The More-Than-Human Trend in Design Research: A Literature Review

Annapaola Vacanti
Università Iuav di Venezia
avacanti@iuav.it
ORCID 0000-0002-7992-8623

Francesco Burlando
Università di Genova
francesco.burlando@unige.it
ORCID 0000-0001-5535-8382

Isabella Nevoso
Università di Genova
isabella.nevoso@edu.unige.it
ORCID 0000-0001-5884-8141

Massimo Menichinelli
Elisava, Barcelona School
of Design and Engineering (UVic-UCC)
mmenichinelli@elisava.net
ORCID 0000-0002-9391-6653

Abstract
The implications of contemporary technological and environmental changes are driving a transition in human practices toward approaches that widen and shift the focus beyond human needs. These approaches leverage new ideas and concepts coming from the posthumanist perspective, which has been gaining momentum across several disciplines, including the design field. As several researchers have started to take interest in those themes, experimental methods and practices have been growing along with different definitions, which may accentuate the complexity of producing consistent advances in the discipline. The objective of the article is to review the existing literature on design practices and approaches that, during the last decade, have evolved beyond the focus of a single user and are thus defined with terms such as More-Than-Human Centered Design, Ecosystemic Design, Posthuman Design, etc. The outputs of the integrative literature review offer a clearer picture of the phenomenon.

Keywords
More-than-human
centered design
Posthumanism
Ecosystemic design
Community-centered design
Multispecies design

Introduction

Human Centered Design (HCD) scope has grown in the past decades, until becoming the most established and popular approach for both practitioners and researchers in the design field. However, the implications of recent technological and environmental changes are driving a transition in all human practices toward approaches that widen and shift the focus beyond human needs. These approaches leverage new ideas and concepts coming from the posthumanist perspective, which has been gaining momentum across several disciplines (Forlano, 2017) design has been dominated by a human-centered and user-centered paradigm. Currently, the implications of technological and environmental transformations are challenging designers to focus on complex socio-technical systems. This article traces emergent discussions around posthumanism from across a range of disciplines and perspectives, and considers examples from emerging design practices that emphasize the interrelations between human and nonhuman actors. Specifically, this article reviews literature from actor-network theory (ANT, with the contribution of the growing political and social attention regarding the environmental impact of production and development of humankind on Earth. Such reflections are based on the awareness that the challenges which we face as a species require a systemic approach and a redefinition of the very boundaries that define what it means to be human. Driven by the acknowledgement that all living and non-living beings – far beyond the influence, benefit and direct impact of humans – may be active agents within the global production systems, Davidová and Zavoleas advocate the need to define a nature-driven model for design practices, inherently flexible and in a constant state of openness and readiness for change, which is mandatory to lay the groundwork toward a better future for the planet and the biosphere (Davidová & Zavoleas, 2020). In short, approaches that extend the focus from an individual human actor to several other types of actors. The challenge to rethink HCD requires users to take a step back – or rather to the side – and leave room for considerations on several matters, such as:

- who or what are the actors (more than just individual human users);
- who or what are we designing for;
- who or what has agency in the design process;
- what design should be desirable and for whom.

More-than-human practices include several themes and perspectives (Levy, 2015). Primarily, the focus has been set on the ecological impact of design and the needs of non-human species, by – for example – taking animal personas into consideration (Frawley & Dyson, 2014). The socio-technical perspective focuses, instead, on the influence of robotics, wearables, ubiquitous computing and other disruptive innovations on social systems, ultimately challenging the Western idea of human (Giaccardi & Redström, 2020). Also, authors are widening the focus from the needs of a single user to those of complex social groups and networks (Tomlinson et al., 2021), with a special attention to issues related to city making initiatives, participatory practices and policies towards cohabitation in smart cities (Clarke et al., 2018). It is worth mentioning that even Donald Norman,

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the main theorist of User Centered Design (UCD) in the 1980s, is currently moving his perspective towards a broader vision on systems, communities, and non-human actors (Dam, 2021).

