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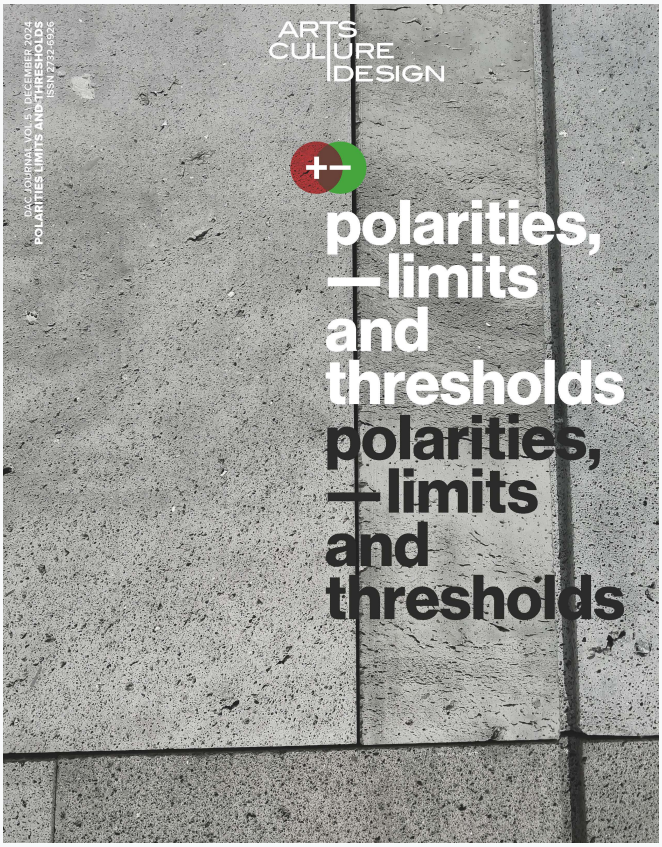
POLARITIES LIMITS AND THRESHOLDS



MAPPING PRIORITIES IN PRODUCT DESIGN:

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MAPPING PRIORITIES IN PRODUCT DESIGN: STUDENT INSIGHTS ON COURSE CONTENT AND PROFESSIONAL RELEVANCE.

ARTICLE

ABSTRACT

This article presents findings from the 2023 survey titled “Study Futures for Product Design,” conducted by three faculty members from ESAD College of Art and Design. The survey aimed to gather and analyse insights from one hundred undergraduate and postgraduate students regarding their experiences and expectations within their product design education. This research was motivated by ongoing observations within ESAD’s Master’s program in Product Design, as well as contemporary studies on design education for the 21st century by scholars such as Michael Meyer and Don Norman. The findings underscore the evolving nature of design education, particularly the need for curricular adjustments that align more closely with the demands of the modern professional landscape. By emphasising student feedback, this article advocates for a reevaluation of current pedagogical approaches, aiming to better prepare students for the diverse and dynamic challenges of the design industry. The study calls for a shift in focus towards teaching content that enhances relevance to professional applications and optimises employment opportunities in the field of product design and related industrial specialisations.

INTRODUCTION

As Meyer and Norman (2019) noted, *“Designers are entrusted with increasingly complex and impactful challenges.*” This article addresses these challenges by exploring the future needs of product designers and discussing the emerging skills required to perform effectively within the Fourth Industrial Revolution[1]. In response, educators, particularly within the polytechnic system, must observe these trends, analyse them, and propose

1 “Fourth Industrial Revolution”, “4IR”, or “Industry 4.0” is a buzzword and neologism describing rapid technological advancement in the 21st century.

new educational content that prepares future generations of product designers for the evolving demands of the design market and industry.

As early as 1971, designer, educator, and author Victor Papanek stated; *"Education for designers is based on learning skills, nourishing talents, understanding the concepts and theories that inform the field, and, finally, acquiring a philosophy. It is unfortunate that our design schools proceed from wrong assumptions. The skills we teach are too often related to processes and working methods of an age that has ended."* (Papanek, V. J. - 1971).

Meyer and Norman further assert; *"When we examine what and how our system teaches young designers, we discover that the most valuable elements of the designer's perspective and process are seldom taught. Instead, some designers grow beyond their education through their experience working in industry, essentially learning by accident. Many design programs still maintain an insular perspective and an inefficient mechanism of tacit knowledge transfer."* (Meyer, M. W., & Norman, D. - 2019).

In May 2023, three Industrial Design Specialists[2], lecturers for the Master's, postgraduate, undergraduate, and technical courses in Product Design at ESAD College of Art and Design[3]—formed an autonomous research group to critically examine the pedagogical activities, methods and tools currently employed in higher art and design education. Their primary focus was on the Master's program in Product Design and the Postgraduate Specialisation courses in Furniture Design and Mobility Design at ESAD. The initial objective was to reevaluate the titles and descriptions of these courses, along with the content presented on the institutional website and social media platforms. However, the discussions soon evolved, leading to a broader examination of the program structures and the consideration of alternative approaches to the expected teaching and learning outcomes for students.

As the discussions evolved into brainstorming sessions, two significant avenues for investigation emerged. The first was to engage with leading design institutions and robust industry influencers to observe emerging trends and expectations. The second was to analyse the relevance of the current curriculum and propose new expected teaching and learning outcomes to meet product design market needs.

Over a period of two months, data was gathered, analysed, and organised into a concise report outlining potential new directions for Master's and postgraduate design courses. This report includes proposed changes to course titles and content, incorporating terms such as innovation, circular design, and intelligent systems. It also compiles keywords that comprehensively represent product design as a discipline, drawing insights from leading higher education design institutions worldwide. The report acknowledges the integration of UX and UI[4] design into the product design process, emphasises the role of business strategies in developing new products, and highlights the importance of virtual consumer testing before product development. Additionally, it underscores the

2 The title of specialist, awarded by polytechnic higher education institutions, proves the quality and special relevance of the professional curriculum in a given area for the exercise of teaching functions in polytechnic higher education.

3 ESAD College of Art and Design (Escola Superior de Artes e Design), based in Matosinhos (near Porto), Portugal, specialises in Design and Digital Arts, and since 1989, has stood out for its prestigious teaching staff, quality facilities and successful graduates it has taught.

4 In digital design, user interface (UI) refers to the interactivity, look, and feel of a product screen, while user experience (UX) covers a user's overall experience with the product.

need to embrace new technologies, including generative artificial intelligence tools[5], to enhance design workflows in both text and image formats.

