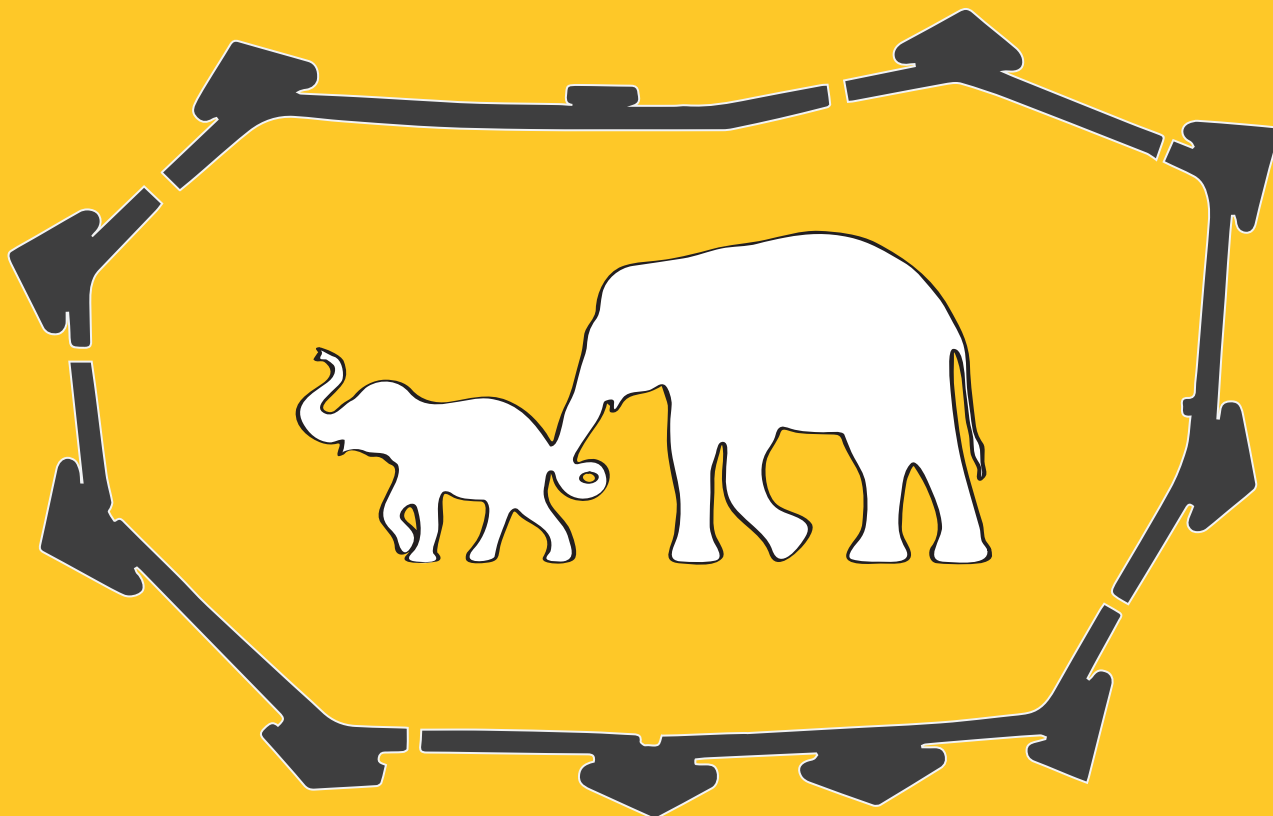


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A Research Agenda for Sustainable Human Centred Design

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ABSTRACT: There is a growing attention in exploring the synergies between Sustainability and Ergonomics (HFE), as both disciplines aim to investigate the relations between humans, living ecosystems, and artefacts used to perform informed tasks. Furthermore, a holistic interplay between human behaviours, creative practices, and contexts of use can be identified within the Human Centred Design domain (HCD). Whilst ergonomic interventions performed under the Sustainability domain must employ design-driven strategies, there is the need to further investigate the new contributions within HCD. This work aims to conceptualize a suitable research agenda for future explorations on Sustainable HCD. Results achieved in this study define a set of thirteen informed actions for Sustainable HCD, which allow to affirm that there are grounds for developing new research avenues linking HFE and Sustainability.

