previous experience with this type of product can influence this perception. To this effect, a study with 54 participants has been conducted. Results show that users perceive the advantages and find the adaptable design interesting. Valuation of the advantages of the product is affected by previous user experience with the need for adaptability. Valuation of the environmental benefits is independent from the degree of experience, as well as from the age of the participants (between 30 and 45 years old).

Keywords: survey research, product lifetime, sustainable consumption, adaptable designs

RESUMEN

El diseño adaptable tiene como objetivo crear productos que puedan adaptarse fácilmente a diferentes necesidades. El objetivo de este estudio es analizar la efectividad en la comunicación realizada para promover un cochecito de bebé adaptable, en aras de conocer la percepción que tienen los usuarios tanto de las ventajas derivadas de su adaptabilidad como de las medioambientales y si existe una correlación entre ambas. También se pretende determinar si la edad o experiencia previa con este tipo de productos influyen en esta percepción. Para ello, se ha realizado un estudio con 54 participantes. Los resultados muestran que los usuarios perciben las ventajas y consideran interesante el diseño adaptable. La estimación de las ventajas del producto se ve afectada por la experiencia previa del usuario con la necesidad de adaptabilidad. La estimación de los beneficios ambientales es independiente tanto del grado de experiencia como de la edad de los participantes (entre 30 y 45 años).

Palabras clave: investigación mediante encuestas, tiempo de vida de los productos, consumo sostenible, diseños adaptables

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Introduction

Advances in technology, as well as the changing needs of the user, drive the design of new products. If these products offer more affordances, the user is quite likely to replace the old ones, even though they can still be used. Literature identifies four general product replacement motives: wear and tear; improved utility, which means improper functionality combined with the desire for an improvement in safety or economy of use; improved expression, which means improper functionality combined with the desire for an improvement regarding comfort of use or quality or design; and new desires (Van Nes and Cramer, 2006).

Products are often discarded “not because they are worn out, but because people are tired of them” (Cooper, 2005, p. 57).

Previous studies, based on interviews held with users and empathy map analyses, concluded that product replacement could be due to: (1) changes in the number or size of

users; (2) changes in users’ capabilities; (3) updates, repairs and technological changes; (4) the physical environment (Royo, 2016).

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Sometimes products are replaced because they are not designed to adapt to changing needs, which can be considered a particular case of improper functionality (Van Nes and Cramer, 2006). This implies that a product needs to be updated or modified to adapt to change (Pialot, Millet, and Bisiaux, 2017). In some market segments, it is usual to see adaptable products for the user's changing needs, such as the design of convertible and evolving furniture, which is essentially aimed at children. As they grow, the furniture is designed to grow with them. Initiatives have also appeared that concern the design of technological products that update and adapt themselves to meet the changing needs that arise over time. For instance, projects such as ARA and Phoneblocks aim to create modular smartphones that can be used for a whole lifetime.

Avoiding product replacement due to wear and tear is also addressed by modular design for reparability, which has recently been applied in smartphone design, like the in case of Fairphone 2, a telephone made up of different modules that can gradually be replaced, thereby extending the useful lifespan of the phone. As a next step, an expert survey on Fairphone 2 sustainability concludes that the modular design approach should be extended from reparability to upgradeability in the next version (Proske et al., 2016)

A goal of adaptable design is creating products that can be easily adapted for different requirements (Gu, Hashemian, and Nee, 2004). The benefits of adaptable design are primarily related to economic and environmental aspects. The user can adapt an existing product, rather than buy a new one, to achieve the new functional requirements. Compared with remanufacturing and recycling, an adaptable product can further extend its lifespan and reduce environmental waste (Gu, Xue, and Nee, 2009). Designers have several different methods available to them for designing adaptable products, with product architectures that provide robust support for adapting products to meet changes in functional and environmental requirements, as well as advances in technology (Levandowski, Jiao, and Johannesson, 2015; Luo, 2015; Zhang, Xue, and Gu, 2015). Since these products are prepared to adapt, they can more easily tip the balance towards longer use instead of replacement. Every time this happens, the service time increases. Hence, although they might be more expensive, a potential saving can be made in terms of the money that would be needed to replace the product with a new one.