As several researchers have started to take interest in those themes, experimental methods and practices have been growing (Tomitsch et al., 2021)leading to the rise in prominence of human-centred design. The field of smart cities has equally adopted notions of citizen participation as a way to ensure that technological solutions improve people's livelihoods. However, these kinds of processes treat the urban environment as separate from nature, promoting human comfort and convenience over planetary health and wellbeing. Motivated by these growing concerns that highlight the urgency to reconsider how we define and practice participation in smart cities and in human-centred ICT solutions more broadly, this article assesses how the personas method can be adapted to include morethan-human perspectives in the design process. Based on a case study, which involved designing smart urban furniture for human and non-human use, we introduce a framework for developing and employing non-human personas. As a key element of the framework, we describe a middle-out approach for forming a coalition that can speak on behalf of the non-human species that are impacted by design decisions. We demonstrate how the framework can be used through its retrospective application on two research-led smart city projects. The article concludes with a discussion of key principles for creating and using non-human personas in design projects.","container-title":"Interaction Design and Architecture(s, along with a dozen different definitions, which may accentuate the complexity of producing consistent advances in the discipline. The main objective of this paper is to review the existing literature on design practices and approaches that, during the last decade, have evolved beyond the focus on a single user and are thus defined with terms such as More-Than-Human Centered Design, Ecosystemic Design, Posthuman Design, Community-Centered Design and Multispecies Design, to provide a clear overview of the phenomenon.

Objective and Methodology

The fragmentation of the terminology referring to the More-Than-Human trend makes it difficult to explore and have a complete picture of the phenomenon. In such a context, conducting an integrative literature review is an effective method to summarize past literature and provide a more comprehensive understanding of the field (Snyder, 2019). We based our literature review on four criteria:

CRITERION 01. First of all, a specific time range in which to conduct the search for items was defined considering that literature regarding Posthumanism has mainly emerged among various fields since the end of the 20th century. We thus decided to consider a timespan of the last 12 years, starting from 2010. It must be noted that the search was conducted in April; this detail causes a drop in the items collected in 2022 compared to previous years.

CRITERION 02. Secondly, the search queries were defined consider-

ing previous exploration of the literature, in order to choose beforehand the main terminologies adopted in the phenomenon. Such terminologies may refer to broader approaches or being very specific on a particular area of the design field; considerations on that will be discussed in section 3.

CRITERION 03. Finally, the search has taken place by using three search engines: *Scopus, Academia.edu, Google Scholar*. Google Scholar is a freely accessible web search engine released in 2004 by Google and that indexes full texts or metadata of scholarly literature across an array of publishing formats and disciplines. While most academic databases and search engines allow to select one factor to rank results, Google Scholar uses a combined ranking algorithm that weighs the full text, the author, the product in which the item appears and how often it has been cited by others; research has shown that the last parameter appears to be the most relevant (Rovira et al., 2018)by relevance, in Google Scholar and the subsequent evaluation of the importance of received citations in this ordering process. The methodology of reverse engineering was applied, in which a comparison was made between the Google Scholar ranking and another ranking consisting of only the number of citations received by documents. This investigation was conducted employing four types of searches without the use of keywords: by publication, year, author, and "cited by". The results were matched in the four samples with correlation coefficients between the two highest rankings, which exceeded 0.9. The present study demonstrates more clearly than in previous research how citations are the most relevant off-page feature in the ranking of search results on Google Scholar. The other features have minimal influence. This information provides a solid basis for the academic search engine optimization (ASEO. Academia.edu is a for-profit social network and repository of academic articles free to read by visitors, while uploading and downloading is restricted to users. The site was launched in 2006 and has grown to the point that the number of registered users reached 180 million in early 2022 (*Academia.edu | About*, 2022). Due to the introduction of premium paid features, Academia.edu only allows searching for queries within titles, rather than in full texts. Scopus is a scientific database launched in 2004, which covers three types of sources, mostly peer-reviewed: book series, journals, and trade journals. It allows users to select the preferred factors to rank results, by searching for the selected query in titles, authors' names, abstracts, keywords and more (Burnham, 2006). Scopus' depth of coverage only goes back to 1966, but that does not represent an issue for the particular objective of our research. In general, Scopus is one of the most authoritative sources, but not necessarily the most comprehensive.

CRITERION 04. We ran the queries in the abovementioned engines and collected the top 20 results for each of them. Google Scholar's output depends on its ranking algorithm, while the free plan of Academia.edu only allowed us to search for our queries within titles; finally, we selected "relevance" as a sorting factor in Scopus. The search output consists of 317 unique items, which we organized by year of publication, DOI and citation in an open dataset on Zenodo (Vacanti et al., 2022). Not all queries reached our limit of 60 results,

as each search engine yielded sometimes less than 20 results, supporting thus our hypothesis that design research has only recently focused on posthumanism Tab. I.

