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Designing Sustainability for All

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1. INTRODUCTION

In the transition towards sustainable society it is essential, also for ethical reasons, to broaden the debate on the role of design in relation to the dimension of social sustainability that refers to the distributive equity of available resources and access to resources, goods and services.

In this perspective, on the one hand the design for sustainability, through the numerous activities, projects and conferences promoted by the LeNS network, enhances its field of investigation in the ethical and inclusive dimension of sustainability. On the other hand, among the different disciplines of the project, ergonomics is also involved in a process of redefining strategies and topics of ergonomic design for sustainability. In particular, within the various Design for Inclusion approaches, Design for All proposes a holistic, inclusive and participatory approach to the design of environments, products, services and systems.

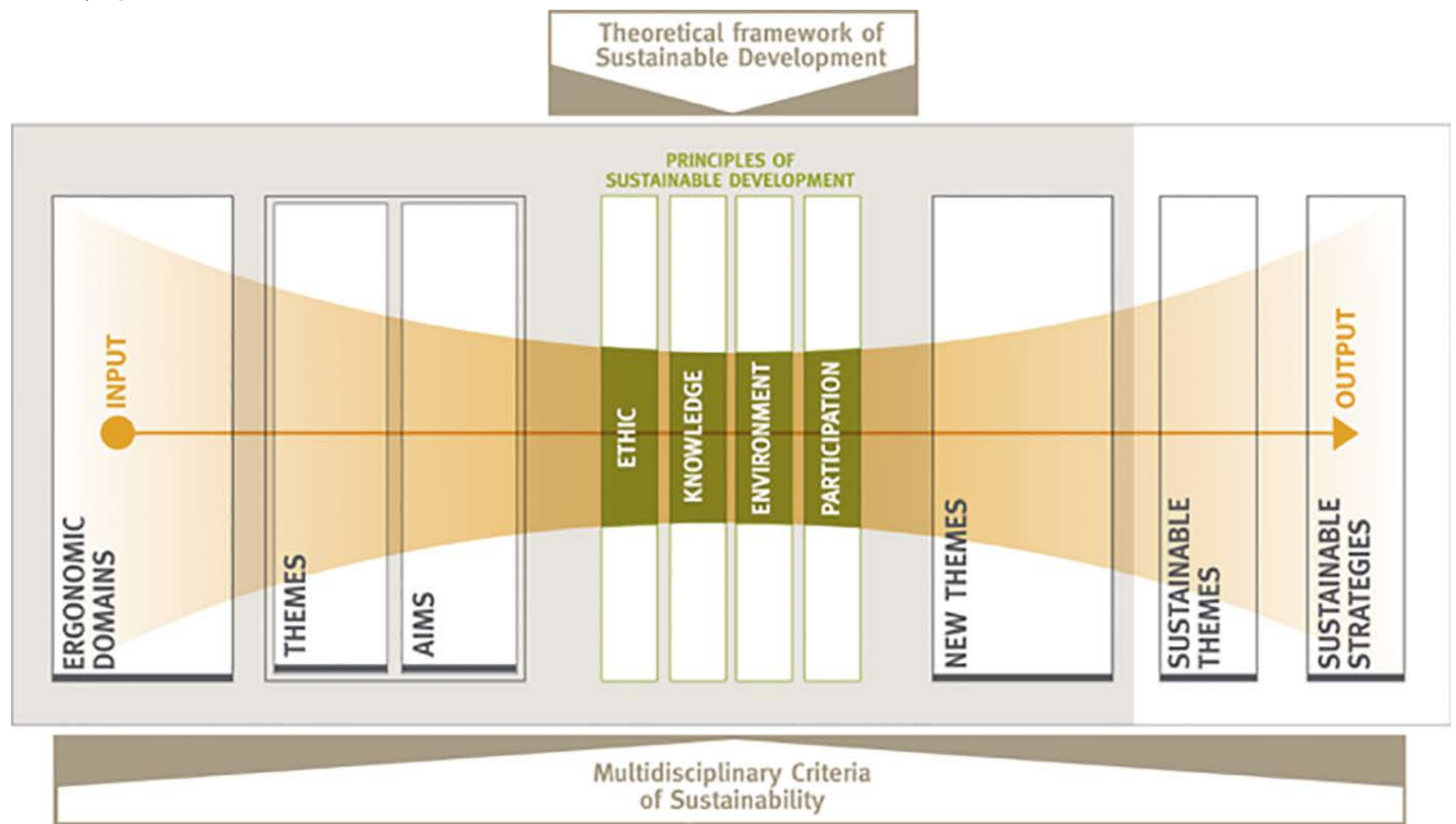
In this sense, Design sustainability for all, as a new and possible expression of design for sustainability, and Design for All, seem to converge towards a common strategy that could favor the application of the principle of equity for all individuals and social groups, according to the concept of human diversity as an inclusive factor, but which requires the development of topics, methodologies, tools and new practices of "Sustainability for All".

