School Furniture Design Based on Product-user Experience Design for Secondary School Students in Timor-Leste

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Abstract

While School furniture is a design challenge as it relates to health and creating satisfying experiences that will in turn increase the efficiency of learning outcomes of students, there is no research exists on Product-user Experience Design in School furniture. This study explored design as the science of creating a meaningful user experience that goes beyond looking at design as the science of solving user problems.

In designing research to test the Product-user Experience, the researcher used the Product-user experience model, developed from the ideas of Mahlke & Thüring (2007) and Mahlke (2007) as a guide to design the research into 3 steps which are related as follows:

Step 1: To do user research method, **Step 2:** Design and develop classroom furniture by using the principles of Product-user experience Design and the integration of theories, **Step 3:** To do Produce design Evaluation in order to know the consequences of the user experience.

The findings show that school furniture design can be based on Product-user experience Design, and the findings also show a comprehensive approach to determining what will enhance the user experience, that is, in addition to the Utilitarian Value, the Hedonic Value that affects, emotional reactions also affect the user. And it also has a higher positive impact than the previous two components. The findings fill a gap in product design knowledge, that often lacks the proof of important emotional aspects and human experience interacting.

Keywords: Furniture Design, School Furniture, Product-user Experience Design, Utilitarian Value, Hedonic Value, Emotional Reactions

Introduction

Education is an important tool that countries use to develop their economy and human resources (Taifa & Desai, 2017). Therefore, it is important to focus on developing facilities to support teaching and learning in order to increase the efficiency of learning outcomes (Agha & Alnahhal, 2012). Among the physical environment of educational facilities, one of the most important things is *school furniture* such as chairs and tables. This is because students will spend most of their time at school sitting on these chairs and tables to study. (Dianat et al., 2013) Research indicates that School furniture has a vital role in student's satisfaction, where a higher level of satisfaction has an effect on increasing the level of skills, mentality, and knowledge of students (Oyewole et al., 2010).

Although *school furniture* is important as mentioned above. The school furniture in the developing countries is a scarce resource, as these countries have limited educational budget while school furniture is an expensive element of education, making them unable to accommodate the number of students (Haviarova, 2000; Quesada, 2001).

Research indicates that the problem is even more apparent in developing countries where population transitions to adolescence (Holsinger & Cowell, 2000), therefore this study selected Timor-Leste countries as an educational context by targeting users as students of secondary schools.

In terms of school furniture, a common problem in Timor-Leste is that many schools are experiencing inadequate resources such as desks and chairs. until the need to share resources from nearby technical colleges

(UNICEF Timor-Leste, 2018) and most of the school furniture. It has also been donated by international organizations or agencies from abroad, such as Australia and the European Union (Lucas et al., 2015). The furniture received was not designed to meet the ergonomics or needs of the local student community.

The Framework for Design Research

Based on the existing problem, the researcher wanted to solve the problem by designing school furniture that raises the level of satisfaction through experiential design approach.

The experiential design here is a design that extends the scope of consideration not only to problem-solving design but to include user emotional satisfaction. It is becoming more common in all authors who have written in Journal of Design in the field of design and emotion have shared the realization that all products affect the emotions of users as neutral products do not exist (Desmet & Hekkert, 2007, pp. 57-66) in research orientation. The researcher also added the concept of design in the design of modern furniture industrial products and the concept of Industrial Crafts Design to differentiate itself from the same type of products available in Timor-Leste.

Research Basis

Provides the framework for reporting the results based on the existing problem, the researcher wanted to solve the problem by designing school furniture that raises the level of satisfaction through experiential design approach.

Product-user Experience Design

Although the definition of experience is very diverse, many academics have defined "experience" in a customer-centric approach. They only differ in perception and measurement techniques.

In this research, the researcher proposed the Product-user experience model, developed from the ideas of Mahlke & Thüring (2007) and Mahlke (2007), suggesting that the components of user experience consist of three key components:

1. **Utilitarian Value** is the actual functioning of the good or service. It aassociates with the functional benefits that a customer gets from a product. Clues related to this work will be interpreted using the logic of the brain primarily. The researcher uses the concept of design principles of the modern furniture industrial products to apply to create measurement criteria. As will be explained in detail in the next section.