Material production requires a large amount of energy, which is a significant source of greenhouse gas emissions and produces large volumes of waste, both in production and at end-of-life disposal. A more efficient use of materials could play a key role in achieving multiple environmental and economic benefits (Worrell, Allwood, and Gutowski, 2016). For domestic equipment, life extension may be an effective way to deliver material efficiency, depending on the rate of energy efficiency improvement for, e.g., refrigerators (Bakker, Wang, Huisman, and den Hollander, 2014) and washing machines (O'Connell, Hickey, and Fitzpatrick, 2013). In the case of refrigerators and laptops bought in 2011, the lifespan is the factor that most influences the environmental impact

and therefore further efforts must be made to design for a product life extension (Bakker et al., 2014).

Material efficiency means providing material services with less material production and processing. The four major strategies for this are: longer-lasting products, modularization and remanufacturing, component reuse, and designing products with less material (Allwood, Ashby, Gutowski, and Worrell, 2011). Thus, designing with a view to prolonging the service life of materials is one of the ways to achieve greater efficiency in their use.

The huge amounts of recyclable or reusable materials that are currently being thrown away (Pérez-Belis, Bovea, and Simó, 2015) is another of the issues to be improved, since the high costs and the difficulties involved in recycling could prove to be insurmountable obstacles for many countries in the future (WBCSD 1995, 2000). The depletion of the planet's natural resources and the cost of recycling make adaptable designs coherent with new paradigms in production and consumption that tend to decouple economic value from material and energy consumption (Ceschin, 2013). According to the European Parliament, a longer lifetime for products will have positive social and economic effects (Montalvo, Peck, and Rietveld, 2016). The circular economy paradigm also endorses the need for a shift in the use of raw materials and resources. The report published by McKinsey highlights the need for a change in economic activity in product areas, by producing circular designs (Dobbs, Oppenheim, Thompson, Brinkman, and Zornes, 2017).

A study of seven nations found that using resources for the longest time possible could cut greenhouse gas emissions by up to 70% and grow workforce by about 4% (Wijkman and Skanberg, 2015). According to Stahel (2016), there are two groups of circular economy business models: those that foster reuse and extension of the service life; and those that turn old goods and waste into new and valuable resources. Shifting to a circular economy requires action on several fronts, concerning everyone from policymakers to the final user. Communication and information strategies are needed to raise the awareness of the public about their responsibility for products throughout their service lives (Stahel, 2016).

Design for sustainable behavior (DfSB) aims to influence people's everyday activities through design, increasing attention in the use phase of products and the way people behave and interact with them. Several strategies and interventions have been reported on DfSB (Boks, Lilley, and Pettersen, 2017).

A previous study was conducted with 13 senior-year industrial design students on products that prolong their useful lifespan by adapting to future needs. Firstly, the students saw pictures of a modular smart phone adaptable to last for a whole lifetime. Then, they answered a Likert scale questionnaire about the advantages they perceived in comparison to a smart phone without these characteristics. After this, 9 out of 13 students were exposed to an awareness session in which a promotional video about the global advantages of the modular smartphone was projected (<https://www.youtube.com/watch?v=Mo1sNm8c2cw>),

followed by a short debate. The results show that when exposed to such a session about the advantages to the user and to the environment of this type of product, the future designers get more convinced about it. These products are perceived as better in terms of frequency of use, material use and savings, and adaptability. Even though the population analyzed in this 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 more frequently usable products with a longer service life (Royo, Mulet, Galán, Felip, and García-García, 2015).

But, how important is lifespan and product adaptability for the user? Users (design vision) or consumers (market vision) concerned about sustainability consider different criteria. A study with 81 green consumers on purchases of technology products indicates that incentives and single-issue labels would help consumers identify sustainable properties (Young, Hwang, McDonald, and Oates, 2010). Research has also been carried out to determine what environmental criteria users take into account when choosing a product, with varying results depending on the type of product. For instance, the EU Energy Label has a significant impact on the purchase of white goods in the UK, but energy efficiency is not so relevant in the purchase of small electrical appliances (McDonald, Oates, Thyne, Alevizou, and McMorland, 2009).

