



PhD in DESIGN - 40th cycle

PNRR 630 Research Field: SUSTAINABLE DIGITAL PRODUCT DESIGN: EVALUATING USER EXPERIENCE, USABILITY, AND ENVIRONMENTAL IMPACT OF OBJECTS INTERFACES

Monthly net income of PhDscholarship (max 36 months)
€ 1500.0
In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	<p>The project investigates the potentialities and the sustainability of digital products, focusing on domestic and domotics applications. The aim is to envision possible future advanced scenarios and evaluate the effectiveness and impact of objects with digital interfaces, such as IoT and AI devices, in terms of emotional engagement, user experience and sustainability.</p> <p>The digital layer undeniably makes objects more attractive and marketable. However, there is a lack of understanding about the real future potentialities and a consequent verification process to ensure it. This PhD research will develop possible future scenarios as well as models to assess the usability and experiential quality of these solutions by integrating or contrasting digital layers within everyday products such as small household appliances.</p> <p>By evaluating the sustainability of the digital layer and defining its impact on user experience, this multidisciplinary project will reflect on business processes related to corporate sustainability while analyzing next-generation product systems, user experiences, and psychological and usability factors within the organization, under the direction of the supervisor's expertise.</p> <p>Today's society, particularly the younger generation, is increasingly attracted by advanced digital solutions but in the meantime aware of its environmental impact and recognizes the need for behavioral and lifestyle changes to ensure a sustainable future. This urgency emphasizes the pivotal role of design and industry in reshaping digital</p>



	<p>the pivotal role of design and industry in reshaping digital products to be more user and environmentally friendly. Several strategies can be implemented to reduce the environmental impact of an artefact, belonging to the following areas:</p> <ul style="list-style-type: none"> - Product and production level: Implementation of recycled materials, waste reduction and optimisation of energy consumption. For example, the use of recycled plastics in small household appliances can address material availability issues while enhancing the aesthetics of the items. - Ecosystem level: Prolong the life of products and implement smart disposal methods. - Social level: Influencing behaviour and attitudes through the use and interaction of products, which is essential for long-term positive change. As products become more complex and connected, this dimension of sustainability becomes increasingly important. <p>This research aims to link design approach, user experience (UX) and sustainable behaviour, redefining sustainability with wider industrial impact. It will rethink product development from the bottom up, responding to the needs of people and the planet. The aim is to envision advanced design smart products that promote sustainable behaviour, enabling conscious and positive user experiences.</p>
<p>Methods and techniques that will be developed and used to carry out the research</p>	<p>The research will adopt a design through research methodology. The candidate will collaborate with the De'Longhi design department to structure test activities on existing products and conduct measurements in collaboration with laboratories of the Politecnico di Milano, such as the Automotive eXperience Design (AXD) laboratory, specialised in the user experience dimension. Starting with an in-depth literature review and desk research, the study will include a careful analysis of the state of the art in sustainability in industrial processes related to design methods, user research, and behaviors. This preliminary phase will be enriched by on-site observations and interviews with key stakeholders in the new product development process, during the internship at the partner company.</p>



	<p>An open and shared co-design approach will be adopted, focusing on enhancing collaboration across different company departments such as design, R&D, innovation, marketing, management, and customer care. In this regard, the research process and findings will be shared with the company and all involved departments, generating a practical, learning-by-doing approach through dedicated collaborative workshops.</p> <p>Additionally, this process will include creating prototypes, conducting user testing, and gathering data on usability and user experience. The integration of biometric and biophysiological measurements will be essential, using connected instrumentation to evaluate the psychological dimensions of user interaction.</p>
<p>Educational objectives</p>	<p>The multidisciplinary nature of this project includes perceptual and psycho-perceptual aspects related to the acceptance of these interfaces by users and the quality of the proposed interaction.</p> <p>The training objectives of the project concern the development of a reflective and professional profile capable of combining practical and methodological dimensions in the creation of new sustainable digital products. The research process and the generated outputs will build new elements to prepare and support designers for contemporary challenges, giving a broader and more practical dimension to the application of sustainability in design methods and new product development. This will enable the candidate to help the company develop innovative elements in which the digital dimension is increasingly integrated and coherent, not only to reduce production costs but also to improve the user experience.</p> <p>Understanding how new sustainability practices will influence the next generation of designers is essential, especially in the training of new professionals. This project aims to provide comprehensive training that integrates sustainability into the core of design thinking and practice, ensuring that new professionals are equipped to address the latest challenges and contribute to sustainable innovation.</p>



<p>Job opportunities</p>	<p>Graduates of this doctoral programme possess a unique blend of skills across design, psychology, visual communication and marketing. This hybrid profile is highly in demand in sectors that focus on the integration of advanced digital interfaces in consumer products. In fact, managing today's complexity requires hybrid and multidisciplinary professional profiles to create innovation in our evolving society.</p> <p>There is a growing demand for strategic design professionals capable of managing this complexity. The overall figure will be able to coordinate different departments within the company and other areas of innovation, hybridizing the characteristics of an innovation manager, a design researcher and a sustainability manager. Potential job opportunities include roles in user experience design, human-computer interaction, product design, and research and development within companies that prioritize digital sustainability and innovation. The candidate's experience in assessing the emotional and experiential impact of digital products will also be valuable in consulting roles, helping companies improve their product offering and sustainability practices. In addition, the collaboration with De'Longhi and Politecnico di Milano will provide strong industrial connections, further improving employability in both the academic and corporate sectors.</p>
<p>Composition of the research group</p>	<p>1 Full Professors 2 Associated Professors 1 Assistant Professors 2 PhD Students</p>
<p>Name of the research directors</p>	<p>Venanzio Arquilla, Luisa Collina</p>

<p>Contacts</p>	
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<p>Additional support - Financial aid per PhD student per year (gross amount)</p>	
<p>Housing - Foreign Students</p>	<p>--</p>
<p>Housing - Out-of-town residents (more than 80Km out of Milano)</p>	<p>--</p>



Scholarship Increase for a period abroad	
Amount monthly	750.0 €
By number of months	6

National Operational Program for Research and Innovation	
Company where the candidate will attend the stage (name and brief description)	DE LONGHI APPLIANCES S.r.l.
By number of months at the company	12
Institution or company where the candidate will spend the period abroad (name and brief description)	Imperial Collage London
By number of months abroad	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information
<p>Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences): financial aid per PhD student per year max 6.114,50 euros per student (total for 3 years)</p> <p>Teaching assistanship: availability of funding in recognition of supporting teaching activities by the PhD student there are various forms of financial aid both for research and teaching activities. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.</p> <p>Computer availability: 1st year, 2nd year and 3rd year: Each research group will supply PhD student with a computer, if necessary.</p> <p>Desk availability: 1st year, 2nd year and 3rd year: Each research group will supply phd student with a desk.</p>