2. **Hedonic Value**

According to Hassenzahl's conceptualization, the hedonic emphasizes the individual's well-being through functional, self-oriented product attributes. He argues that "the functions and the attributes it [the hedonic] subsumes are strong potentials for pleasure" (Hassenzahl, 2003, p. 35).

The researcher uses Mahlke (2007)'s hedonic elements to apply as follows:

Aesthetic Aspects: which has sub-elements including visual aesthetic, haptic quality, acoustic quality.

The other is **Symbolic Aspects**, in which he gives examples of associative symbolics and communicative symbolics. In this research context, aesthetic aspects are artistic aspects of school furniture, and symbolic aspects are cultural symbolic aspects of design which encompasses both being culturally symbolic and also communicative identity that directly relates to the user, so I use the term Cultural and symbolic identity in this category.

3. **The Emotional Reactions**

Harvard Business Review research report entitled the New Science of Customer Emotions which indicated that customers are considered to be emotionally connected with a brand when the brand aligns with their personal motivations and enables them to fulfill deep desires, some of which they are not even aware of (Magids et al., 2015). From that research we can say, people nowadays become more sensitive to dimensions of products that

go beyond traditional aspects of usability, so the need to understand emotion and experience and their implications for product design increases.

In creating the scale, the researcher review of the dimensions of pleasure that Mehrabian and Russell developed in 1974 (Mehrabian & Russell, 1974) to assess emotional reactions.

Although pleasure comes from a wide variety of emotions. Here, the researcher chose the emotions associated with the design: Pride, Affection and Joy.

Design Principles of the Modern Furniture Industrial Products

"Modern furniture industrial product design" has its roots in the Industrial Revolution, as Hunter & Wood (2016) explains: the onset of the industrial age and the development of steam power in the 19th century led to the manufacture of furniture in Rapidly large factories (Hunter & Wood, 2016), which directly affects furniture design and furniture production methods. However, the characterization or development of the modern furniture industry product concept cannot be explained by the time frame of the phenomenon. This is due to the fact that the conceptual change in the design does not coincide with the exact date. Explaining the changes and approaches to furniture design Therefore, it is important to explain through the work of the designer or the artistic movement.

To create a visual understanding of changes in furniture design and manufacturing methods. due to the industrial revolution and the emergence of the development technology of the steam engine (Evolution of the steam engine), the researcher chose to present it through key designers of the era, Michael Thonet, who were among the first. that initiated the design in a contemporary way, which became a model for furniture design in the new era (Mário et al., 2011).

In the 1830s, Michael Thonet began experimenting with steam beech construction to produce furniture that was lighter and had fewer components compared to existing standards. He created his own approach to design: the same construction principles and standardized elements.

In a design era known as the Midcentury modern design era, the era was famous for affordable and accessible design, so furniture designs tended to be simple, practical while still being beautiful too. Many designs by this generation's designers created for mass-market consumption and pricing. To illustrate this approach, it is best summed up by the most famous medieval designers Charles and Ray Eames, describing their ideology as: "Get the most from the most people with the least money" (Kirkham, 1998). So, furniture manufacturers focus on developing cheap, new, identically standardized, and practical furniture for the mass production industry.

Based on this idea the study of documents and related research, the researcher finally outlined the design fundamentals from the basic principles of designing modern furniture industrial products into these elements: Usability and function (plus Ergonomics), Structural strength, economy of validly used materials, Simple Beauty and Visual Expression, inexpensive, suitable for mass production.

Industrial Crafts Design

The concept of 'Industrial Crafts Design' is new in the international research arena. This is because industrial production remains the mainstream in both industry and educational research.

This concept, for Thailand, comes from the initiative by the Department of Industrial Promotion to develop Thai handicraft products. which has the potential to generate income for the country in the form of exports and also generate income for both urban and rural people (Department of Industrial Promotion, Ministry of Industry, 2000).

The meaning of the word Industrial Crafts Design may refer to "Product Design Guidelines with a production style that combines Handicraft process that requires elaboration mechanic skills Wisdom from the craftsmanship

of the creators and the industrial production process by relying on materials, machines and technology today. Which products that was created in the way of industrial handicrafts, it has a modern style, suitable for contemporary lifestyle but at the same time still aura of culture and can create demand in marketing" (Industrial Craft Design, Faculty of Fine and Applied Arts, Thammasat University, n.d.).