However, to propose the integration of this material into our existing curriculum, it was necessary to establish a hierarchy of this information to determine the appropriate level of intervention within our current courses. To further validate the study and prioritise these proposed changes, it was decided to conduct an online survey targeting current undergraduate and postgraduate product design students at ESAD in 2022/23, as well as graduates since 2016, to assess the relevance of the study and identify key priorities for future teaching and learning objectives.

2. METHOD

This survey aimed to quantitatively assess students' knowledge, vision, and suggestions regarding various aspects of product design, offering twelve questions with various response options to capture their preferences. The questions were organised into four parts of inquiry, gathering data on students' current perceptions of product design, emerging trends and technologies, pedagogical methods, and teaching and learning outcomes. The survey was written and published online using Google Forms[6], and distributed by the researchers, inviting ESAD product design students and graduates to participate.

In addition to the provided response options, ten of the twelve questions included an 'Other' option, allowing participants to suggest alternative responses. Furthermore, seven of the twelve questions permitted participants to select three, five, or eight responses—approximately one-third of the possible options—enabling us to identify response priorities when analysing the data in conjunction with other participant responses. Lastly, the survey was produced in both Portuguese and English to clarify specific design terminology and include participation from Erasmus[7] students who attended the product design courses.

PART 1 - CURRENT PERCEPTIONS OF PRODUCT DESIGN

This section of the survey allowed participants to briefly identify their current working status in product design education or graduation. This identification helped categorise participants' experience levels as novice, moderate, or expert in product design. Our intention was to focus on participants with more product design experiences, so invitations were distributed to those in their second year of undergraduate study and beyond:

Question 1. What is your current working status?: Undergraduate student; Postgraduate/Master's student; Recently graduated; Other (please specify);

Question 2. What does product design mean to you? (select five options): Aesthetics; Business; Development; Engineering; Ideation; Industry; Materials; User-centred; Process; Research; Society; Strategy; Sustainability; Technical; Other (please specify).

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5 Generative artificial intelligence is artificial intelligence capable of generating text, images, videos, or other data using generative models, often in response to prompts.

6 Google Forms is a survey administration software included as part of the free, web-based Google Docs Editors suite offered by Google.

7 The Erasmus Programme is a European Union student exchange programme established in 1987. Erasmus+, or Erasmus Plus, is the new programme combining all the EU's current schemes for education, training, youth and sport, which was started in January 2014.

The latter question aimed to understand students' perceptions of their chosen discipline. While all the response options—and more—were relevant, the goal was to identify preconceptions or practical realities regarding the primary skills needed for product design. This result would be particularly interesting to cross-reference with part four, questions eleven and twelve, to observe commonalities between students' initial perceptions and their specific expectations for teaching and learning outcomes.

PART 2 - EMERGING TRENDS AND TECHNOLOGIES

Questions three to seven present alternative course titles for the product design field, informed by research trends from other higher education institutions and emerging technical curricular units within product design programs, primarily in Europe. These alternatives were also supported by suggestions from respected product design professionals and industry leaders. The questions explored potential new titles for our current courses—Product Design, Furniture Design, and Mobility Design—assess the relevance of UX design within a product design curriculum, and investigate students' knowledge of and preferences for digital tools:

Question 3. In your opinion, which course is most appealing or relevant for specialising in designing 4.0 product solutions by embracing new technologies? (Select up to three options): Product Design; Industrial Design; Advanced Product Design; Design for Industry; Product Innovation Design; Product Design and Development; Product Design Interfaces; Product Design Interaction; Product Design Strategies; Other (please specify);

Question 4. In your opinion, which course title is most appealing or relevant for specialising in designing sustainable products for various local industries? (Select up to three options): Circular Product Design; Design for Industry; Furniture Design; Industrial Design; Integrated Product Design; Product Design and Development; Sustainable Product Design; Other (please specify);

Question 5. In your opinion, which course title is most appealing or relevant for specialising in designing future mobility solutions for moving people and goods? (Select up to three options): Automotive Design; Mobility Design; Smart Vehicle Design; Transportation Design; Vehicle Design; Other (please specify);

Question 6. In your opinion, UX design is primarily for?: Product designers; Communication designers; Both product and communication designers; Other (please specify);

Question 7. Which digital tools do you consider important for product design? (Select up to five options): Adobe Illustrator[8]; Adobe Photoshop[9]; Autodesk Alias[10]; Autocad[11]; Autodesk Fusion 360[12]; Autodesk Inventor[13]; Autodesk 3ds Max[14];

8 Adobe Illustrator is a vector graphics editor and design software developed and marketed by Adobe.

9 Adobe Photoshop is a raster graphics editor developed and published by Adobe for Windows and macOS.

10 Autodesk Alias is a family of computer-aided industrial design software predominantly used in automotive design and industrial design for generating class A surfaces using Bézier surface and non-uniform rational B-spline modelling method.

11 Autocad is a 2D and 3D computer-aided design software application developed by Autodesk.

12 Autodesk Fusion is a commercial computer-aided design, computer-aided manufacturing, computer-aided engineering and printed circuit board design software application, developed by Autodesk.

13 Autodesk Inventor 3D CAD software provides mechanical design, documentation, and simulation tools.

14 Autodesk 3ds Max, formerly 3D Studio and 3D Studio Max, is a professional 3D computer graphics program for making 3D animations, models, games and images.

Blender[15]; Catia[16]; Figma[17]; KeyShot[18]; Onshape[19]; Rhinoceros 3D[20]; Sketchbook[21]; Solidworks[22]; Other (please specify).The primary goal of these questions was to gauge student's preferences on the extent to which technological and sustainable trends are integrated into their courses, and whether these themes should be highlighted in course titles or emphasised within course descriptions. Additionally, over the past decade, user experience—originally coined by Don Norman in the 1990s (Uddin, N. 2023)—along with the study of human factors and ergonomics from the 1940s and 50s, has evolved from focusing on the tangible aspects of a product to encompassing digital experiences and screen interfaces, making it an essential part of product design today.

> *"The fusion of emerging technologies with industrial design has catalysed a fundamental shift in the aesthetics, user experiences, and service frameworks of products in the Industry 4.0 era. Simultaneously, this convergence has heightened the demands placed on the technological integration competencies of designers."* (Zhang, M., Zhang, X., Chen, Z., Wang, Z., Liu, C., Park, K. - 2024).

