DESIGN FOR THE ELDERLY: AN IMMERSIVE HUMAN DIGNITY EXPERIENCE FOR UNIVERSITY STUDENTS

Griselda Esthela OYERVIDES-RAMÍREZ and Juan Carlos MÁRQUEZ CAÑIZARES
Tecnologico de Monterrey, Mexico

ABSTRACT
Various population groups present conditions that require special considerations in the design process, such as the elderly. The present research focuses on developing and implementing a structured design process for this group, which is divided into four stages: research, conceptual design, detailed design, and implementation. The methodology was implemented in a sample of two student groups (31 students total) studying Product Design in their sixth semester at Tecnologico de Monterrey. They developed 14 product design projects for a nursing home in Monterrey, Mexico. The students visited the nursing home during the course, identifying problems through observation and interviews with the residents and their caregivers. At the end of the course, the students responded to a survey-type instrument to evaluate the impact of the model on their educational experience. The students positively assessed the nursing home personnel's participation in the project's development, emphasising its importance during the research. However, the students recognised the differences between this design process and previous experiences in Design courses.
The impact of project development transcends practical aspects. Working with older people implies deepening empathy, comprehending their vulnerability, and preserving their human dignity as they depend on others. Ultimately, it was possible to determine that the design process proposed in this research facilitates developing products that meet real user needs that would tend to go unnoticed.

Keywords: Human dignity, design process, elderly, higher education, educational innovation

1   INTRODUCTION
Various population groups present conditions that require special considerations in the design process, such as the elderly. The UN defines an "elderly" person as someone over 60 [1]. Older people generally present degenerative diseases that diminish their functions, limiting mobility, movement capacity, and independence. Aging is associated with dysfunctions such as hearing loss, cataracts and refractive errors, back and neck pain, osteoarthritis, chronic obstructive pulmonary diseases, diabetes, depression, and dementia, which hinder their ability to carry out daily activities and interact adequately with the spaces and objects around them [2] [3]. This population group is increasing; it is estimated that by 2030, one in six people in the world will be 60 years of age or older. By 2050, the world's population of people 60 and over will have doubled (2.1 billion). People aged 80 and over are expected to triple between 2020 and 2050 to 426 million [4].
On the other hand, life expectancy is increasingly longer, allowing opportunities of great benefit to society through the population's increase in productivity, contributing to economic and social development; in addition, older people contribute in numerous ways to their families and communities [3] [5]. This is why paying attention to this population group is essential, as they are a vulnerable group usually neglected in Latin America, where their needs are overlooked, reducing their chances of preserving their independence and remaining productive. By 2050, two-thirds of the world's population over 60 will live in low- and middle-income countries [4].
The teaching of design has continuously evolved. Students learn various design methodologies, from the one proposed by Bruno Munari in 1980 to systematically identify problems and solve them logically [6]to the human-centred design [7], which aims to provide tools for solving complex problems placing the user in the center, the method is based on creating empathy, generating prototypes and iterating solutions. However, in recent years, authors have emphasised participatory design or co-design

involving the users deeper in the process where they become a fundamental part of the design process by collaborating directly in the solution. Moreover, design education addresses other perspectives, such as design for aging [8], which seeks to implement solutions for the elderly living in retirement homes.

This work employed a mixture of these, seeking to collect the best practices of various authors, while incorporating the learning experiences of each student during the process, helping each to discover the importance of designing with empathy. It is important to emphasise that the research stage is where students delve into the users' particular needs for a better understanding of the elderly's problems in everyday life, valuing their different perspectives [9].

Designing products for the elderly opens great opportunities to positively impact the quality of life for this growing group of users. Designers are challenged to create value through spaces, products, services, and experiences from a universal design perspective [10], adapting to the physical and cognitive characteristics of older adults performing their daily activities while simultaneously meeting the general population's needs [2].

Beyond the economic aspect that this opportunity presents through creating a good offering of products and services for older people, it aims to motivate them and affirm their capabilities and autonomy for dignified aging [2] [10]. Likewise, the methodology seeks to awaken students' genuine desire to generate value for the various user groups through their discipline and assume their social responsibility as design professionals.