There is literature about the connection between product longevity and sustainable design, consumption, and production (Appadurai, 1988; Cooper, 2010). Material issues, such as costly maintenance, and social aspects, such as increased financial capital, act as barriers to extending lifetime, as has been studied in the case of furniture (Hebrok, 2014). A study about how the consumer influences product lifespans in everyday footwear, large kitchen appliances, and upholstered chairs acknowledged that consumers are uninterested in product lifespans during the acquisition phase and that few of them exhibit highly optimizing behavior toward them. This behavior is related to personal and social characteristics, such as routines and cultural expectations (e.g. rejection of consumerism) (Crilly, 2011). Research about the influence of lifespan labelling has also been considered, which led to find, in a study with nine categories of products, that it is indeed effective. Besides, this effect is higher in young consumers: the younger people are, the more they show a preference for products with longer lifespans (EESC, 2016).

According to Evans and Cooper (2016), attempts to increase the lifespan of household goods will be ineffectual if consumers are not making full use of the utility provided by them. Recent studies reveal how some products influence a behavioral change (Crilly, 2011), promote pro-environmental behavior, and enhance the user's awareness (Laschke, Diefenbach, and Hassenzahl, 2015; Sohn and Nam, 2015). For instance, interaction with products that evoke emotions can motivate users to pursue long-term goals despite immediate satisfactions and needs (Mugge, Schoormans, and Schifferstein, 2005; Ozkaramanli and Desmet, 2012).

Cox, Griffith, Giorgi, and King (2013) conclude that it is unlikely for consumer attitudes towards product lifetimes to change on their own. Instead, the market has to change to influence consumption decisions. According to Perella (2015), triggering a different behavior in customers changing perceptions is needed. Thus, it is necessary to identify user factors and apply appropriate communication strategies, one of which is storytelling (Chamberlin and Books, 2018). In a recent study, persuasive communication techniques proved to have a positive impact on retailer behavior to purchase remanufactured refrigerated cabinets for groceries (Muranko, Andrews, Chaer, and Newton, 2019).

These studies highlight the complexity involved in getting users to bear in mind all environmental aspects when choosing products. In the case of products that adapt their functionality to users' changing needs, it can be even more difficult for them to evaluate the advantages of adaptability. In this regard, previous experience with the product can be expected to result in a higher appraisal of the advantages that adaptable designs offer the user, although no data have been found to support this.

Despite the advantages for the environment and for users, who can spare themselves the purchase of new products in the medium and long term, there is no evidence for the extent to which users rate these benefits. There is no evidence either on whether previous experience has any influence on how adaptable products are valued. Gaining knowledge about this would help to define new design and communication strategies. No studies have been found that analyze the effect of communication on the perception of adaptable products. Hence the aim of this study.

This objective is divided into a set of particular objectives: first, to analyze the effectiveness of the communication of an adaptable baby stroller. Secondly, to state whether users value both the advantages derived from the adaptability of design and its potential environmental advantages. Then, to analyze whether a higher valuation of the advantages for the user also implies a higher valuation of the environmental advantages, that is, if they are related. Another aim is to determine whether the valuation of the advantages of adaptable designs depends on the age or previous experience of the need that is covered by the product's capacity to adapt one or some of its functions over time.

Materials and Methods

To achieve the aims of this research, a survey with a focus on an adaptable design was conducted. The product was chosen in such a way as to make it possible to identify the users who have not had the need to adapt the product and those who have.

For this research study, attention was focused on the childcare sector, and more especially on baby buggies, or strollers. There is a wide range of products to choose from, with large variations in prices. It has been observed that families that have two children in quick succession find it difficult to walk

them at the same time. They cannot use the stroller they bought for their first child to carry both of them.