Understanding student preferences can guide investment in these tools, especially given the limited teaching hours for this subject. Additionally, this research indicated that Adobe and Autodesk software programs dominate within higher academic institutions due to their extensive menu of digital tools and availability of educational licences. However, industry is increasingly recommending alternative software programs for their specialised functions, some of which are free or open-source, providing an open data culture to product design workflow.

An ecological mindset should also be reinforced within the product design discipline by promoting methods and theories of sustainable design. Sustainable design is defined as *"an approach to design that consists of a variety of sustainable design principles, all of which are centred around extending product lifespans and avoiding the depletion of natural resources"*. (Kramer, L. 2021). This topic should be analysed not only with students learning the product design discipline, but also with business and industrial collaborators who will eventually support their projects or produce their products.

PART 3 - PEDAGOGICAL METHODS

The next three questions explore students' preferences regarding how they wish to be taught, focusing on their desired access to teaching staff and the degree of

15 Blender is a free and open-source 3D computer graphics software tool set that runs on Windows, MacOS, BSD, Haiku, and Linux. It is used for creating animated films, visual effects, art, 3D-printed models, motion graphics, interactive 3D applications, virtual reality, and, formerly, video games.

16 CATIA is a multi-platform software suite for computer-aided design, computer-aided manufacturing, computer-aided engineering, 3D modelling and product lifecycle management, developed by the French company Dassault Systèmes.

17 Figma is a collaborative web application for interface design, with additional offline features enabled by desktop applications for macOS and Windows.

18 KeyShot is a 3D rendering program developed by Luxion, Inc. It is designed to create photorealistic images of 3D models quickly and easily.

19 Onshape is a computer-aided design software system, delivered over the Internet via a software as a service model.

20 Rhinoceros is a commercial 3D computer graphics and computer-aided design application software that was developed by TLM, Inc.

21 Sketchbook is a raster graphics software app intended for expressive drawing and concept sketching also for making animations.

22 SolidWorks is a brand within Dassault Systèmes that develops and markets solid modelling computer-aided design, computer-aided engineering, 3D CAD design and collaboration, analysis, and product data management software.

freedom they have to choose or influence learning experiences based on their personal ambitions or design career goals. This flexibility is primarily relevant in project design classes, which utilise more practical teaching methods and can therefore be customised to meet individual student needs. However, this approach could also extend to laboratory, theory, or technical classes, depending on the number of course candidates and the resources available to support such customisation:

Question 8. Design project classes typically account for a significant portion of most design courses (40% of contact teaching hours). Would you prefer: One specialised teacher; Multiple specialised teachers; Other (please specify);

Question 9. For project classes, would you prefer: The same design briefing for all students; Tailored design briefings to meet students individual needs; Other (please specify);

Question 10. For future Master's and postgraduate courses in design, would you prefer: The regular curricular program; To customise your curricular program; Other (please specify).

Michael Meyer and Don Norman state that *"Design is an applied field, and our students must practise the application of a good design process, often within a studio environment, on actual project work."* Consequently, learning from design experts and industry specialists can effectively transfer real-world experiences into design education. The survey aims to gather student opinions on this approach.

PART 4 - TEACHING AND LEARNING OUTCOMES

The last two questions focused on what students and graduates expected to learn from a Master's-level product design course, compared to the skills they considered important for professional practice. These questions are interrelated, approaching the same topic from different perspectives, and aligning response options to better understand participants' interpretations and priorities.

Question 11. Which learning experiences do you consider important at the Masters and postgraduate level in product design? (Select up to eight options): Design strategy; Design process; Design business; Research; Brainstorming methods; Design thinking; Sketching and rendering; Materials and processes; Circular design; Sustainable design; Industry collaboration; Creativity; Multidisciplinary; Using artificial intelligence; Making/testing models and prototypes; Analysing user-data; Technical communication; Colour, material and finish (CMF); 3D digital tools; Interview and portfolio; Design management and budget; Leadership; User-experience (UX/UI);

Question 12. Which skills do you consider important for a professional product designer? (Select up to eight options): Design planning; Design stages and activities; Design marketing; Informative studies; Discourse and visual dialogue; Cognitive methods; Visual representation; Components and assemblies; Circular industrial methods; Environmental issues; Projects with business and industry; Inspirational activities; Cross-disciplines; Working with AI; User-interaction; Using tables and charts; Mechanical feasibility; Product aspect and user-feel; Virtual modelling; Formal presentations and speaking; Organising time and costs; Group cooperation; Digital products and screen experiences.

Similar to question two, we could have expanded this list with many more response options. To ensure a comprehensive yet manageable set of choices, we reduced

the survey to twenty-three options, carefully combining related learning characteristics. This approach was based on common course philosophies and descriptors found in reputable higher education institutions. The objective was to analyse and cross-reference these responses to prioritise students' preferred learning outcomes.

3. RESULTS

The survey, titled "Study Futures for Product Design," was produced and distributed to students via email. In some cases, researchers encouraged participation during classes to help achieve quantitative results. This research was conducted as an in-house initiative, so participants were exclusively ESAD students from the product design course, ESAD graduates with a product design degree, or Erasmus students who attended the product design course at either the undergraduate or postgraduate level. A total of ninety-six students participated in the survey, and the results were presented in graphical form.

It was noted that several students expressed satisfaction with this research initiative, particularly appreciating the potential customisation of course material, the inclusion of emerging technologies, and the emphasis on sustainability issues.

RESPONSES TO QUESTION 1 - WHAT IS YOUR CURRENT WORKING STATUS?

From this diagram, Figure 1 - Students' Working Status, it can be observed that the distribution of participants among undergraduate, postgraduate, and graduated students was almost equal, thereby providing a balanced basis for analysing responses from novices, intermediates, and experts within the product design field.

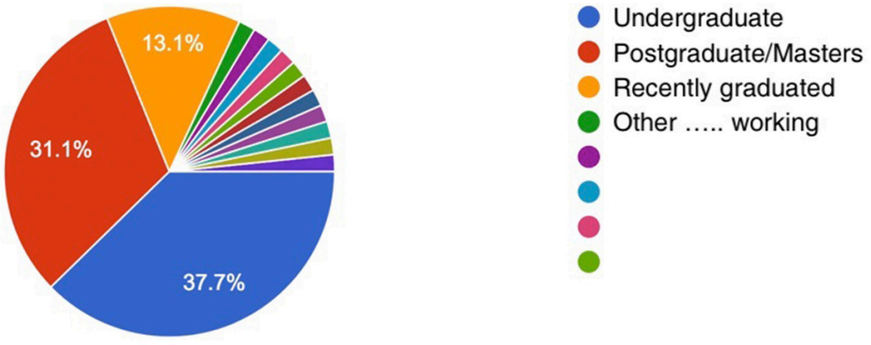

Figure 1. Students' Working Status (Aston 2023)

RESPONSES TO QUESTION 2 - WHAT DOES PRODUCT DESIGN MEAN TO YOU?