Based on this idea, the researcher finally outlined the design fundamentals from the basic principles of Industrial Crafts Design into these elements: locally produced materials, furniture is an industrial or craft-based design and inexpensive, cultural and symbolic identity

In designing research to test the Product-user Experience, the researcher used the Product-user experience model, developed from the ideas of Mahlke & Thüring (2007) and Mahlke (2007) as a guide to design the research into 3 steps which are related as follows:

Step 1: To do user research method which uses two research methods as follows:

- Ethnographic field study
- User interviews research

Step 2: Design and develop classroom furniture by using the principles of Product-user experience Design and the integration of theories.

Step 3: To do Produce design Evaluation in order to know the consequences of the user experience.

Methods

Research Methodology

Research methodology employed both qualitative and quantitative approaches.

Since mixed-method tools allow for more flexible evaluation design options to combine evidence in various ways until it fulfills the purposes of an investigation and object of inquiry (Chatterji, 2010).

For Step 1 to do user research method which uses two research methods as follows: ethnographic field study and user interviews research, this research uses qualitative well-executed sampling techniques focusing on students, Division of schools by region, and School types: public, private school to increase generalizability and ecological validity of findings. The purpose of this research was to determine the ergonomic suitability of secondary classroom furniture in Timor-Leste by measuring the body size of a sample of Timor high school students. To use quantitative data to define criteria for design.

Population and Sampling Method

Target population refers to the entire group of 186,363 Timor-Leste high school students aged 12-17 (UNESCO Institute for Statistics, n.d.).

Multi-stage randomization was used as the sampling method in this study.

Step 1: The first step is to divide Timor-Leste into five regions, according to the Ministry of Education, Timor-Leste (2011).

Step 2: Randomly select 1 region by raffle. and the result of the label is region 2, after that 1 city is randomly selected by drawing the city name. and the random result is the city of Dili.

Step 3: The researcher selected schools to represent both public and private schools from a group of schools in Delhi. Selection method start from contacting to present the research project to the school directors and select schools based on the acceptance results by considering schools that allow the researcher to conduct the research. The reason why the researcher used this criterion is that during the research period there has been a pandemic of COVID-19

resulting in many schools are not convenient for researcher to conduct research in schools. Finally, two schools were accepted, representing both types of schools: Escola SECUNDÁRIA GERAL 4 DE SETEMBRO UNAMET, which represents public schools, and Escola Amigos de Jesus - Timor-Leste, which represents private schools.

Step 4: Researcher selected 10 secondary school students from each class between 10^{th}-12^{th} Grade from schools representing government schools which total is 30 students. After that, researcher selected 10 secondary school students from each class between 10^{th}-12^{th} Grade from Schools representing private schools which total is 30 students. The sample group of this research is therefore 60 people. The investigators also asked teachers to contact students' parents to explain the research and to ask their parents to sign their consent for the students to participate in the research.

The size of the sample set of 60 people. This amount is according to Uma Sekaran in Research Method for Business 4^{th} Edition, Roscoe (1975) proposed the rules of thumb for determining sample size where sample size larger than 30 and less than 500 are appropriate for most research (Sekaran, 2003). The reason why the researcher chose a sample of 60 people was because it was an acceptable number in the research. And in line with the situation with the epidemic of COVID-19, there are very few schools accepting research in the school area. Figure 60 comes from the selection of one representative of public and private schools that accept the researcher's research. And the researcher needs 10 representatives from each class between 10^{th}-12^{th} Grade from representatives of public and private schools, eventually getting a sample group of 60 students as described above.

Step 5: The researcher conducted body size measurements of students using Ethnographic field studies and User interviews research per 60 secondary school students from 2 sample school type groups. The researcher interviewed with a semi-structured interview format.

Results

To answer the first objective, the researcher specifies the user requirements.

The results of collecting data from the interviews based on user experience components resulted in the analysis of the data according to the following framework:

Usability Dimension

The results of the data collection revealed that all the students in the sample were facing problems due to the use of furniture including back pain and lumbar pain.

In terms of activity, research indicates that secondary school students in Timor-Leste want to use school furniture not just to support learning activities only. But there is still a need to support activities in terms of social and religious culture, such as organizing parties. performing religious rituals. They will use their own classroom space for activities.

When the researcher presented furniture styles available in Timor-Leste for comment (please see Figure 1). most students concluded that the writing armrest style had become a barrier to their social activities, at the same time, the non-adjustable distance between the chair and the armrest interferes with their learning activities. Students also mentioned that school furniture was too heavy, as shown in Figures B and C, hindering their social activities which required the tables and chairs to be stackable.