	Scopus	Academia.edu	Google Scholar
More-than-human AND Centered AND Design	16	8	14
Ecosystem OR Ecosystemic AND Design	20	4	17
Posthuman AND Design	20	8	17
Humanity AND Centered AND Design	20	20	20
Post-anthropocentric AND Design	8	17	17
Community AND Centered AND Design	20	17	16
Multispecies AND Design	15	4	19

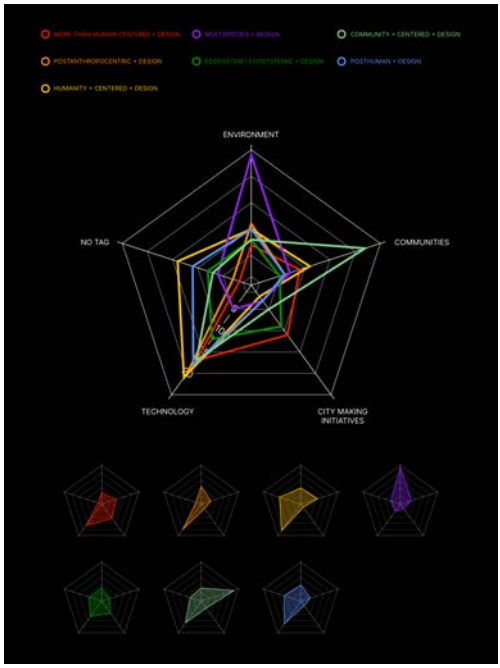
Tab. I
Number of results from the search run in April 2022 on 7 selected queries.

Results and Critical Analysis

After collecting the data, we analyzed the occurrence of specific terminologies within the items and deepened our research by proposing a categorization that highlights the theme of each article. This activity allows us to map the slight variations of perspective among different terminologies. Four categories have been retrospectively defined as follows:

- *Environment:* the focus is on the impact of design on the planet and non-human species, thus recognizing the importance of a systemic approach that takes into consideration a broader set of matters, rather than just focusing on human needs and satisfaction.
- *Technology:* the focus is on the influence of technological innovation on design and collaborative systems that involve humans and artificial agents, acting as equals.
- *Communities:* the focus widens from the needs of the single user to those of a whole community, taking into consideration the complexity of human relations within our contemporary societies.
- *City making:* the focus is on practices and policies that aim to improve living standards and cohabitation in urban areas, by leveraging citizens' participation.
- *Not defined:* the item refers to design theory and practice, but it is not possible to categorize it through the previous definitions.

The following section will discuss the results of our search, through a conceptual Fig. 1 and chronological analysis of each query.



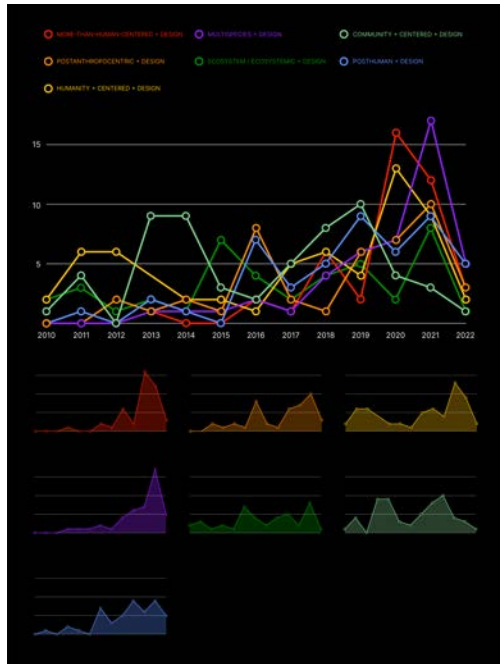


Fig. 1
Annapaola Vacanti, 2022. Radar diagrams showing which topics are covered by which terminology within the posthumanist scope in design.

Fig. 2
Annapaola Vacanti, 2022. Line charts showing how the use of the selected terminologies in scholarly products varied during the last 12 years.

More-than-human AND Centered AND Design (38 items – 16 Scopus, 8 Academia.edu, 14 Google Scholar). As shown in the timeline, MTHCD seems to be the fastest-growing terminology in the field, with a very high peak registered since 2020. Although showing a slight majority of items revolving around the theme of technology, MTHCD appears to have a quite broad focus, shifting from socio-technical matters to city making initiatives and needs of communities. Most of the items discuss technological innovations – Artificial Intelligence in particular – through their potential to facilitate the interaction among humans and non-humans agents (Coulton & Lindley, 2019; French et al., 2020). Also, technology is considered to have agency in the design process, by generating data and information (Giaccardi & Redström, 2020).