In Figure 2 - Students' Perception of Product Design, it can be observed that "Development," "Process," and "User-Centred" were the top three options selected by participants, with "Aesthetics," "Research," and "Sustainability" close behind. While this may not represent a comprehensive list for product design, it is reassuring that the essentials were highlighted, particularly "Design Process" as a primary competence to master in this discipline. Interestingly, "Development" topped the list, yet "Engineering" and "Technical" options ranked near the bottom, despite their importance for product development. This suggests some misunderstanding or irregularities in students' perceptions of the subject. Additionally, "Business," "Industry," and "Society" scored relatively low, likely because the

question focused on ‘What is product design?’ rather than ‘Why do we do product design?’ A rephrasing of the question could potentially have yielded significantly different results.

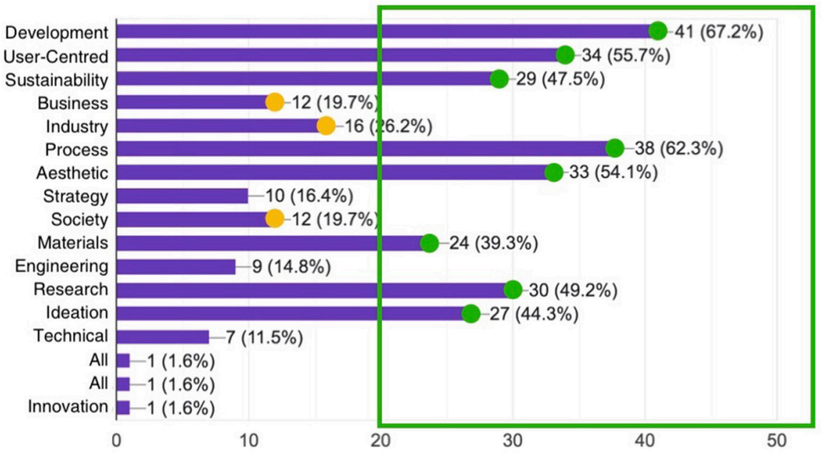

Figure 2. Students’ Perception of Product Design (Aston 2023)

RESPONSES TO QUESTION 3 - IN YOUR OPINION, WHICH COURSE TITLE IS MOST APPEALING OR RELEVANT FOR SPECIALISING IN DESIGNING 4.0 PRODUCT SOLUTIONS BY EMBRACING NEW TECHNOLOGIES?

In alignment with the top response from the previous question, Figure 3 - Most Appealing Course Title for Product Design 4.0, shows that “Product Design and Development” scored highest among students and graduates, followed by “Product Innovation,” and “Advanced Product Design.” This highlights students’ preference for integrating a technological edge into the course title, reflecting an evolution from traditional product design. Although titles featuring “Interfaces” and “Interaction” received above-average consideration, it was surprising to see that titles including “Industrial” or “Industry” were less popular, since they are more commonly associated with product design.

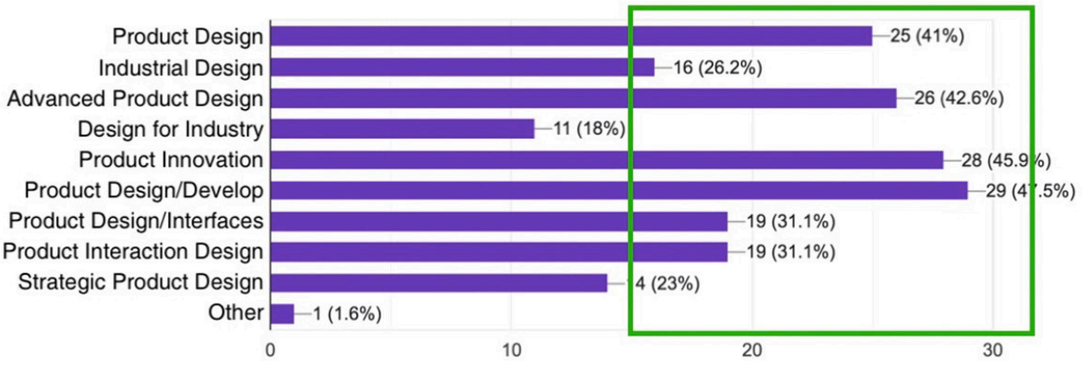

Figure 3. Most Appealing Course Title for Product Design 4.0 (Aston 2023)

RESPONSES TO QUESTION 4 - IN YOUR OPINION, WHICH COURSE TITLE IS MOST APPEALING OR RELEVANT FOR SPECIALISING IN DESIGNING SUSTAINABLE PRODUCTS FOR VARIOUS LOCAL INDUSTRIES?

According to the diagram, Figure 4 - Most Appealing Course Title for Sustainable Product Design with Local Industry, course titles containing the words “sustainable,” “circular,” and “development” scored the highest. Once again, titles including “industrial”

or “industry” received fewer responses. Similarly, “furniture design” had a below-average response, though it was intended to identify a type of local industry. If the course title had been “Sustainable Furniture Design,” it might have scored higher in this question.

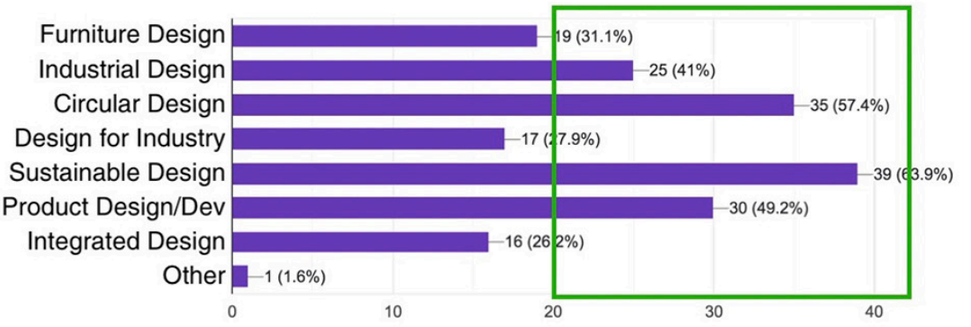

Figure 4. Most Appealing Course Title for Sustainable Product Design with Local Industry (Aston 2023)

RESPONSES TO QUESTION 5 - IN YOUR OPINION, WHICH COURSE TITLE IS MOST APPEALING OR RELEVANT FOR SPECIALISING IN DESIGNING FUTURE MOBILITY SOLUTIONS FOR MOVING PEOPLE AND GOODS?