Although there are models on the market that can be adapted from one to two children, many parents did not consider this when their first child was born. Thus, when the second child comes along, and they find themselves with the need, the most common way to solve the problem is to buy a twin, or double stroller, or to have two individual ones, which requires the presence of two adults to push them. There is also an auxiliary support, a platform that can be attached to the rear of the stroller for the older child to stand on. However, this child cannot sit down. Therefore, a better solution would be to have an individual stroller that can be transformed into a double one. An interview with a stroller manufacturing company confirmed that customers who previously bought an individual stroller were calling for a device to adapt the stroller to carry two babies or toddlers together. However, parents do not usually consider this need when they have their first child, although there are several models on the market that offer this solution (Royo, 2016).

To conduct the study, a new concept has been devised to adapt an individual stroller into one that can be used for two children. The intention of this concept is to avoid the need to buy a twin stroller and to solve the new need while using the initial stroller. With the strollers available in the market, users need to anticipate that they will need a stroller designed to adapt to this kind of situation. With the concept presented in the research, users just buy a single stroller and, if later on they need to carry two kids on, they will just have to buy a coupling to attach a second child seat.

To demonstrate the advantages of the adaptable product, original material was developed consisting in the use of storytelling to narrate a solution that allows for the adaptation of a stroller purchased in the past. This material seeks to describe in detail how the product adapts to the changing needs that arise as time goes by. In this way, users of a non-adaptable version of the product will have audiovisual information about the advantages of the adaptable design. In the video (<https://vimeo.com/129596346>), they can also see the environmental benefits the adaptable design has to offer, in terms of total use time of the product and the kilograms of material that could be saved per year. Figure 1 shows the script of the video developed for the study.

Participants and sample size

The sample size was calculated by applying the Bartlett equation (equation 1) (Bartlett, Kotrlík and Higgins, 2001), where n is the size of the sample and t is the value of the normal distribution for a certain level of confidence, which in this case was taken as being 85% ($t = 1,44$). p is the proportion that is expected to be found and, when this is unknown, the recommendation is to take a value $p = 0,5$; that is to say, 50%. Lastly, d is the margin of error the researcher is willing to accept, which in this case will be 10% (0,1). On substituting the values in the equation (1), a minimum sample size of 52 is obtained.

$$n = ((t)2 * (p)(1 - p))/(d)2, \tag{1}$$

Hi, everyone! I'd like to tell you the story of Pablo.	His parents, Carlos and Paula, have been planning for his arrival for some time now, and they are very excited because he's going to be born soon.	Among the different arrangements to be made, there is the choice of stroller; something that is not always easy, as there seem to be too many aspects to be taken into account.
But they end up deciding on a very versatile model.	At last the big day comes – look at how comfortable Pablo is in his stroller! It looks as though they made the right choice.	Some time later... everything changes again... Pablo's little brother, Alex, is going to join the family.
Thanks to the stroller they chose, all they have to do is buy a coupling mechanism so that it can carry both children at the same time.	That is how Carlos and Paula avoided the need to buy a second individual stroller or one for twins.	Pablo has now grown and prefers to walk, so his parents put the coupling mechanism away and use the stroller as an individual one again with Alex.
In sum, they didn't need to buy any more strollers, so they have spent less money and, moreover, the storage room isn't so full. Furthermore, because a single stroller meets different needs, better use is made of the planet's resources, with the ensuing savings in raw materials.	If we count up all the children that are born not long after their brothers and sisters, by using a convertible stroller, it would be possible to save up to 250 tonnes of strollers a year in our country alone! (*)	Hence, if we prolong the use of the products we have, we are looking after ourselves and the environment.

(*) Data estimated taking into account the average number of children born before their elder brother or sister is two years old

Figure 1. Storyboard to show the advantages of a convertible stroller. **Source:** Authors

Participants were recruited by posting announcements about the study at five local kindergartens in the area around the experiment lab in Castellón de la Plana, Spain. In the posters parents with one single child under 18 months or less of age (type 1, non-experienced users) and parents with two children born within 24 months of each other (type 2, experienced users) were summoned to participate in a research study. Parents of twins were not recruited since their need to carry two kids is not varying in nature and is met from the beginning. The posters included mobile phone and email addresses to contact the researchers. During the first contact, the researcher confirmed if the participant fulfilled the requirements and arranged a appointment to perform the study. When the number of one of the user categories (type 1 and type 2) exceeded half of the sample size, they were told that they would be put in a waitlist. 54 parents, 37 mothers and 17 fathers, took part in the experiment to get a stroller bag in return. Due to last moment contingencies, some participants did not attend the study and people from the waitlist were required. Therefore, 28 participants from the 54 were type one users, whereas 26 belonged to type 2.