2. ERGONOMIC DESIGN AND SUSTAINABLE WELLNESS STRATEGIES, ARGUMENTS AND TOOLS

As part of the project, sustainable development requires new forms of well-being less linked to the acquisition and use of artefacts, and more able to recognize and enhance the qualities of the physical and social environment in which we live, through the identification of sustainable solutions, ie systems of products, services and knowledge that facilitate the individual-actor in achieving a goal (Manzini, Jégou, 2003). In its disciplinary guidelines, ergonomics already pursues "human well-being" through the design of "comfortable" material and immaterial goods: objects, equipment, tasks, operating procedures, services, environments and organizational systems of life and work. Using specific methodologies and advanced research tools, ergonomics provides a contribution to product innovation in the field of design (industrial design, architecture, urban planning and organizational structures and processes in general), through the study of risk and safety factors, adaptability, usability and pleasantness of use. Thus, ergonomics, being already addressed to well-being, is culturally predisposed to imagine and extend its own criteria of reasoning even to the parameters of sustainability.

What is missing, however, is the start of a evolutionary process of the theoretical-procedural apparatus, belonging to the discipline, towards the search for design solutions, certainly "comfortable" (basic performance qualities that should belong to all artifacts and not only those so-called "ergonomic"), but, above all, in harmony with the new idea of sustainable well-being increasingly widespread in the scientific communities of many design, social and economic disciplines.

With reference to this problematic framework, for some years now the IEA / Sub-Technical Committee "Ergonomics and Design for Sustainability" promoted a debate on the basis of a specific study, divided into two successive studies on ergonomic design for sustainability (Di Bucchianico, Marano, Rossi, 2011), whose first results were discussed in the IEA (International Ergonomics Association) Conferences. These researches have substantially highlighted how "classical" ergonomics is no longer able to respond in a sufficiently organic and coordinated way to the complexity and novelty of the issues posed by sustainability. The classic ergonomics, in fact, which wanted to guarantee first the safety and then the well-being of man, has always been interested in the average individual, "normal", healthy and intact, whose biological, psychological and behavioral characteristics are common to the generality of individuals, males or females depending on the roles codified by society and therefore easily generalizable and parameterizable.



2.1 Strategies and themes of ergonomic design for sustainability

The general objective of the first research work on "Strategies and themes of ergonomic design for sustainability" concerns the identification and the setting of a research methodology for the definition of ergonomic design criteria for sustainability.

The research has achieved some initial results concerning the identification and description of possible and significant ergonomic design strategies for sustainability, which corresponds to the indication of specific sustainable topics. In particular, the strategies identified, which respond to specific issues, are:

- Optimizing the ergonomic life of products, services and work environments.
- The facilitation of the sharing and socialization of products, services and work and management activities.
- The choice of intelligent systems for learning and developing technical skills and creative skills.
- Valorisation of contemplative time in targeted actions.
- Cultural, psychological and economic-productive regeneration of everyday life contexts.