Illustrated in this question, Figure 5 - Most Appealing Course Title for Future Mobility Solutions, students’ preferred course title was “Mobility Design,” followed by “Smart Vehicle Design” and “Transportation Design.” Interestingly, the weaker responses were for “Automotive Design” and “Vehicle Design.” This may indicate that students prefer course titles that communicate broader mobility concepts and the systems that support them, rather than focusing solely on vehicle styling.

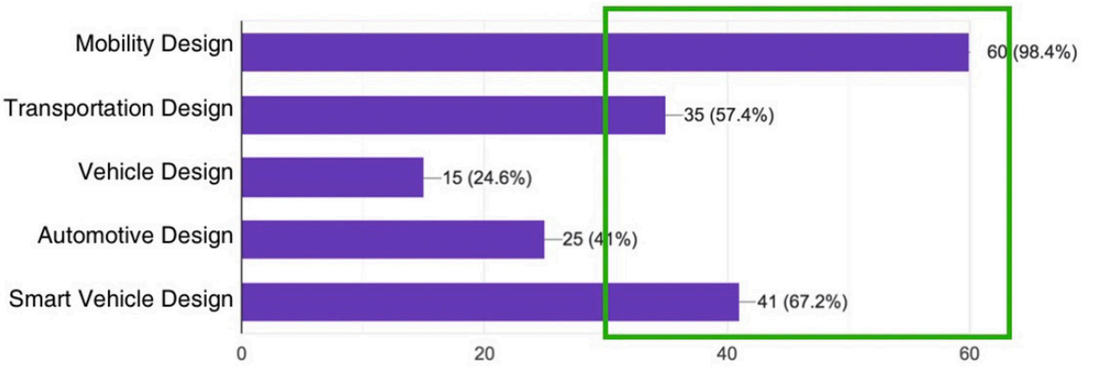

Figure 5. Most Appealing Course Title for Future Mobility Solution (Aston 2023)

RESPONSES TO QUESTION 6 - IN YOUR OPINION, UX DESIGN IS PRIMARILY FOR PRODUCT OR COMMUNICATION DESIGNERS?

The diagram, Figure 6 - UX Design for Product or Communication Designers, clearly shows that the majority of student responses favour UX design as a discipline for both product and communication designers. Unfortunately, communication designers were not invited to participate in this survey, and their inclusion would likely have impacted the results. However, this outcome highlights the need to incorporate UX design activities into future course study programs for product design.

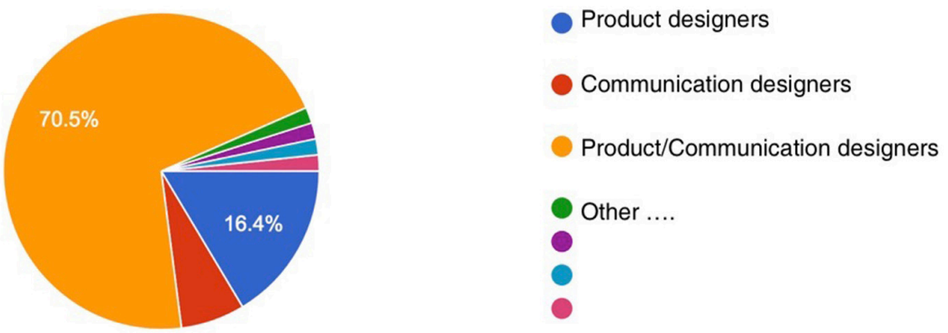

Figure 6. UX Design for Product or Communication Designers (Aston 2023)

RESPONSES TO QUESTION 7 - WHICH DIGITAL TOOLS DO YOU CONSIDER IMPORTANT FOR PRODUCT DESIGN?

Given that the survey participants were product design students and graduates, their responses were based on the software programs they were currently learning, using for their study projects, and considering employment demands or compatibilities. Interestingly, the diagram, Figure 7 - Digital Tools Considered Important for Product Design, shows that image editing software, typically associated with communication design, ranked higher than computer-aided design (CAD) software, which is commonly used for product design, development, and prototyping. This might suggest that students and graduates are more focused on the ideation or presentation of product design concepts rather than technical development. While it is good practice for product designers to use both image editing and CAD software, future surveys might benefit from analysing these digital tools in separate questions to provide clearer insights.

Additionally, online collaboration platforms and generative artificial intelligence software were not included in the responses to this question, as research indicated they were not formally taught in product design courses at the time. However, tools such as

Google Workspace[23], Miro[24], ChatGPT[25], Midjourney[26], DALL-E[27], and Vizcom[28] have emerged in classroom settings and are increasingly used informally, despite lacking formal training.

23 Google Workspace is a collection of cloud computing, productivity and collaboration tools, software and products developed and marketed by Google.

24 Miro, formerly known as RealtimeBoard, is a digital collaboration platform designed to facilitate remote and distributed team communication and project management.

25 ChatGPT is a chatbot and virtual assistant developed by OpenAI and launched on November 30, 2022. Based on large language models, it enables users to refine and steer a conversation towards a desired length, format, style, level of detail, and language.

26 Midjourney is a generative artificial intelligence program and service, generating images from natural language descriptions, called prompts.

27 DALL·E is a text-to-image model developed by OpenAI using deep learning methodologies to generate digital images from natural language descriptions known as “prompts”.

28 Viacom is an Ai-powered creative tool designed for design and creative professionals. It offers a transformative approach to concept drawing, enabling users to enhance visuals and workflow.