Postanthropocentric AND Design (42 items – 8 Scopus, 17 Academia.edu, 17 Google Scholar). This query seems to be growing slowly but steadily, with a high peak of 10 items being registered in 2021. Among all the queries, it is the one which is most focused on technological matters. However, items in this category tend to keep the human being at the center of the design process, merely exploring how to improve the interaction among users and smart products (Scarpitti & Valsecchi, 2021).

Humanity AND Centered AND Design (60 items – 20 Scopus, 20 Academia.edu, 20 Google Scholar). This terminology shows a unique evolution, being quite common already in 2010 and continuing its growth in the following years, becoming widely used in 2020. It is the only query that reached the maximum of 20 items per search engine. Interestingly enough, this query has its focus on technology,

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regardless of the term "humanity" being used in the name. Items discuss various themes connected to the condition of disadvantaged social groups, proposing to use design and technology as drivers to produce positive change and balance differences (Chadalavada & E, 2020; Russell & Buck, 2020).

Multispecies AND Design (38 items – 15 Scopus, 4 Academia.edu, 19 Google Scholar). The timeline clearly shows a dramatic increase in items using this terminology in 2021. This query is probably the one with the most specific area of interest within the scope of the discipline: almost all of the items refer to the environment category, proposing to place new actors at the center of the design process, namely animals and other non-human agents (Westerlaken, 2021).

Ecosystem OR Ecosystemic AND Design (41 items – 20 Scopus, 4 Academia.edu, 17 Google Scholar). The terms "ecosystem" and "ecosystemic" are used in describing quite a broad range of themes, referring to several areas of design practice. Although being in use already at the beginning of 2010s, the terminology has not reached significant peaks in recent years. Items often refer to issues and activities related to the design of urban and non-urban areas, trying to understand how to improve living standards and cohabitation in those places (Blanco et al., 2021).

Community AND Centered AND Design (53 items – 20 Scopus, 17 Academia.edu, 16 Google Scholar). Being one of the queries with the highest total number of items, CCD seems to be less and less used in the last three years, in counter trend with the other terminologies. Predictably, the main category of interest is Communities, followed by Technology. Most of the items revolve around participatory experiences to develop products and services that target issues of specific social groups and local communities (Pahk et al., 2018).

Posthuman AND Design (45 items – 20 Scopus, 8 Academia.edu, 17 Google Scholar). Posthuman is a term that has been widely used in philosophy and ethics and has gained momentum in the design field as well. However, data show that such terminology never obtained a broad diffusion among scholarly items. The main matter of study is the impact of technology on society (Del Campo et al., 2019), but several items are quite hard to categorize, showing a theoretical approach that drifts into ethical themes.

Conclusions and Further Developments

The scope of design practice – and the academic research related to it – has undergone great transformations since scholars began to displace the project focus in favor of a broad set of non-human agencies. Such a process has led to a revolution, which is still ongoing, in the methodological and mental approach of designers, who have historically been committed humanists and advocates for people against a techno-centric vision of innovation (Forlano & Maze, Accepted/In press). This results in theoretical and practical challenges for design research and education which are made more complex by the fragmentation of the terminology used in literature by

different authors. As we consider the habit of continually introducing neologisms and subcategories to be chaotic and harmful to every area of study, we give our contribution to the evolution of the design field by analyzing non-anthropocentric practices, and their potential impact on the future, by producing a review of the existing literature on posthumanist research in design scope. Some evidence emerged from the analysis are presented below as results of the paper.

A clear growth of academic production is observable Fig. 3, which confirms the research hypothesis regarding the development of the MTH scope in the last decade. In particular, the number of items has significantly grown since 2017, proving that the development is recent. However, it is essential to specify again that the analysis has been carried out in April 2022; therefore, it was possible to include only the data of the first quarter of the year. This results in a final decrease of items observable in the chart.

