

# FROM HUMAN-CENTERED TO MORE-THAN-HUMAN DESIGN

Exploring the transition

edited by Barbara Camocini and Francesco Vergani



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D. | . **FRANCOANGELI** OPEN  ACCESS  
DESIGN INTERNATIONAL

Cover image by Sara Sciannamè

ISBN e-book Open Access: 9788835132585

Date of first publication: December 2021

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# Introduction

*Barbara Camocini\**, *Francesco Vergani\**

The environmental emergency of the last century, highlighted by the pandemic (Morin and Abouessalam, 2020), has led to an urgent need to reformulate the predominant role of human beings on the planet by undertaking a less anthropocentric design approach (Díaz et al., 2019; Fry, 2017; Laybourn-Langton et al., 2019). This urgency has been especially outlined by a re-evaluation of the concept of the Anthropocene, which can be defined as a geological era characterized by the significant human impact on the geology and ecosystems of the Earth (Braidotti and Hlavajova, 2018; Edwards, 2015; Ellis, 2018).

Within this theoretical framework, the book explores the role of Design as multifaceted discipline capable of exploring the complexity of a changing world, and reconsiders the human being's position in a pervasive relationship with the contemporary environments (physical and abstract) through a more-than-human approach. In this volume that illustrates reflections, analyses, and interventions guided by or intersected with the concept of the post-Anthropocene, two different scales of observation can be traced. The first, explored in the two starting chapters, highlights how the complexity of the topic requires a large-scale analysis perspective in order to be fully understood. The concept of the post-Anthropocene does not exclude the human being as a fundamental component but takes the latter as a

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departing point to frame wider contemporary needs and issues and to support a call for action to envision and shape the future. The second part of the book instead explores the possibility to include, within this broad discussion, the theme of More-than-Human applied to specific disciplines – linked to the culture of Design – analyzing different aspects that move from taxonomy, application, and creativity.

The first chapter by Biamonti, titled ‘The Political and Social need for a New Design Culture’, describes the pandemic as a phenomenon that brought to light the fragility of our system of values on different scales. Even if the diffused overprotection and recent restrictions has affected human relationships, the Covid-19 emergency has injected new energies to revise old paradigms and to assign new meanings to our actions. The pandemic has opened new opportunities at different levels of contemporary life, fostering designers (professionals, companies, schools, and other institutions?) to see projects not as isolated phenomena but as part of the dynamics of contemporary times. The author argues that the real objective of designers and the ecosystem of which they are part is the production of scenarios – often clearly different from everyday life – built on the objectives, themes and conditions of the present.

The contribution goes on to develop an analysis centered on the following topics: inclusion, sustainability, respect, designing with/for, beauty and meaning. The topics selected by the author confirm the analysis perspective that invite a transition from the central position of the human being to more-than-human perspective, where, for instance, *inclusion* means *boundaries* open to all, allowing any difference to be assimilated whereas *respect* is to be addressed to both users and framework. The last two topics are particularly interesting as they are not directly traceable among the core concepts of More-than-Human Design. The author defines *beauty* as an anthropological tension, a dimension of human existence, which assumes a new level of *meaning*. In fact, *meaning* follows *beauty* as a key factor, referring to the initial interpretation of reading a new vision of contemporaneity.

The second contribution by Di Prete and other authors is about ‘Design for urban regeneration’ and expresses the previous synergistic perspective even more clearly by placing actions-research be-

tween Design and Anthropology in a multispecies world. If in the previous contribution the author refers to the development of future scenarios starting from the conditions of the present, the second chapter suggests the assumption of a projective perspective, *moving the edge* where the anthropology of the future is promoting the uncertainty and the fragility as vectors of innovation. The contribution focuses on peripheral areas, where marginals and diversities show a *residual authenticity* that has to be preserved. Exploring this *residual authenticity* – a concept that embrace different components – requires a new point of view to interpret urban regeneration from the perspective of the post-anthropocentric era. The authors suggest that Anthropology and Design can effectively co-operate in studying the existing, exploring the future and co-designing a positive change.

The first part of the chapter presents the concept of regeneration as an opportunity for innovation to be gained through a consolidated cooperation where the anthropological view has guided the design work, experimenting tools and practices. Four case studies involving the Municipalities 8 and 9 of Milan experimented a high participatory approach in diverse modalities. The common goals shared by the case studies are about the requalification of anonymous urban interstitial areas which remain largely unrecognized. The strategy here promoted has been to involve the community – with a particular emphasis on the voiceless community – involving them in prototyping solutions, managing their contribution in the different phases of the design process and with different modalities.

The second part of the chapter focuses on possible future scenarios – already hidden in the present – that require new design experiences to be developed. These include the *built environment*, and the integration with the animal and plant world as a major challenge, reimagined as a potentially *augmented* ecosystem, sustainable, hospitable and rich in biodiversity.