From the critical reading of the results achieved it was possible to identify a first logical-interpretative filter for the construction of a thematic table of ergonomics for

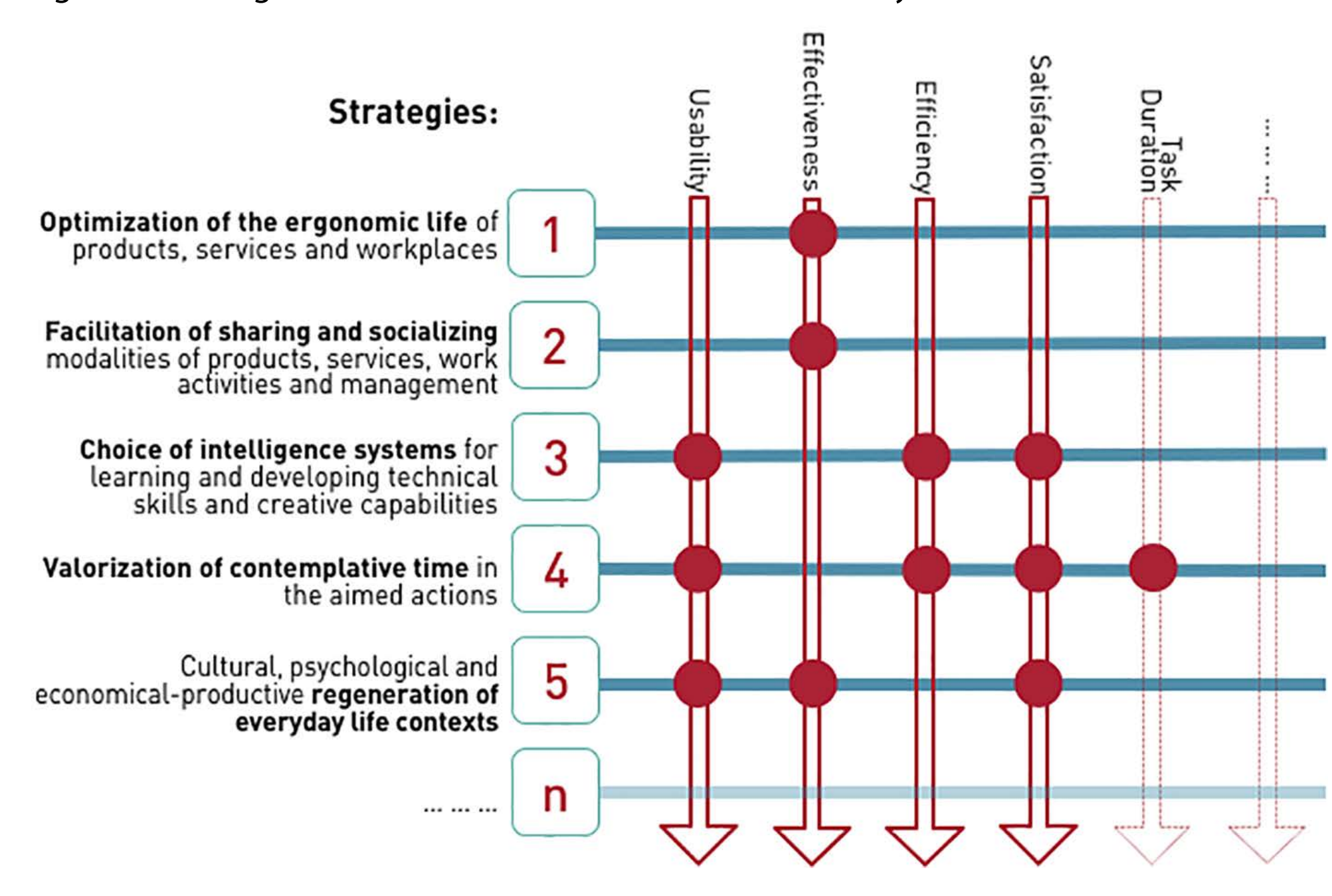
sustainability. This in the idea that, if the same evaluation and comparison model were extended to all Domains of specialization and related Themes of ergonomics, an organic framework could be obtained of the new thematic structure of ergonomics for sustainability.

2.2 Towards the transdisciplinary approach of ergonomics for sustainability

The second research work, "Toward a transdisciplinary approach of ergonomic design for sustainability", has dealt with the "multidisciplinary" and "interdisciplinary" dimension of "classical" ergonomics, which makes use of the contribution of several disciplines, even distant among them, such as psychology, physiology, occupational medicine, sociology, engineering, architecture, and so on, and at the same time favors the interchange of approaches, methods and tools between them. In particular, the research has moved from a critical comparison with some ergonomic design strategies for sustainability with respect to which the current theoretical and instrumental apparatus of ergonomic design can no longer be used without a "sustainable" evolution.