A B C

Figure 1 Research Materials Shown by the Researchers to Timor-Leste High School Students: Furniture Styles Available in Timor-Leste for their Opinions on Existing Products.

Therefore, the design should be designed to separate the table and chair. In addition, user feedback was found that the table and chair should be lightweight and should be able to overlap and save space when storing so that they have more space for social activities.

Emotional Dimension

Timor-Leste students are interested in applying national identity to their designs. This is consistent with the Usability dimension that students want to design school furniture to support social and cultural activities. Students also pay attention to the use of natural materials in their designs. and interested in design that is beautiful.

When the researchers showed pictures of furniture available in Timor-Leste to ask for their opinions on beauty. Students commented that the existing furniture styles lacked aesthetics and did not inspire them to study.

When the researcher asked if elements of Timor-Leste culture are used in the design what will the students think. The results showed that most of the students agreed.

Product Design Solutions

To answer the second objective, the researcher carried out the design and development.

The design development in this step was derived from the analysis of the target group's experience data, the analysis of the student measurement data together with experiential design theory analysis, material studies and the study of culture and identity of Timor-Selte. All parts of the information are synthesized into 3 types of school furniture sets Type A, Type B and Type C.

Each model offers both Design concept inspired by Timor-Leste culture, Technical Drawing, and Perspective Skating so that 3 experts in product and furniture design can make the best choice.

Figure 2 Design Development: Type A.

Type A was inspired by the shape of the roof of a house in Timor-Leste which has many forms however the design team chose two designs: Colinas Planalto and Planicie. (Cinatti et al., 1987, p. 57)

Figure 3 Design Development: Type B.

Type B is inspired by the unique shapes of Timor-Leste houses and columns.

Source: https://www.pixcove.com/wooden-timber-buildings-architecture-traditional-old-style-timor-leste-house-asia-structure-architecture-building-architecture-design-city/

Figure 4 Design Development: Type C.

Type C is inspired by the headpieces of men and women and the sacred house. (Chiu-Freund, 2010)

Product Design Evaluation

The third objective of this research is a design evaluation process, which has two steps:

1. Expert Evaluation

Expert evaluation methods utilize the knowledge of user experience professionals in evaluating overall experience of the product and production. Compared to user studies, expert evaluation is often easier to arrange. Experts can also evaluate "difficult" material such as product specifications or early prototypes with many technical problems. Basic problems can be avoided by conducting an expert evaluation before a more expensive user study.

Research Tools: The questionnaire uses the conceptual framework of Product-user experience Design to consider the scale together with the design principles of modern furniture industry products and the concept of industrial crafts design until the measurements were obtained in 7 areas as follows: Structural strength, Utility and Ergonomics, Using locally produced materials, Furniture is an industrial or craft-based design and inexpensive, Emotional experience, Simple Beauty and Visual Expression and Cultural and symbolic identity. The researcher examined the tool by having the expert examine the Content Validity of each question to ensure consistency with the objectives (Index Item of Congruent: IOC) by 3 University professor teaching product design from different universities. The results showed that all questions were valid with an average of 0.6-1, as the acceptable conformance index must be 0.50 or higher.

The researcher sends 3 design developments to 3 furniture design experts to evaluate according to the research framework that has been set up to select the most acceptable design results. The scoring criteria are as follows: average score 4.21-5.00, 3.41-4.20, 2.61-3.40, 1.81-2.60, 1.00-1.80 mean high level, high level, moderate level, low level and lowest level respectively. The results of the expert evaluation appear as follows:

Table 1 The Table Shows the Average of the Three Expert Evaluation Results and their Rankings

	Position	Type A is Ranked 3rd		Type B is Ranked 2nd		Type C is Ranked 1st	
		$\bar{x}$	Meaning	$\bar{x}$	Meaning	$\bar{x}$	Meaning
1	Structural Strength	3.44	Satisfied	3.66	Satisfied	4.22	Very Satisfied
2	Utility and Ergonomics	3.55	Satisfied	3.66	Satisfied	4.66	Very Satisfied
3	Locally Produced Materials	3.44	Satisfied	3.66	Satisfied	4.22	Very Satisfied
4	Furniture is an Industrial or Craft-based Design and Inexpensive	2.9	Satisfied	2.93	Satisfied	4.26	Very Satisfied
5	Emotional Experience	3.33	Satisfied	3.33	Satisfied	4.55	Very Satisfied
6	Aesthetics/ Simple Beauty and Visual Expression	3.55	Satisfied	3.44	Satisfied	4.33	Very Satisfied
7	Cultural and Symbolic Identity	3.33	Satisfied	3.33	Satisfied	4.11	Satisfied
	Total	**3.36**	**Satisfied**	**3.43**	**Satisfied**	**4.33**	**Very Satisfied**