Questionnaire about perception of the adaptable stroller

Each of the 54 participants watched the animated video about an adaptable stroller, the storyboard of which can be seen in Figure 1. After that, they were asked to answer a questionnaire consisting of basic questions about previously owned strollers, followed by questions to evaluate the advantages to be gained from the adaptable design as well as the environmental advantages, which can be seen in Table 1.

Table 1. Survey questions about the advantages for the user and for the environment

Question	Answer options
Do you think you would have used it for longer than the stroller you had?	Yes/No/I do not know
Do you think you would have spared yourself the purchase of a stroller?	Yes/No/I do not know
How interested are you in its advantages?	Very interested/Interested/Indifferent/No advantages
How much do you think this kind of design would help the environment?	
Less waste would be generated?	A lot /quite a lot /a little or not at all
Recycling expenses would be saved (social cost)?	A lot /quite a lot /a little or not at all
Reduction in consumption of raw materials?	A lot /quite a lot /a little or not at all

Source: Author

Finally, a personal open interview was carried out to delve deeper into their needs and opinions. The 54 participants were able to opine openly on the acquired strollers and their experiences with their purchase and use. The average duration of the interviews was about 10 minutes. They were conducted by one researcher with one user individually or two users at the same time. After few days, users were contacted by phone in order to inquire whether they had changed any of their previous opinions related to the video or the acquisition of these products.

Results

Once the experiment had finished, the answers and data obtained were analyzed. Most of the users with two children were between 35 and 39 years of age (62%), whereas users with one child were between 30 and 39 years old (37% between 30 and 34, and 37% between 35 and 39). Concerning the total number of strollers acquired, it is remarkable that 17 of the participant families have bought two and 10 have acquired three or more strollers. The most usual price for the first stroller was between 600 and 1000. It was also observed that the use of a second-hand stroller was not common, but was increasing, since a greater number of the younger participants (those with one child under 18 months) than users with two children chose to use second-hand (30% versus 15%, respectively). The users usually stored the strollers away when they did not need them (57%) and 24% lent them to friends and relatives. 8% of the surveyed have sold it, and 11% have thrown it away. None of them knew about convertible strollers for carrying one or two children.

Evaluation of the advantages of adaptable design

Regarding the advantages of using an adaptable stroller, analysis of the answers shows that 69% of the surveyed think they would have used this kind of stroller for a longer

time, while 61% think they would have spared themselves the need to purchase another one. Very few of them think they would not have used it longer (7%) or that they would have avoided the need to buy a stroller (9%). When asked if they were interested in this kind of stroller, two out of three were interested (69%) and one out of four was very interested (26%).

With regard to their answers to the questions about how they perceive adaptable products could help the environment, Figure 2 shows that most of the participants think they would make an important contribution to generating less waste (72%) and to consuming fewer raw materials (65%). Half of them think that it would make quite an important contribution to reducing recycling costs (49%). Therefore, participants clearly perceive the advantages for the environment.

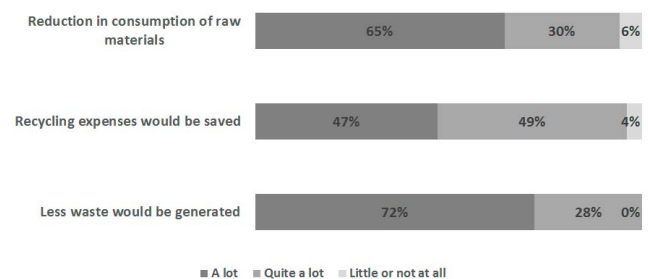


Figure 2. Participant's opinion about how they perceive adaptable products could help the environment.