This research focuses on developing and implementing a specially structured design process for the elderly and their needs. The process was divided into four stages to guide university students during their projects, emphasising user interactions and detecting their needs. The four stages are Research, Conceptual Design, Detailed Design, and Implementation.

2   METHODOLOGIES

As part of the methodology, a literature review was carried out to define the stages and elements necessary to apply the proposed design process [12]. In addition, the structure suggested in the subject syllabus was used to define the stages and activities that would be considered in the process.

2.1 Description of the process generated for this research

The subject syllabus divided the activities into four stages, namely: (1) preparation, (2) research and analysis, (3) synthesis and definition of requirements, and (4) creativity and specification. These stages were distributed over fifteen weeks, each with a different duration. Based on these stages and the set of activities that each involved, an adaptation was made for a better approach to the project and the type of user that had been previously defined, also considering the theoretical proposals consulted about the design process, the methodology, and the methods themselves [13]. In this adaptation, four new stages redistributed the activities and adjusted the times of each (see Figure 1).

The first stage, Research, established eight activities to facilitate the approach to the user and raise awareness about their living conditions; it concluded with a brief [14]. The second stage, Conceptual Design, was where the design proposals were generated with different validations per type of user [15]; the aim was to develop an understanding of the specifications that meet the users' requirements and fully respond to their expectations. The third stage, Specification Design, validated aspects of the product such as colour, materials, and finishes (CMFs) [16] and developed a Beta prototype with excellent fidelity to what the industrially manufactured product would be [17]. Finally, the fourth stage, Implementation, tested the prototypes with users and developed another series of additional elements to complement the user experience, such as packaging, instruction manuals, and digital supports (apps and websites).
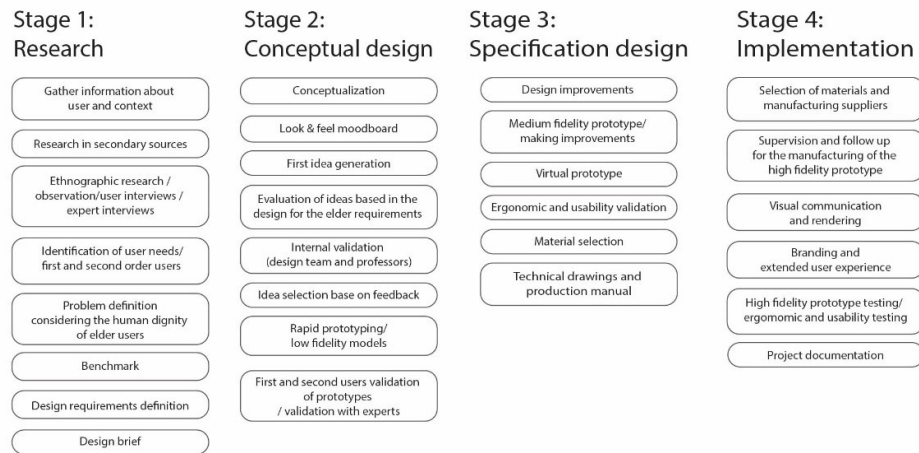
Figure 1. Design process generated for this research

2.2 Implementation

Once the process was defined, it was implemented in a sample of two groups of sixth-semester Product Design students at Tecnologico de Monterrey (31 students total), who developed 14 product design projects.

The projects were designed to meet the needs identified in a nursing home in Monterrey, Mexico. During the course, the students visited the nursing home on several occasions, identifying problematic situations through observation and interviews with the residents and their caregivers. Observations were made using a designed guide focusing on specific categories such as space, illumination, environment, relationships, activities, roles, attitudes among others; interviews were conducted individually and also a focus group with the personnel was carried out. Students also had numerous interactions to present their ideas and validate prototype iterations with users [9].