In particular, research has evaluated:

- the level of inadequacy of the current interdisciplinarity of ergonomic design and of the apparatus of the disciplines attributable to the main areas of specialization of ergonomics with respect to the questions posed by sustainability;
- if and how the current theoretical, methodological and instrumental apparatus of ergonomic design can be transformed into a sustainable key.



This last point, in particular, has been applied, for example, to the definitions of usability of products (declined compared to the concepts of effectiveness, efficiency and satisfaction) which, with respect to the new paradigms of "sustainable wellbeing", have developed into:

- "Extended" effectiveness: also referred to the objectives of socialization and sharing;
- "Relative" efficiency: with the introduction of the concepts of relative or "educational" error (error-friendly) and relative time, extended to include also the time for reflection and learning ("slow" usability);
- "Extended" satisfaction: with well-being also referred to the gratification and fulfillment of the task and the appreciation of the value of things.

Traditional Usability	Usability for Sustainability
Usability: "...effectiveness, efficiency and satisfaction in which specific users achieve goals in a specified context of use"	Usability: "...effectiveness, efficiency, satisfaction, creativity and awareness in which specific users achieve goals in a specified context of use"
Effectiveness: accuracy and completeness with which users achieve the overall goals set by the system	"Extended" Effectiveness: it is also reported to the aims of: - Socialization - Sharing
Efficiency: accuracy, completeness obtained in relation to spent resources (physical effort, mental effort, time costs)	"Relative" Efficiency: meanings introduced are: - Relative error: "educative" error (error-friendly) - Relative time: reflection and learning ("slow" usability)
Satisfaction: comfort and acceptability in the system use; subjective user reactions that use the system itself	"Extended" Satisfaction: well-being referred also to: - Gratification and fulfillment of tasks - Appreciation of the value of things
...	Creativity: individuation of inedited strategies of use
...	Awareness: evolution of decisional processes from development to skills (how) to awareness of goals (why)

3. WELLBEING FOR ALL, DESIGN FOR ALL

In recent decades society has undergone substantial changes, both on the demographic and on the social and cultural levels. Aging of the population, migratory phenomena and development of networks: three phenomena that have amplified the comparisons and highlighted the differences between generations, cultures, and different habits.

Since the last decades of the last century, however, we began to think of human diversity not as a discriminating factor, but as a systemic characteristic of the generality of individuals, and in many cases as a resource, useful for encouraging project innovation. 1993 was a pivotal year in this sense.

In New York in that year, in fact, at the United Nations, with the "Standard rules on equal opportunities for people with disabilities" a long ideological itinerary is completed based on the concept of "society for all", which has its roots on the functionalism of the '50s and the Scandinavian politics of welfare, and at the same time a new path begins that will end in the "International Convention on the Rights of Persons with Disabilities" (CRPD), approved by the United Nations on December 13, 2006.

In the same year 1993, in Dublin, the EIDD (European Institute for Design and Disability) was established: the association was chaired by Paul Hogan who, starting from his hiring "Good design enables, bad design disables", outlined the goal of "improving the quality of life through the Design for All" for the largest possible number of individuals.

Design for All, therefore, is a relatively recent design approach, which falls within the framework of the "Design for Inclusion" approaches, but which differs from the others

essentially to concentrate primarily on the design process. This must take into account the principles of sustainable development and the participatory involvement of all project stakeholders, from end users to decision makers (public administrators, politicians, business executives), in order to activate virtuous awareness processes.

The 2004 Stockholm Declaration briefly defines Design for All as the "design for human diversity, social inclusion and equality", with the aim of facilitating equal opportunities for participation in all aspects of society for all. In this perspective, human diversity is considered a resource and not a limitation for the project; equality is understood as equal opportunity for all individuals to make use of products, environments, services and systems in an autonomous and comfortable manner; social inclusion is the principle on which Design for All is based, seeing in the needs, desires and aspirations "of all" especially the socio-political implications, as an indispensable step to change reality: if an artifact is really for all, it will probably be suitable for adults and children, fat and thin, distracted and illiterate, Europeans and Orientals ... (Bandini Buti, 2008).