Parole chiave: Human Centred Design; Ergonomics, Sustainability, Research Agenda.

Preferenza di presentazione: Orale

1. INTRODUCTION

According to the official definition of 'Ergonomics' (HFE) endorsed by International Ergonomics Association, there is a holistic interplay between human behaviours, creative design practices, and contexts of use where actions are performed (IEA, 202-). This, however, is observable both at the micro and the macro scale.

Such linkage is also echoed in Sustainability studies where it has been proved that negative anthropic actions significantly affect the capability of human systems to properly achieve suitable levels of endogenous Sustainability (Marten, 2001; Fischer et al., 2012).

Human Centred Design (HCD) is one of the pillars of HFE and it is proven that a design intervention centred on humans, such as direct and indirect customers, may produce remarkable improvements both in the lifecycle and the use of the intended systems (Giacomin, 2014). Furthermore, ISO (2010) defines the HCD as 'an approach to systems design and development that aims to make interactive systems more usable by focusing on the use of the system and applying HFE and usability knowledge and techniques'.

It becomes clear that any ergonomic

intervention performed under the Sustainability domain must employ design-driven learning processes needed to link communities (re: users), situational actions, often performed by technological equipment, and living ecosystems, either virtual or physical. In other words, a design is an informed action needed to make in place the ergonomic intervention within a scenario of change, aiming to achieve a new sustainable quality.

HFE and Sustainability studies are therefore linked by human-centred/-oriented designs (e.g.: tangible products and intangible services) and studies (e.g.: speculative research methods, theoretical studies, new tools, etc.), though a more structured convergence between such domains is paramount to better address the challenges of present and future society.

Although evidence demonstrates that HFE and HCD can synergistically work to address Sustainability studies, further explorations around the idea of Sustainable HCD are needed to deal the systemic complexity of notions and disciplinary foci raised in the last years within transition studies (Grin et al., 2007). This leads to raise some initial but

relevant research questions, such as:

- RQ1. What is the potential impact of Sustainable HCD in transition studies?
- RQ2. What is the extent of design-led human-centred interventions in Sustainability studies?
- RQ3. Which testing grounds benefit from this interdisciplinary convergence?

A systematization of available knowledge is needed to ascertain suitable research trajectories, along with identify the most suitable testing areas on which to work on in the near future.

Whilst HFE is logically asked to generate the needed interest around focused sustainable actions in terms of conferences, dissemination projects, symposia, wide discussions, etc., a research agenda for Sustainable HCD is also needed. HCD can therefore become the testing ground on which the contemporary debates can be hinged, and through which it could be possible to trigger the will to connect past and future research activities.

2. AIMS

This work aims to systematize the available most relevant knowledge in the field to conceptualize a suitable research agenda for future explorations on Sustainable HCD. Therefore, the specific goal is to provide evidence on the need to develop a research agenda for Sustainable HCD by gathering and systematizing significant theories, approaches, and research contributions developed in the last years to understand the synergies and the elements to converge. The contemporary disciplinary interpretations of ‘Sustainable Design’ concept are also considered to assess relevant research avenues ranging from product design dimension to built environment, from service design to interactive systems.

Regardless the scale of applications, the proposed interpretation also aims to raise the

interest of the scientific community on the need to explore new areas and interdisciplinary research domains for novel studies and activities, which also require new expertise, research skills, and intersectoral competencies.

In any case, this work underlines the need to develop further investigations and common discussions to clarify terminological biases and errors that often limit constructive debates and the comparison of data.

3. METHODOLOGY

Secondary research methods in the form of literature review and systematic analysis are used to address the study and the preliminary research questions stated in the Introduction. Thus, this work employs studies and research outputs to understand the current disciplinary trends and, later, to set the elements of the research agenda.

Deductive considerations and cultural speculations are also proposed in the last part of this work – Conclusion and Discussions.

4. RESULTS

Preliminary results achieved in this study define an research agenda for Sustainable HCD and allow to affirm that there are grounds for developing new research avenues linking HFE and Sustainability.

The agenda is made by thirteen informed research actions that are consistent with the idea of Sustainable HCD – Sustainability in combination with HCD. These actions are both ‘detailed’ to suggest clear research indications and topics for promising studies, and ‘open’ to give scholars the freedom to operate personalization.