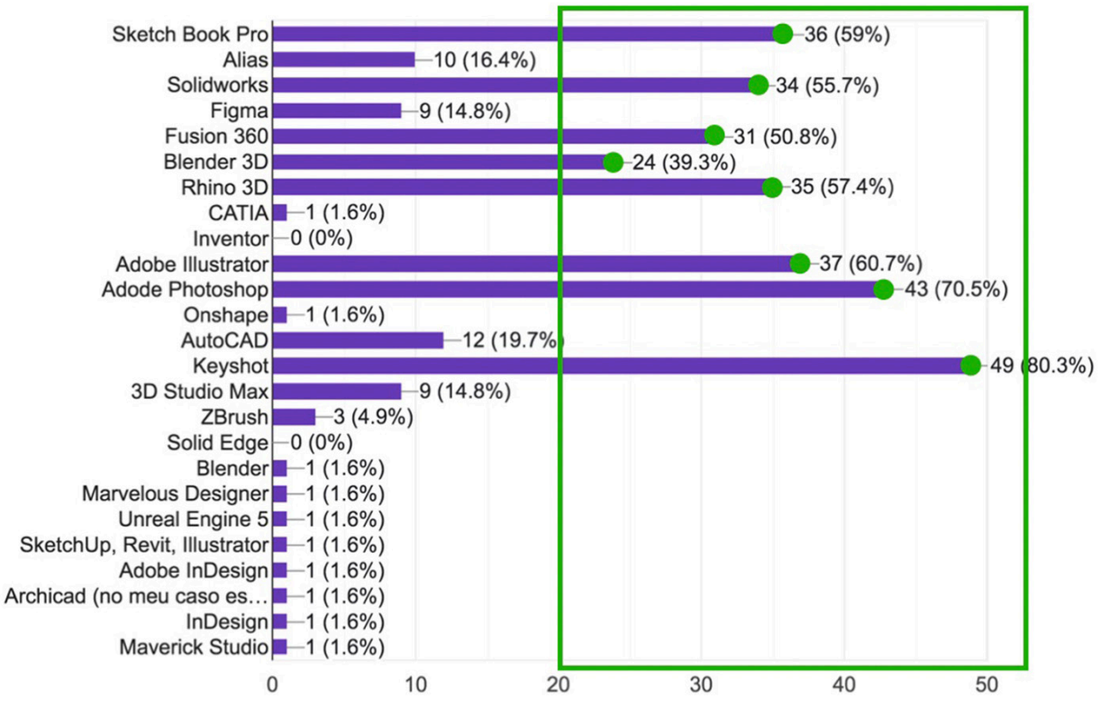

Figure 7. Digital Tools Considered Important for Product Design (Aston 2023)

RESPONSES TO QUESTION 8 - DESIGN PROJECT CLASSES TYPICALLY ACCOUNT FOR A SIGNIFICANT PORTION OF MOST DESIGN COURSES (ABOUT 40% OF CONTACT TEACHING HOURS). WOULD YOU PREFER ONE OR MULTIPLE SPECIALISED TEACHERS?

According to the diagram, Figure 8 - Preferred Teaching Format—One or Multiple Teachers for Project Classes, there is clear evidence that students and graduates prefer multiple teachers for project classes. Additionally, participant responses in the 'Other' category mentioned a preference for lead teachers supported by assistants and invited specialists, further reinforcing the preference for a multiple-teacher format.

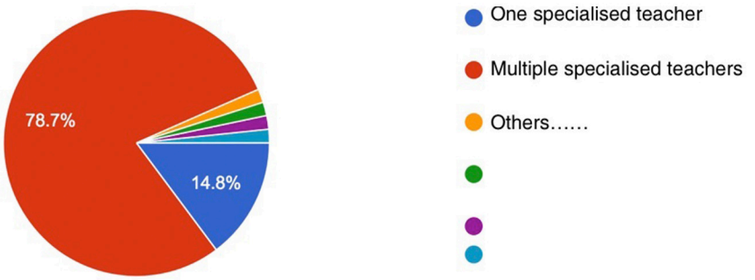

Figure 8. Preferred Teaching Format—One or Multiple Teachers for Project Classes (Aston 2023)

RESPONSES TO QUESTION 9 - FOR PROJECT CLASSES, WOULD YOU PREFER THE SAME DESIGN BRIEFING FOR ALL STUDENTS, OR A TAILORED DESIGN BRIEFING TO MEET STUDENTS' INDIVIDUAL NEEDS?

As shown in the diagram, Figure 9 - Preferred Design Project Briefing—Common or Tailored, over two-thirds of the students and graduates preferred a tailored design project briefing. While both formats have their advantages and disadvantages, this raises questions about the feasibility of allowing students the liberty to choose topics and

themes, as well as the logistical challenges teachers may face in implementing the tailored option. Nonetheless, this result is valuable for analysing the potential for customising project briefings for students, individuals or groups.

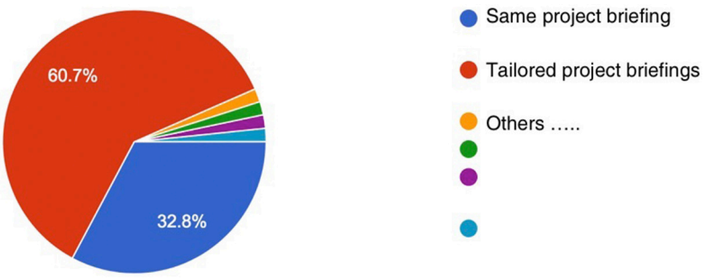

Figure 9. Preferred Design Project Briefing—Common or Tailored (JHA 2023)

RESPONSES TO QUESTION 10 - FOR FUTURE MASTERS' AND POSTGRADUATE COURSES IN DESIGN, WOULD YOU PREFER THE REGULAR OR CUSTOMISED CURRICULAR PROGRAM?

It is clear from the diagram, Figure 10 - Prefer Regular or Customised Curricular Program, that nearly 80% of students and graduates prefer to customise their curricular program, tailoring their learning experience to set options or individual requirements. This aligns with the results from the previous question, where a preference for tailored design project briefings was evident, and further reinforces the need to analyse students' ambitions in specialised areas of product design.

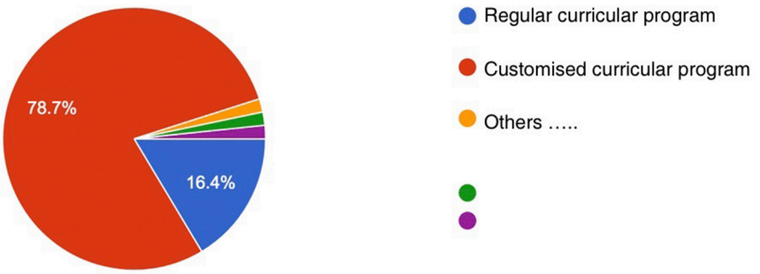

Figure 10. Preferred Regular of Customised Curricular Program (Aston 2023)

RESPONSES TO QUESTION 11 - WHICH LEARNING EXPERIENCES DO YOU CONSIDER IMPORTANT AT THE MASTER'S AND POSTGRADUATE LEVEL IN PRODUCT DESIGN?