Source: Authors

Analysis of the relationship between product and environmental advantages

The next step was to determine the relationship between the advantages that the user perceives for the product and those perceived for the environment. This was analyzed based on the frequency of each answer and applying the Chi2 test and calculating Cramer's V coefficient. The Chi2 test was calculated for a significance level *p* of 0,05, whereas Cramer's V coefficient ranges between a value of zero, which indicates independence, and 1, which indicates a perfect relationship between the two factors. Values above 0,30 normally indicate that there is a possible relationship between the variables.

Table 2 shows the cross-tabulated answers concerning whether they perceive the product advantages and the valuation of each of the three environmental advantages in the questionnaire. One of the participants did not answer the last two questions (Save cost of recycling and use less raw materials). In this table, the number of answers for these questions is 53.

Table 2. Cross table of the perception of product and environmental advantages

Use longer	Throw away less rubbish				Save cost of recycling				Use less raw materials			
	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total
No	1	4	0	5	1	4	0	5	0	5	5	5
Don't know	4	12	0	16	10	5	1	16	4	12	0	16
Yes	11	19	3	33	15	16	1	32	11	21	0	32
Total	16	35	3	54	26	25	2	53	15	38	0	53
Save purchase	Throw away less rubbish				Save cost of recycling				Use less raw materials			
	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total
No	2	2	0	4	2	2	0	4	1	3	0	4
Don't know	3	10	0	13	8	4	1	13	5	8	0	13
Yes	11	23	3	37	16	19	1	36	9	27	0	36
Total	16	35	3	54	26	25	2	53	15	38	0	53
Interested	Throw away less rubbish				Save cost of recycling				Use less raw materials			
	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total	Quite a lot	A lot	Little or not at all	Total
Indifferent	0	3	0	3	1	2	0	3	1	2	0	3
Interested	14	21	2	37	20	14	2	36	13	23	0	36
Very interested	2	11	1	14	5	9	0	14	1	13	0	14
Total	16	35	3	54	26	25	2	53	15	38	0	53

Source: Author

Table 3 shows that, with the collected data, it is not possible to prove any relationship between the advantages of the adaptable product perceived by the user and the environmental ones, as the Chi2 value presents a level of significance p that is above 0,05 and Cramer's V coefficient does not even reach a value of 0,3.

Relationship between previous experience, age, and the perception of functional and environmental advantages

The third aim is to analyze whether the perception of the advantages depends on previous experience and age. For the more experienced users, the prevalent answer was that a convertible stroller could be used for a longer period. For users with a single baby, the most common answer was that they did not know whether they would use it any longer (50%). More than 80% of the experienced participants thought they would have used the adaptable design for longer, whereas this opinion reached 43% among the non-experienced ones.

For the second question, that is, if they thought they would have avoided the need to buy a stroller, the results were more conclusive, and most of them (61%) thought that they would. Again, a difference was observed depending on the type of user. Whereas this was almost the only answer in type 2 users (88%), those who have only one were divided in their patent opinions (50%).

The reason for this may be that those with only one child did not know if they were going to have any more children –some of them told us that they would probably have just one.

Table 3. Chi2 and Cramer's V tests on the dependence between perception of the adaptable product and environmental advantages

Variables	Chi2	p-value	Cramer's V coefficient	Interpretation
Perception of using the product for a longer period of time				
Throw away less rubbish	3,035	0,552	0,168	Independent
Save cost of recycling	4,742	0,577	0,210	Independent
Use less raw materials	3,322	0,506	0,175	Independent
Perception of saving themselves the purchase of a stroller				
Throw away less rubbish	2,597	0,627	0,155	Independent
Save cost of recycling	2,831	0,830	0,162	Independent
Use less raw materials	1,356	0,852	0,112	Independent
Perception of how interesting an adaptable stroller is seen to be				
Throw away less rubbish	4,427	0,351	0,202	Independent
Save cost of recycling	4,052	0,670	0,194	Independent
Use less raw materials	4,726	0,317	0,209	Independent

Source: Author

To test whether these results are significant, and, as they are qualitative variables, again the Chi2 test and Cramer's V coefficient were applied. The result of the Chi2 for the

relationship between longer use and previous experience shows a level of significance below 0,005 (0,003), thus reflecting the fact that there is a dependence. Nevertheless, since the number of frequencies below 5 is greater than 20% (see Table 4), this result is not reliable, since it could be a false positive. The results of Cramer’s V coefficient also indicate that there may be a relationship between these variables, although the dependence is not strong. Therefore, the results of the tests presented in Table 5 show that there does seem to be a relationship. A greater number of data would be needed, however, to determine this statistically.