The researcher compared the results of the assessment, and the model 3 was the design developments that received the highest average score. Therefore, it has been developed into a furniture model. for further evaluation by the user.

2. User Evaluation

General information of product testers and respondents.

The general information of the product testers and respondents were all 20 Timor-Leste people, mostly 12 males representing 60% and 8 females representing 40 percent, aged between 16-18 years.

Research Tools: The questionnaire uses the conceptual framework of Product-user experience Design to consider the scale together with the design principles of modern furniture industry products and the concept of industrial crafts design until the measurements were obtained in 6 areas: Structural strength, Utility and Ergonomics, Using locally produced materials, Emotional experience, Simple Beauty and Visual Expression and Cultural and symbolic identity,using rating scale.

The statistics used to analyze user experience satisfaction with the school furniture prototype. Based on the guidelines of Naiyapatana (2011, p. 195) by using the formula for calculating the mean score of satisfaction ($\bar{x}$) and the Standard Deviation (SD) by specifying the interpretation criteria for the average score of satisfaction as follows:

4.50 - 5.00 means Very Satisfied

3.50 - 4.49 means Satisfied

2.50 - 3.49 means OK

1.50 - 2.49 means Dissatisfied

1.00 - 1.49 means Very Dissatisfied

The results of the user evaluation appear as follows:

Table 2 Assessment Results of User Experience Satisfaction with the School Furniture Prototype in 6 Areas

	Position	User Experience Satisfaction Level		
		$\bar{x}$	SD.	Meaning
1	**Structural Strength**	**4.126**	**.45**	**Very Satisfied**
	1.1 Strength and safety.	4	.68	Satisfied
	1.2 Lightweight furniture design.	4.16	.61	Satisfied
	1.3 Crafting them seamlessly and securely.	4.22	.80	Satisfied
2	**Utility and Ergonomics**	**4.68**	**.69**	**Satisfied**
	2.1 Meet the needs by designing separate tables and chairs.	4.55	.51	Very Satisfied
	2.2 Design furniture ergonomically.	4.83	.38	Very Satisfied
	2.3 Meet the needs by stackable design and lightweight.	4.66	.48	Very Satisfied
3	**Using Locally Produced Materials**	**4.34**	**.65**	**Satisfied**
	3.1 Use quality materials.	4.55	.51	Very Satisfied
	3.2 Use economical materials.	3.83	.85	Satisfied
	3.3 Use locally produced materials.	4.66	.59	Very Satisfied
4	**Emotional Experience**	**4.83**	**.38**	**Very Satisfied**
	4.1 Create a sense of pride from the perception of the identity of the country.	4.83	.38	Very Satisfied
	4.2 Cause a favorable mood from the design of tables and chairs that are beautiful and different from the chairs in the school furniture market.	4.83	.38	Very Satisfied
	4.3 Create a happy mood by touching the texture of natural materials and colors that represent nature.	4.83	.38	Very Satisfied
5	**Simple Beauty and Visual Expression**	**4.48**	**.7**	**Satisfied**
	5.2 Be creative.	4.33	.84	Satisfied
	5.3 Art in design.	4.61	0.5	Very Satisfied
6	**Cultural and Symbolic Identity**	**4.27**	**.78**	**Satisfied**
	6.1 Represents the Timor-Leste culture.	4.38	.6	Satisfied
	6.2 Conveys self-respect as a Timor-Leste citizen.	4.22	.87	Satisfied
	6.3 Conveys understanding to the local community.	4.22	.87	Satisfied

Discussion

Research on school furniture design for secondary school students in Timor-Leste according to the Product-user experience Design, in addition to finding designs that are more responsive to the user experience, this research also aims to expand the body of knowledge in product design.