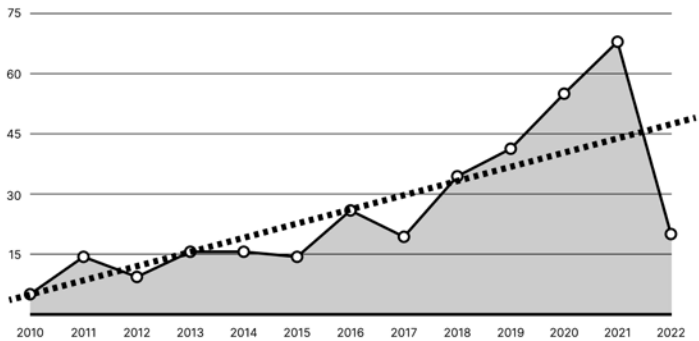

Fig. 3
Annapaola Vacanti, 2022. Line chart showing the overall trend of academic production regarding posthumanist approaches, from 2010 to April 2022.

As stated before, some recurring themes of research have been observed and transformed into tags. Aside from the terminologies, there are some tags more common than others Fig. 4.

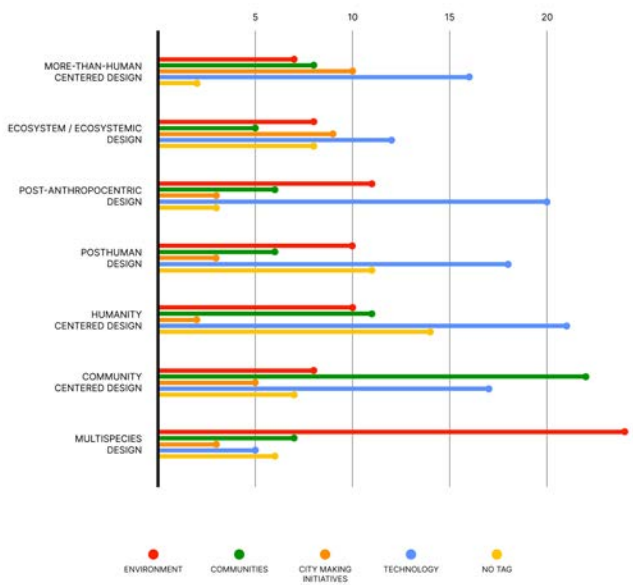

Fig. 4
Annapaola Vacanti, 2022. Grouped bar chart showing the distribution of different thematic categories within each terminology referring to the posthumanist scope in design research production.

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Almost one in three items refers to the category of “Technology”. The 23% refers to environmental concerns, while the category “Communities” collects 19% of the total. Lastly, “City making initiatives” collects the 10% while there is a 15% of items that do not refer to any of the tags.

Regarding the use of terminologies, it can be seen a correlation between nomenclature and tags. “City making initiatives” items use mostly “More-than-human Centered Design” and “Ecosystem/ Ecosystemic Design” terminologies. Items found in “Multispecies Design” refer mostly to “Environment” and rarely to “Technology”. “Communities” tag refers primarily to items from “Community Centered Design” and “Humanity Centered Design”. These observations emphasize that, even if all the queries can be considered as synonyms, some nomenclatures are more common in specific scope.

Finally, it is important to point out that this paper is an expression of the authors' Western (South European, Italian) vision, as professors, researchers and Ph.D students born and raised in Italy and currently residing between the latter and Spain. Therefore, some concepts may not apply to other communities or social groups different from those of the authors. Future research will investigate the geographic distribution of contributions and the most active scholars in specific themes, trying to validate or disprove the hypothesis that there is a marked Western bias generalized or in some specific topics. In addition, it would be our goal to deepen this literature review and make it systematic, using dedicated softwares such as Bibliometrix and VOSViewer. Also, we intend to undertake a thorough exploration of the main bibliographical references in the field, along with the results of the review.

Annapaola Vacanti
Ph.D in Design, Research Fellow at Università Iuav di Venezia, working on Human – Technology Interaction and Data-driven Design. Since 2019, she is also art director at TEDxGenova.

Francesco Burlando
Ph.D in Design, Research Fellow at DAD – Architecture and Design department (UniGe), working on More-than-human Centered Design and Robotics.

Isabella Nevoso
Graduated in Design and in Digital Humanities, she is a Ph.D student in Design at DAD – Architecture and Design department (UniGe), working on More-than-human Centered Design and Robotics.

Massimo Menichinelli
Profesor Contratado Doctor (Associate Professor) at Elisava, Barcelona School of Design and Engineering (UVic-UCC), Doctor of Arts in New Media (Aalto University) & Master of Science in Industrial Design (Politecnico di Milano).

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