The elderly residents were divided into three categories depending on their autonomy to perform daily activities. The first group of dependent patients encompassed those users who required assistance to carry out all their activities and usually had limited or no mobility. The second group was semi-dependent; they could perform some activities by themselves or with the help of devices but required assistance with some, such as changing diapers, bathing, or dressing. The third group was the autonomous patients, who required occasional aid.

On the other hand, a differentiation was also made between first and second-order users [15][18], considering the elderly residents as primary or first-order users and the caregivers as secondary or second-order users.

Table 1. Students' projects

1. Wheelchair safety harness	2. Adjustable tray with support for upright eating	3. Adjustable support for diaper change

The dependent and semi-dependent patients require the support of their caregivers to operate the products and carry out their daily activities, which generally leads to an invasion of their privacy and a decrease in their human dignity because they require assistance to perform their most essential activities. Another aspect identified was related to the type of materials or devices used when performing therapies to maintain or recover the residents' mobility. In many cases, these activities are conducted with instruments or toys designed for children, with children's colours and figures. This generates

discouragement and indifference among patients who feel that they are treated as children. For this reason, the products designed had to consider especially the dignity of the residents and their emotional state when interacting with the products to prevent them from feeling denigrated or unworthy when receiving support [19]. Some of the results of the projects carried out by the students can be seen in Table 1.

2.3 Evaluation

At the end of the course, an online survey-type instrument with dichotomous and Likert scale questions was applied [20] to the students to evaluate the model's impact on their educational experience and validate the unique characteristics of the process proposed in this research [21]. The data obtained from the survey were analysed to produce the results.

3   RESULTS

The survey was applied to 31 students in the sixth semester of the design degree at Tecnologico de Monterrey, of which 77% were women and 23% were men between the ages of 20 and 24. The data analysis revealed that 68% already had some experience designing for people with particular conditions on previous design courses.

The students were asked how difficult they considered this project (on a Likert scale where one represents not difficult at all and seven represents very). More than 30% rated it with five; when added to the percentages rated six and seven, the total rises to 75% as a high level of difficulty. However, comparing this with the students' assessment of the impact of this project on improving their professional skills shows a remarkable similarity between the two results (see Figure 2).
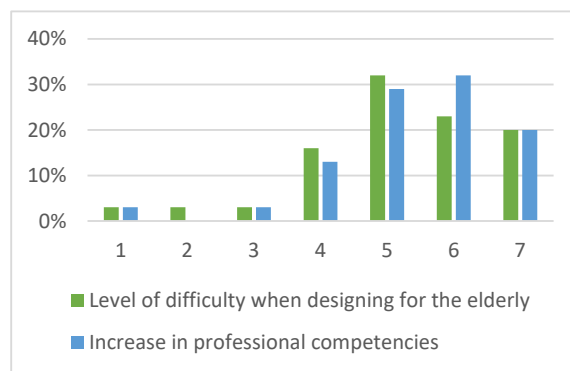

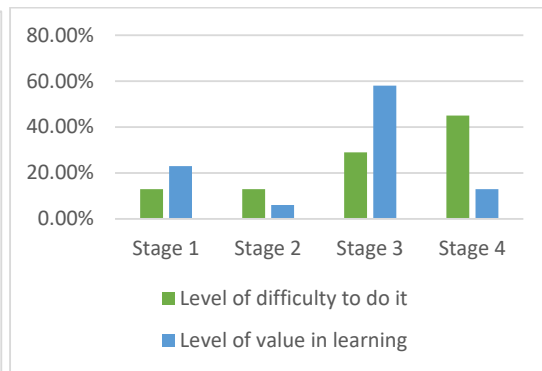Figure 2. Comparison between difficulty and professional improvement

Figure 3. Comparison between difficulty and value in learning

The students were asked about the process stages to identify their perceptions of each regarding the difficulty of carrying them out and the value for their learning. Their assessments presented a significant variation (see Figure 3), where Stage 3 was the one they considered to be of greatest value for their learning. Still, Stage 4 was the one they thought most challenging to perform. Stages 1 and 2 evaluations were similar, although Stage 1 stands out in value for learning.