Table 4. Cross table of previous experience and product adaptability advantages

Previous experience	Use it for a longer time				Save the need to buy a stroller			
	No	Don't know	Yes	Total	No	Don't know	Yes	Total
No	2	14	12	26	3	11	14	26
Yes	3	2	21	28	1	2	23	28
Total	5	16	33	54	4	13	37	54

Source: Author

Regarding whether perception of the advantages varies depending on the age, taking into account two age groups –those under and over 35 years old– the results show that there is no significant relationship.

An analysis was also performed to determine whether the degree of interest in the adaptable stroller depends on previous experience. The answers to the questions show that most of the participants, 75% of non-experienced and 62% of experienced users, perceived having a convertible stroller as being “interesting” (Royo, 2016). Almost all of the users consider this design either interesting or very interesting. However, this difference is not statistically significant, since the Chi2 test showed no significant variation between the answers to this question and the type of user.

Another analysis was performed to determine whether the experience of going from carrying one child to having to carry two has an influence on the perception of the environmental advantages. Figure 3 shows the results obtained for the three additional closed-ended questions about how users perceived the environmental advantages of a convertible stroller. The results showed that the subjects of the experiment thought this helps to reduce waste and reduces recycling expenses “a lot” or “quite a lot”, and that it would greatly reduce the consumption of raw materials. Data showed that non-experienced people do perceive the environmental advantages more strongly, but the Chi2 tests ($\alpha = 0,005$) yielded no differences according to the type of user, nor did the Cramer’s V test.

Finally, an analysis was carried out to determine whether the perception of the environmental advantages of an adaptable stroller varies depending on the age. To do so, the answers were separated into two groups: those from respondents aged over 35 years and from those under 35 years of age. In this case, results showed that the ratings of the environmental

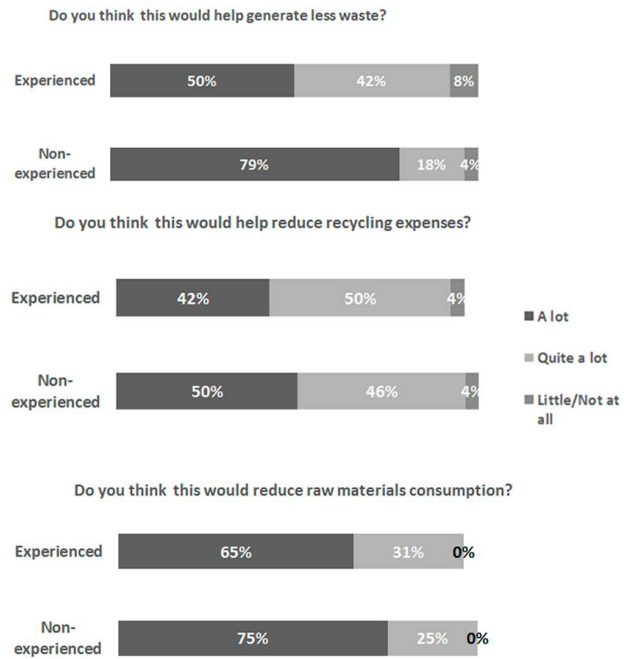


Figure 3. Participants’ opinion about how they perceived the environmental advantages of a convertible stroller.

Source: Authors

advantages do not vary significantly with age (p value < 0,05, and Cramer’s V test < 0,3).

Interview results

From the interviews carried out on the 54 participants, one notable finding is that half of them stated that, if they had been shown a convertible stroller like the one seen in the videos, they would have considered buying it.