The results of the research can be used to extend the knowledge of product design at least two things as follows:

User Experience has a Positive Effect on the Response to Product Design/Furniture Design

The results confirmed that the Product-user experience Design research framework had a positive effect on attracting users to the product, so experience factors should be taken into account when designing.

As Mahlke (2005) describe that user experience can be used as an umbrella term to summarize all the relevant aspects of interaction from the user's perspective. In application, product experience means the sum of all aspects of users' interaction with a product that encompasses together (Norman, 1999).

While the User experience study began with the change of human-computer interaction between computers and users from traditional keyboard and mouse control to image-based interface and sensory control, as a result experts and researchers in all fields attach great importance to user experience issues (Jetter & Gerken, 2006;

Mahlke, 2005). But in this paper, we seek to consolidate the insights from the aforementioned research domains in the context of furniture-product design, consider them together with two other concepts namely Design principles of the modern furniture industrial products and Industrial Crafts Design.

This research seeks dimensions that will influence the user's perception and then define the range of product dimensions that can evoke a specific reaction of the user. The research result proves that the consumer's experience with the product; school furniture is made up of all aspects. of users' interaction with a product, including Utilitarian Value, Hedonic Value, and emotional reactions, detailed below.

1. Utilitarian Value

a. Users had a mean perception of Utility and Ergonomics at 4.68, which was interpreted as having the greatest effect on experience satisfaction. Next, users had a mean perceived perceptual strength of Structural strength at 4.126, which was interpreted as having a high effect on experience satisfaction. Both elements emphasize the fundamental principles of furniture design based on the Design principles of the modern furniture industrial products.

From the study of user needs an important problem in the design area was that the students had problems from back pain, lumbar pain. In addition, they faced the problem that the furniture they were using did not support their social and cultural activities. Therefore, when the researcher designed to solve such problems. This perception received the highest response. And in the next step, the user pays attention to structure and strength. This is consistent with the principles of modern furniture design that must pay attention to this as well.

b. Research shows that high school students in Timor-Leste Pay attention to using locally produced materials at a mean level of 4.34 interpreted as having a strong effect on the satisfaction of the experience. These findings are in line with the principles of Industrial Crafts Design which proposes the use of local materials to be aesthetically pleasing in a modern style suitable for the contemporary lifestyle, so one proposal from this research suggests that if you are designing furniture in a developing country context, design considerations are locally produced materials that are contemporary but at the same time still an aura of culture can create demand in marketing.

2. Hedonic Value

a. Users had a mean perception of visual aesthetic at 4.34, which was interpreted as having a high effect on experience satisfaction. The findings are consistent with Hassenzahl's idea that, in addition to functional design. The consumer response is the hedonic subsumes, which are demands for strong potentials for pleasure" (p. 35). Hassenzahl (2003) again emphasized that visual aesthetic affect the attractiveness of designs. This research result therefore proposes that designer's attention should be paid to the visual aesthetic of the product (Mahlke, 2007) in order to enhance the user experience through the aesthetic aspects.

b. Research indicates that *cultural and symbolic identity* influences the user experience to a large extent, consistent with Mahlke & Thüring (2007) who described that this aspect of interaction encompasses both being culturally symbolic and also communicative identity that directly relates to the user. This research thus encouraging designers to choose *cultural and symbolic identity* to be an important part of the design

Conclusion and Suggestions

Expanding Product Design Knowledge that Emotions Affect Real Users

Research has confirmed that emotions are the aspect of users' interaction with a product that causes a reaction in its user the most. As can be seen, users when interacting with the prototype product have higher emotional satisfaction than their Utilitarian and Hedonic Value, as detailed below.

- The user has an average level in Emotional reactions at 4.83, which means very satisfied.
- Users had average responses to Utilitarian Value and Hedonic Value at 4.384 and 4.375 respectively, meaning satisfied.

The result of this research is to expand the body of knowledge that Hassenzahl et al. (2000) have suggested that the product's features of pragmatic and hedonic aspects are the key factors for appealing. Then, the two apparent product character leads to emotional consequences (e.g., pleasure, satisfaction) and behavioural consequences (e.g., increased time spend with the product).

But in this research Emotions are not merely a result of Utilitarian Value and Hedonic Value, but they themselves affect the user.

Moreover, research indicates that the level of emotional impact is higher than both the Utilitarian Value and the Hedonic Value. Therefore, it may be time for designers to consider the dimension of emotional impact as a critical aspect of product design.

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