Specifically, this study discusses the need to:

1. Explore innovative human-centred patterns in Design for Sustainability, including Innovation Design and New Product Development that are opening new research avenues connecting the creative practice with transition studies.

2. Analyse the role of User Research into sustainable studies. Here, the research attention is addressed on the inter-, cross-, and multi-disciplinary interplay between HFE and Sustainability at the human scales, including recent advances on Design for Social Inclusion.
3. Further implement Sustainable Design Thinking and Design-Driven Innovation, as these areas may promote the adoption of creativity-led research patterns, cross-sectorial methods, and interdisciplinary developments.
4. Develop new studies on Usability for sustainable products, services, and systems, along with explorations of the contribution of HCD methodologies in combination with Design for Sustainability (e.g.: Eco-Design, Design for Sustainable Behaviour, Systemic Design, Sustainable Service Design, Life-Cycle Design, etc.).
5. Elicit interest on the scientific role of HCD toward the recent multi-disciplinary issues concerning Design for Sustainability, including Social Inclusion, Social Innovation, Smart Cities, GLocal scenarios, etc.
6. Strongly consider the contribution of Human-Computer Interaction (HCI) and User Experience Design (UX) for sustainable applications by considering the opportunity to perform studies linking humans and communities with technology-mediated design practices.
7. Ascertain vertical and horizontal explorations on sustainable systems, networks, and services. Specifically, understanding how HCD improves the design of large-scale solutions, mainly intangible, and how HCD addresses the research on sustainable networked applications.
8. Understand the positive implications occurred in sustainable manufacturing, including 3D Printing. What is the role of Sustainable HCD in the design of new sustainable manufacturing processes that use the LCA and LCD as assets for the competitiveness of SMEs?
9. Explore the implications on sustainable architecture and smart cities. Hence, the need to develop studies on how the HCD approaches can implement the current design practice, along with the analysis of human factors in the creation of living places, both at the micro and at the macro scales.
10. (Consistently with 9.) Investigate the implications on Civil, Structural, and Environmental Engineering – the need to assess HCD aspects in the technical design of sustainable living ecosystems and places.
11. Develop consistent clarifications on the role of Sustainable HCD around topics like (Design for) human diversity, disability, special population, etc. and how the design practice can benefit from the contributions of HFE methodologies to be in line with sustainability-related studies.
12. Clustering the cultural design aspects belonging to sustainable reflective practices, by exploring the role of HCD in relation to the evolution of speculative creative thinking and contextual studies.
13. Further investigate the analysis on transition studies linking HFE and HCD. Examples could concern, but not limited to, Circular Economy, distributed systems for delocalised manufacturing, and product-service systems (PSSs).

5. CONCLUSION AND DISCUSSIONS

This work provided evidence on the need to develop new studies on Sustainable HCD to properly investigate the link between HFE and Sustainability. Accordingly, a research agenda

containing thirteen informed actions has been proposed to promote effective ergonomic interventions that are consistent with the modern idea of Sustainability.

As discussed by Ezio Manzini (Manzini, 2003; Willis & Manzini, 2005), the transition toward Sustainability requires a discontinuity from the previous consumption models, along with focused learning processes needed to trigger holistic scenarios for sustainable living. Therefore, the role of design is paramount to properly implement these studies on HFE.

In relation to RQ1, Sustainable HCD can play a strategic role in transition studies. It has been observed that a new set of research issues raised in the last years, which requires new interdisciplinary methodologies that cannot employ traditional design approaches. Updates are therefore needed and must be shared with the design community to assess disciplinary limitations, between research opportunities and challenges.

In relation to RQ2, design-led human-centred interventions are able to support proper interdisciplinary explorations linking the three dimensions of Sustainability – environmental, social, economic – with the four areas of HFE. The design side of the ergonomic interventions is the aspect where researchers and ergonomists can properly address Sustainability.

In relation to RQ3, this work demonstrated that future design explorations and research explorations on Sustainable HCD can be started (at least) in thirteen promising testing grounds – here called as ‘actions’ – which reflect the most contemporary design interests of the research community.

Finally, this work also points out the need to complete these studies and to start a choral research action toward structured convergences to rediscuss theories, methodologies, and tools.

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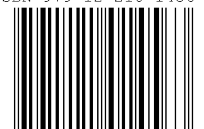
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