30% of the interviewed (36% of parents with two children and 13% of type 2 participants) also openly pointed that the video adequately explains the evolution of the use of the stroller. 22% of them commented that the environmental subject drew their attention (32% of type 1 users and 11% of type 2 users). Moreover, 26% of the interviewed declared that the message conveyed by the storyboard leaves no room for doubts.

For many of the participants, the purchase would continue to depend on whether they know if they are going to have another child in a short period of time (24%), a question that 17% of them did not take into account at that time. They also expressed that the video made them think more about the amount of products that they buy without considering future or changing needs.

Many participants expressed that it was difficult to choose a stroller due to the lack of experience with the kind of product. One of the interviewed said: “It is very difficult to select a stroller because there is a wide range and every single model has its own particular features”. Another one said: “I made an excel sheet to compile all the characteristics (folding, size, etc.) for a big number of models”. It is remarkable that

a small number of participants saw an existing convertible stroller in the stores, but did not immediately notice the possibility of having to carry two kids. One of them pointed that “the salesman told me that one of the strollers was broader; therefore, it was more comfortable. But in fact it was a convertible stroller” (Royo, 2016).

All participants confirmed that they did not change their opinion when asked about it two or three days later.

Discussion and Conclusions

A study was conducted with 54 participants that provided us with interesting information regarding the perceived advantages of convertible stroller designs that adapt to future needs. The results show that when users are told about the advantages of an adaptable design and the advantages that this kind of product can have for the environment, they perceive them and consider it to be an interesting proposition. Furthermore, from the data collected it was also found that:

Both types of participants regard the concept of a convertible stroller as an interesting option. None of the respondents knew about this type of convertible strollers, which shows that their advantages are not being well promoted or communicated.

No relationship has been established between the perception of the advantages that the adaptable design offers users and the perception of the advantages for the environment.

The rating of the advantages of the product in terms of its useful lifespan and sparing the need to purchase an additional stroller does seem to have a relationship with previous experience with the need for adaptability. Therefore, further data would be needed to confirm this, although the results obtained seem to indicate that these advantages are more appropriate for those who have already chosen a stroller for one child and later found themselves with the need to carry two.

The age and the rating of the advantages of the adaptable stroller are independent of each other. This result may be biased by the fact that the older participants are also the ones who have had two children in quick succession.

The rating of the environmental advantages is independent of both the degree of experience and the age in participants between 30 and 45 years of age. Experienced users perceive the environmental benefits less. This could be due to disappointment with the number of products they have had to buy or the complexity of a single product that meets all needs.

After seeing the video, half of the users declare that if they had been shown a convertible stroller like the one in the video, they would have considered buying it. They feel that they have not been aware about the amount of products they buy. Thus, this experience has helped them to be more aware about the consumerism.

This study has some limitations. The most important one is that the relationships identified are based on qualitative data.

Studies where quantitative data is presented could lead to other results.

The results obtained have practical effects on communication, as they help to raise promotion campaigns of adaptable products. Stating all the advantages of an adaptable product will increase the user’s interest in it, especially for those who have previously needed a product to adapt to new needs. Mentioning these products’ advantages for the environment will also increase interest. In this case, the environmental aspect is more interesting for users who have not needed the adaptable product than for those who have needed it. Therefore, depending on the user to whom the product is addressed, the message should emphasize to a greater or lesser extent the user and environmental advantages.

These results are relevant to getting users to value product characteristics with long-term effects and sustainability. Choosing adaptable products is choosing products that extend their time of use, which is one of the strategies of circular economy design.

Users value an adaptable design if they are given information about the advantages it has for the environment. Still, because there is no relationship between environmental and user advantages, efforts should be made to communicate both of them. It is also very important to implement enhanced communication strategies concerning the latter, since, at least in the case of strollers, this criterion is hardly ever considered when the first child is born. This work has analyzed user perception when empathy tools as storyboard are used. These kinds of techniques, applied in addition to eco-labelling, can help to communicate the advantages derived from the adaptability and lifespan of a product. QR codes, Augmented Reality, etc. could be used to combine storyboard technique with eco-labelling.

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