This question presented twenty-three responses, from which product design participants were asked to select their preferred eight. As shown in the diagram, Figure 11 - Preferred Learning Experiences for Product Design Masters, the top five preferred response options were a mix of design processes, methods, tools, and skills: (G) Sketching and Rendering, (B) Design Process, (K) Industry Collaboration, (O) Making/Testing Models and Prototypes, and (S) 3D Digital Tools. On the other hand, the less popular responses included: (Q) Technical Communication, (V) Leadership, (I) Circular Design, (P) Analysing User-Data, and (N) Using Artificial Intelligence. As mentioned earlier, all the response options presented are commonly found in descriptions of other product design courses, and our objective was to prioritise these based on student and graduate preferences. Interestingly, the most popular responses align more with what students typically learn during an undergraduate

degree, while the less popular options should be emphasised in master's courses as more advanced design methods, particularly for design research and product development.

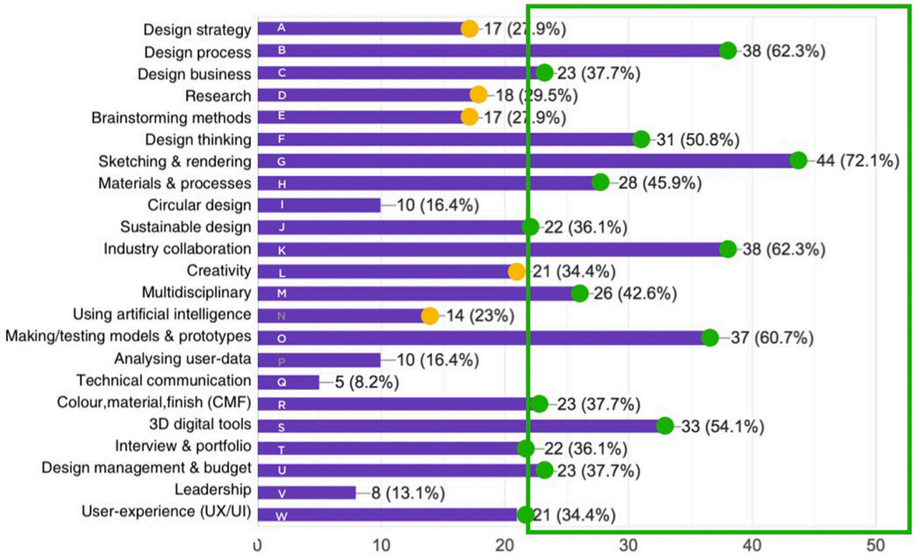

Figure 11. Preferred Learning Experiences for Product Design Masters (Aston 2023)

RESPONSES TO QUESTION 12 - WHICH SKILLS DO YOU CONSIDER IMPORTANT FOR A PROFESSIONAL PRODUCT DESIGNER?

In this question, product design students and graduates were asked to select eight of the possible twenty-three responses. These responses were similar to those in the previous question, with slight rephrasing for cross-referencing purposes. The diagram, Figure 12 - Preferred Skills for Professional Product Designers, shows the top five responses as: (K) Projects with Business and Industry, (A) Design Planning, (G) Visual Representation, (O) User-Interaction, and (V) Group Cooperation. Notably, three of these—K, G, and O—are common with the previous question's top responses. The least popular responses were: (P) Using Tables and Charts, (D) Informative Studies, (F) Cognitive Methods, (H) Components and Assemblies, and (W) Digital Products and Screen Experience, with one common response, P, overlapping with the previous question.

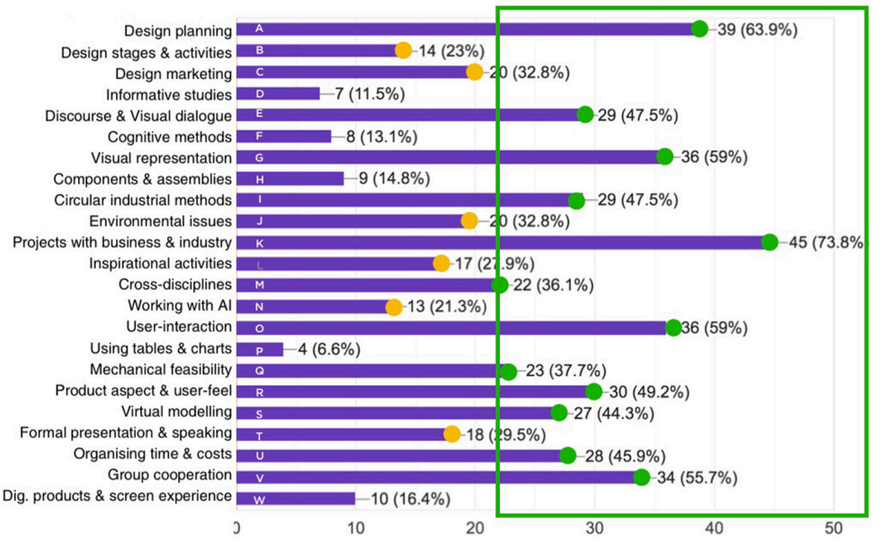

Figure 12. Preferred Skills for Professional Product Designers (Aston 2023)

MERGING RESPONSES TO QUESTIONS 11 AND 12 - COMPARING PREFERRED LEARNING EXPERIENCES WITH PROFESSIONAL SKILLS FOR PRODUCT DESIGNERS.

When comparing the results from questions eleven and twelve, distinct patterns emerge in the responses from students and graduates. In the diagram, Figure 13 - Comparing Responses from Learning Experiences and Professional Skills for Product Designers, we observe that the responses fall into two categories: those with similar levels of popularity and those with opposite levels of popularity. For instance, response (K) – Industry Collaboration/Projects with Business or Industry – which scored the highest, showed similar popularity across both questions, indicating that product design students prioritise practical learning experiences and challenges that involve collaboration with real-world industries. Similarly, response (P) Collecting and Analysing User-data/Using Tables and Charts, scored the lowest in both questions, therefore the least popular. In most cases, comparisons that showed opposing responses could be averaged to find a balanced consensus. However, when comparisons resulted in conflicting data—such as with response (V) Leadership/Group Cooperation— the phrasing of the response options were reviewed, even though the individual response to the question was still valid.