Students were asked to identify (on a Likert scale where one represents not at all and seven represents a lot) how important they considered function, aesthetics, human dignity, safety, and product cost when making product design decisions. Significant differences can be observed between the aspects evaluated: Figure 4 compares Aesthetics and Human Dignity, in which the latter obtained a much higher rating than Aesthetics.

As a result, they evaluated all the process stages positively, highlighting the Detailed Design stage (3) as the one that contributed the most value to developing their disciplinary competencies and pointed out the Implementation stage as the most challenging. Likewise, the students positively valued the nursing home staff's participation in the project's development, highlighting its importance during the Research stage. On the other hand, students recognised some differences in this design process compared to their previous experiences in other design courses such as specialists participation, difficulties to obtain information directly from users due to their physical and cognitive impairment, also in the design stages there was a significant difference in the number of iterations required to reach a viable solution ensuring

that it improves the patient's quality of life and maintains their human dignity, while other processes focus on market opportunities or designs for commercial purposes.
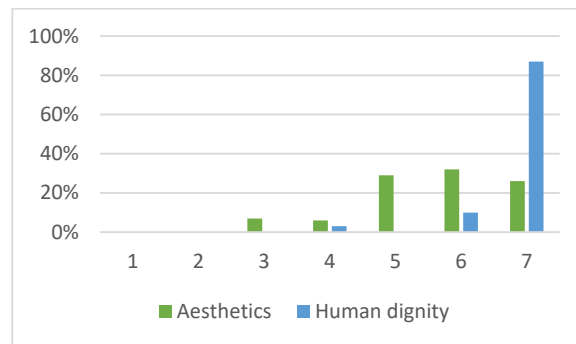

Figure 4. Importance of aesthetics vs human dignity when designing

4 DISCUSSIONS

As can be seen in the results, the students found the project very difficult even though 68% said that they already had experience in projects for people with particular conditions. This could be related to students having to consider several user types as patients, caregivers and family members simultaneously, as Flores suggests [18], and it is reinforced by their appreciation for the increase in their professional skills (Figure 2). Regarding this aspect, it is a valuable indicator that students positively appreciate a project of this type in their professional skills development because it connects the disciplinary task with this type of user.

Regarding the process followed in executing the projects, it is significant that the students rated Stages 1 and 3 as producing more learning, considering that the first stage is when they have the first contact with the users and become aware of their living conditions; moreover, Stage 3 is when they present their beta prototype, a product with a very high level of quality and finish that they also must validate with users. Also, it is striking that the students found Stage 2 to be of lesser value in learning because it is where the most user interactions and concept iterations occur within the process.

Figure 4 shows the highly relevant importance the students gave to human dignity when making design decisions. They aligned with Adolfo et al. [2]and Gossett et al. [10]by seeking to improve the elderly's quality of life by giving them more independence in their activities; this factor prevails over others that traditionally impact design decisions. This allows us to say that the students demonstrated a change in the way they approach social impact projects and that they have the required competencies to achieve them.

5 CONCLUSIONS

The project's development had an impact that transcended the practical aspects; working with older people implies deepening empathy and considering their vulnerability. Students also paid attention to the residents' human dignity due to their dependence on others to meet their basic needs. They recognised the value of identifying how several types of users interacted with the products. In this, the students noted the relevance of medical personnel and caregivers, who attend to and accompany the older adults in all their daily activities even if they are not considered the primary or first-order users.

In conclusion, it was possible to determine that the design process proposed in this research allows the development of products that satisfy real needs that tend to go unnoticed such as personal safety, diaper changing and feeding due to the lack of consideration of the different users, where each may have a different perception of the same activity simply because of how they relate to it, as usually happens in cases involving the elderly residents, their families, and their caregivers in nursing homes.

ACKNOWLEDGEMENTS

Architecture, Art and Design Research Group - Advanced Design Processes for Sustainable Transformation- of which they are part.

REFERENCES

[1]   The UN Refugee Agency Older persons *https://emergency.unhcr.org/protection/persons-risk/older-persons* 2020, May 18. Retrieved November 15, 2023, from https://emergency.unhcr.org/protection/persons-risk/older-persons.