4. SUSTAINABILITY FOR ALL: A NEW RESEARCH PARADIGM?

The holistic, inclusive and participatory approach of Design for All to the design of environments, products, services and systems, based on the enhancement of human diversity, can offer new paradigms to the possibility of amplifying the diffusion in the world of Design for sustainability, aiming to a "Sustainability for All".

An attempt to find points of contact and integration between Design for All and Design for Sustainability, and in particular, between the complex dimension of social inclusion and that of environmental sustainability is being tested in a research project, under development.

The research, conducted in the context of an industrial Doctorate in progress at the University of Chieti-Pescara (Italy) and financed by the PON - National Operational Program for Research and Innovation 2014-2020, involves the College of Engineering Design and Physical Sciences of Brunel University London and the company Aran cucine. The research intends to jointly and comprehensively investigate the complex dimension of social inclusion and eco-sustainability in industrial production, with particular attention to the Kitchen furniture sector, which requires studies and product innovations to respond with scientific data and tangible solutions, to the new needs related to human diversity, through the integrated and coherent approach between Design for all (DfA) and Ecodesign according to the strategies of Life Cycle Design (LCD) and the Life Cycle Assessment (LCA) methodology.

It is a research model in which multiple branches with different specializations (university research centers and companies) can interact each other, aiming at the study, development and testing of technological, functional and morphological product solutions, through the use of methods and tools of the discipline of industrial design applied to the issues of social inclusion and eco-sustainability.

In particular, in order to reach the design solutions, the research involves the following phases:

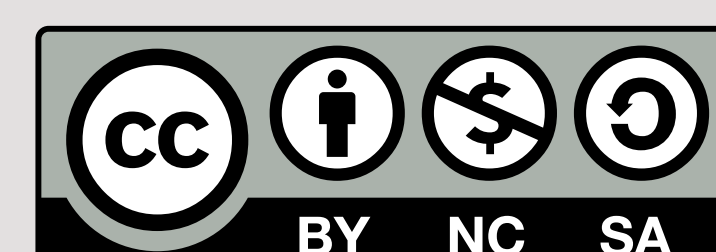
- metaprojective analysis, aimed at orienting research and isolating design problems (problem finding), structuring knowledge and organizing information (problem setting), identifying technological constraints and opportunities for product innovation (vision design and innovation scenarios).
- product brief, aimed at describing the expected results and identifying the list of environmental requirements (Ecodesign) and the requirements of physicality, perception and sensoriality, understanding (DfA) for the development and subsequent evaluation of the product innovation process in the considered industrial sector.
- concept and development of the product concept, aimed at displaying one or more original concepts of components and product subsystems that best meet the strategic objectives of environmental sustainability and inclusive usability, and the development and design of the concepts necessary for the integrated implementation of solutions.
- anthropometric, analogical and digital checks (2D and 3D), and environmental checks conducted on the concepts, to attribute the definitive measures and characteristics to the parts of the product that physically interface with the human body, and to measure the potential ecological footprint of the proposed solutions.
- first prototypes and experimental laboratory tests on prototypes and physical simulations of components and product subsystems, for further comparisons and evaluations with the results of virtual verifications carried out in the laboratory, and possible re-design of parts and components.
- definition of the design innovation model related to the integrated solutions of Design for All and Ecodesign for product innovation in the kitchen furniture sector and communication of the final results of the research.

5. CONCLUSIONS

In order to facilitate the transition towards a sustainable society, it is necessary to amplify the diffusion in the world of Design for sustainability, aiming in fact at a "Sustainability for All". Design for All, considered as a holistic evolution of ergonomic design, already has in its "genetic heritage" the concepts of aware participation of the greatest number of individuals to the design processes, in the diversity that characterize them, aimed at social inclusion and well-being based on autonomous and comfortable access to goods and services. The attempt to find points of contact and integration between Design for All and Design for Sustainability, and in particular, between the complex dimensions of social inclusion and environmental sustainability, also through unprecedented research paths that involve and facilitate dialogue between actors different, could make it possible to achieve the desirable goals of global dissemination of the principles, processes and models of design for sustainability more quickly and more effectively.

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