This comparative analysis aims to identify similarities between what students expect to learn in a master's course in product design and what they need for professional practice, prioritising these responses accordingly. The five most popular responses were: (K) Industry Collaboration/Projects with Business or Industry, (G) Sketching and Rendering/ Visual Representation, (O) Making and Testing Models and Prototypes/User Interaction, (S) 3D Digital Tools/Virtual Modelling, and (R) Colour, Material, Finish (CMF Design)/Product Aspect and User-Feel. The least popular responses were: (P) Collecting and Analysing User Data/Using Tables and Charts, (N) Using Artificial Intelligence/Working with AI, (Q) Technical Communication/Mechanical Feasibility, and (W) User Experience and Interaction (UX/UI)/Digital Products and Screen Experience.

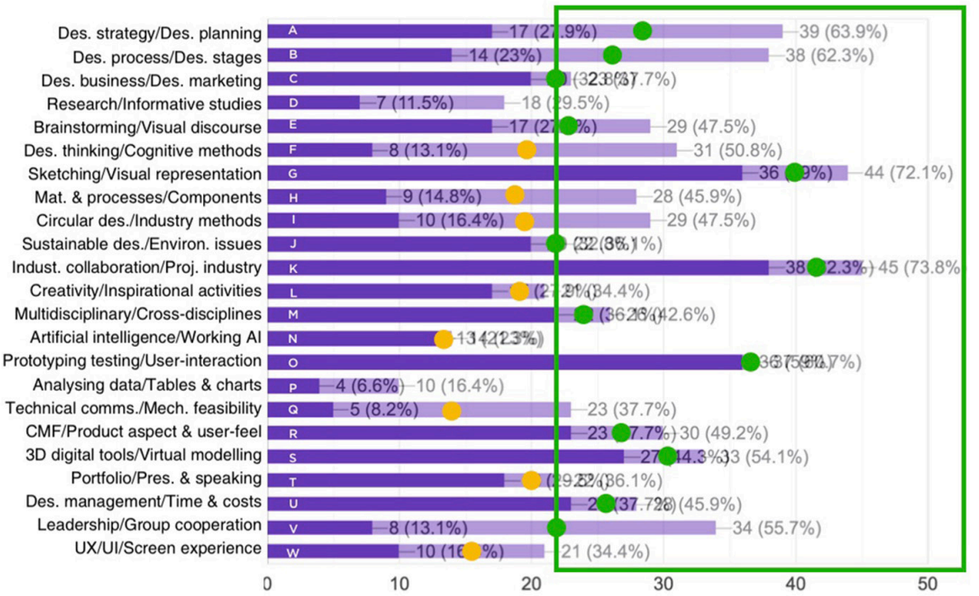

Figure 13. Comparing Responses from Learning Experiences and Professional Skills for Product Designers (Aston 2023)

These results offer valuable insights for discussing future learning objectives in product design courses. For instance, it is evident that participants prioritise industry

collaboration, which promotes applied product design practice, enhances portfolio quality, and increases potential employment opportunities. This practical teaching methodology aligns well with the Portuguese polytechnic system. Additionally, the high scores for (G) Sketching and Rendering/Visual Representation and (O) Making and Testing Models and Prototypes/User Interaction suggest that students and graduates place significant value on advanced drawing and making skills for visually representing and developing their product design ideas. However, these three experiences or skills are currently emphasised in the undergraduate product design curriculum, which could explain their popularity. However, this preference may reflect students' familiarity with traditional design education rather than emerging industry trends and demands, such as Generative AI, UX, or CMF Design.

4. CONCLUSIONS

The objective of this research was to map the priorities for product design higher education by observing the current landscape and integrating students' insights into course content and its professional relevance. The survey results provided valuable insights, highlighting clear trends while also raising some uncertainties. Although the participant pool was limited—comprising primarily ESAD product design students and graduates from 2016 to 2023, most of whom were Portuguese, broader distribution could have yielded more diverse perspectives. Nonetheless, the findings offer useful information that can be further developed and serve as a foundation for discussions on future curriculum enhancements.

The participants' initial perception of product design was analysed, revealing a preference for established practical activities over more technical ones. This suggests a tendency towards a 'learning by doing' teaching methodology rather than focusing on more complex theory. However, if the analysis were segmented into participant groups—novice (undergraduate), moderate (master's), and expert (graduated and working)—the results might better reflect their experiences and provide more accurate insights. This could also indicate the need to increase technical activities in the latter two groups. Additionally, it's worth noting that some graduated participants were working in other design areas, such as interior design. This suggests that product design courses might benefit from a more holistic approach, incorporating design methods and tools that are applicable to various specialisations, such as interior, furniture, mobility, and UX design.

This holistic approach is further evidenced by participants' preferences for emerging trends and technologies, as seen in their favourable response to course titles featuring terms like 'sustainability,' 'innovation,' or 'smart.' The acceptance of UX design and the integration of various digital tools to enhance the ideation, development, and presentation of product design concepts also reflect this broader perspective.

Regarding pedagogical methods, the survey results clearly indicate a student preference for curricular diversity and the ability to customise their learning outcomes within the product design course. While ESAD's current Master's program offers some choice in the second year through options such as final projects, dissertations, or internships, this flexibility is less present in the first year. These findings suggest that extending customisation and learning flexibility to the entire program could enhance the overall learning experience.

Lastly, the participants' preferred teaching and learning outcomes for a master's in product design, particularly when comparing expected learning experiences to professional skills, open a debate about the program's future direction. While the results are clear, a deeper analysis of the content and meaning is necessary to understand the potential priorities and relevance. The survey indicates that most participants gravitated towards 'safer' or more 'commonly known' aspects of product design, rather than embracing the 'riskier' or less familiar options. For instance, topics including UX design, Generative AI, and CMF design, which are increasingly highlighted by industry professionals as critical for product design roles, received only moderate interest from participants. This underscores the importance for product design course administrators to introduce or adapt curricular content to align more closely with industry needs, thereby enhancing students' employability.

This research provided valuable insights into the potential future of product design education. As many esteemed designers, educators, and researchers have noted, the field of design is encountering new challenges driven by industry and societal demands, necessitating educational adaptation. This survey served as a pilot study to gather evidence for this evolving landscape, some of which has already been implemented within our design courses. However, we plan to refine this research further and present it to a broader audience in the future to validate the priorities for product design education and ensure their professional relevance.

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