[2]   Adolfo G. and Cadavid S. *Diseño de envases para usuarios de la tercera edad Designing containers for elderly users* (n.d.).

[3]   World Health Organisation Ageing and Health *World Health Organisation* 2022, September 22. Retrieved March 7, 2024, from https://www.who.int/news-room/fact-sheets/detail/ageing-and-health.

[4]   Pan American Health Organisation Data and visualisations *Pan American Health Organisation* 2019. Retrieved March 7, 2024, from https://www.paho.org/en/data-and-visualisations.

[5]   Pérez-Pérez M., García-Morales L., Coromina-Hernández J. C., Álvarez-González M. Á., Balmaseda-Serrano R. and Manzanero A. L. *Visual memory in the third age. Regularities for interface design* 2020. Retrieved from http://www.rii.cujae.edu.cu1

[6]   Munari B. *Da cosa nasce cosa* 1981. Rome: Laterza.

[7]   Norman D. *La psicología de los objetos cotidianos* (NEREA, Ed.) 1990 (Castellano.). Madrid.

[8]   Anderzhon J., Hughes D., Judd S. and Kiyota E. *Design for Aging: International Case Studies of Building and Program* (Wiley, Ed.) 2012.

[9]   Brown T. *Change by Design: How Design Thinking Transforms Organisations and Inspires Innovation* 2009. New York: Harper Collins.

[10] Gossett A., Mirza M., Barnds A. K. and Feidt D. Beyond access: A case study on the intersection between accessibility, sustainability, and universal design *Disability and Rehabilitation: Assistive Technology* 2009, *4*(6), 439–450. https://doi.org/10.3109/17483100903100301

[11] Kiyota E. Co-creating Environments: Empowering Elders and Strengthening Communities through Design *Hastings Center Report* 2018, *48*, S46–S49. https://doi.org/10.1002/hast.913

[12] Hanington B. and Martin B. *Universal Methods of Design: 100 Ways to Research Complex Problems, Develop Innovative Ideas, and Design Effective Solutions* 2012 (1st ed.). Digital ed. Beverly, MA: Rockport Publishers. 2012.

[13] Rodríguez Morales L. *Diseño: estrategia y táctica* 2004. México: Siglo XXI. Retrieved from http://0-search.ebscohost.com.biblioteca-ils.tec.mx/login.aspx%3fdirect%3dtrue%26db%3dnlebk%26AN%3d131788%26lang%3des%26site%3deds-live%26scope%3dsite

[14] Philips P. *Creating the perfect design brief: how to manage design for strategic advantage* (Allwoth Press, Ed.) 2004. Retrieved from https://search.ebscohost.com/login.aspx?direct=true&db=cat03431a&AN=bdis.b1047431&lang=es&site=eds-live&scope=site

[15] Rodríguez Mondelo P. M., Gregori Torada E. and Barrau P. *Ergonomía I Fundamentos* 1999. Edicions UPC. https://doi.org/10.5821/ebook-9788498801125

[16] Becerra L. *CMF Design: The Fundamental Principles of Colour, Material and Finish Design* 2016. Frame Publishers.

[17] Ulrich K. T. and Eppinger S. D. *Product Design and Development; Sixth Edition.* 2016 (6th ed.). New York: McGraw-Hill. Retrieved from www.mhhe.com

[18] Flores C. *Ergonomía para el diseño* 2001 (1st ed.). México: Designio.

[19] Zhou Z., Wang L., Ye R. and Yue H. A humanistic-care factors application hierarchical design-model for intelligent elderly products *Heliyon* 2023, *9*(3). https://doi.org/10.1016/j.heliyon.2023.e13734

[20] Hernández Sampieri R., Fernández Collado C. and Baptista Lucio M. *Metodología de la investigación* 2010 (5th ed.). McGraw Hill.

[21] Cañizares J. C. M., Rojas J. C. and Acuña A. Idea generation and integration method for inclusion and integration teamwork *Frontiers in Education* 2023, *8*. https://doi.org/10.3389/feduc.2023.1009269.