Searching for *residual authenticity* in complex networks and ecosystems requires new ways to envision relationships in the post-Anthropocene. Old paradigms are no longer effective to face the multifaced dimension of the contemporary world and Design must find new practices to face the complexity of conducting research. As described by Gatto in the third chapter, Multispecies Design emerges

as a possible way to move beyond the ethnographic boundaries of the past and the present. Looking into the future with a post-anthropocentric approach means considering more speculative stances leading to world-making processes, embracing agents from the natural world to develop new storytelling and scenarios. The author highlights the issue of communication in a more-than-human world wondering about the need to frame participation between human beings and plants. As a long-standing issue, Gatto explores new ways to trigger encounters within the plant world by presenting two projects that follow plants' metabolic processes. *Geomerge* and *Vegetal Rescuers*, intertwines plant research with a series of ethnographies focusing on the theme of vegetal agency in contaminated landscapes. The contribution highlights how Design Research – supported by new tools and practices – can open infinite and unexpected possibilities for participation in the post-Anthropocene.

As previously stated in the first contribution of the volume, the urgent environmental and social conditions have triggered new paradigms to go beyond the Anthropocene. Designers can and must play a role in this journey, updating their methods and approaches to anticipate the forthcoming and unclear future.

In this framework, the fourth chapter by Piccinno focuses on the need to develop a new Taxonomy of contemporary Spatial Design in order to respond ethically to the global emergency conditions by using a holistic vision of the world. By assuming that human beings are part of a *whole* – and not the center of the *whole* – the author states that spatial designers should be able to develop a new taxonomy built on Design Tactics as strategies to envision post-anthropocentric scenarios that are primarily conceptual experiments and visions and subsequently formal aesthetic outcomes. These Tactics may be useful to cross borders between different disciplines – such as humanistic logic, scientific knowledge, transdisciplinary attitudes – and to observe the complex relationship between *nature* and *artifice* with new experimental approaches such as Technonatures (i. e. a continuous renewal of its capacity for genesis, creation, and adaptation, capable of absorbing the artificial as its component).

Spatial designers must be involved in cross-disciplinary teams, which operates within a design scale of variable intervention, from

micro to macro, for a concrete ecological vision of the project towards the post-Anthropocene Era. The urgent environmental and social conditions, therefore, require serious reflections on the role that Design and designers can and must play in modifying the consumerist dimension and the unsustainability of human action over the last hundred years, in order to shift the axis towards a non-anthropocentric vision that considers equilibrium as a basis for any (human) impactful action in the Earth environment, up to and including the Cosmic dimension.

Shifting in the post-Anthropocene means focusing on the envisioning of new Design practices but also requiring the search of new ways to apply concretely design researches. In an ever-changing world where finding resources is becoming harder, Design has to find new ways to imagine, develop and create new solutions. In this framework, the fifth chapter focuses on materials as the first and fundamental design component that contribute to a sustainable transition. If yesterday designers were focused on selecting the available materials, today they are called to find more suitable and sustainable solutions. Rognoli and the other authors highlight the need to focus on organic waste, circular and bio-manufactured materials from living organisms as emerging trends to support the transition to the post-Anthropocene Era.

Biocompatible organisms, such as mycelium, bacteria, algae and yeasts – as well as organic waste – are considered as an alternative source in producing new bio-based materials, improving sustainable development and promoting effective waste management. Nowadays it seems no longer possible to distinguish if materials derive from natural resources and those from waste and the boundary between natural and artificial is becoming increasingly blurred. The fifth chapter frames the need to focus on the innovative potential of organic waste as a valuable way to support bioeconomy, strengthening the concept of a symbiotic human-nature perspective that can be prompt at any level, from Politics to bottom-up and DIY initiatives. Design and designers, as previously highlighted, are expressing a high social impact in fostering awareness towards the issues of the Anthropocene and more than others are positively supporting new forms of bioeconomy. In the same way as the contributor of the third chapter,

the authors effectively make a point in showing the ways in which Design Research is implementing new ways to produce sustainable products, describing emerging trends for the transition to a post-Anthropocene Era.

The last contribution by Canina and other authors focuses on creativity and the way in which the digital evolution can support new forms of creativity in a more-than-human world. Stating that creativity is mainly a human-based skill, the authors wonder how it could be possible to shift from a Human-Centered approach to a More-than-Human one, framing Design tools, methods and approaches to support the transition to the post-Anthropocene. In this chapter, digital transformation is described as the main stream to support any kind of creative and intellectual process (both human and non-human) as well as green and sustainable transition. The authors underline the emerging technological advancement and digital transformation as essential tools to sort the complexity of the contemporary era. More specifically, they declare that Design must be a guiding light to achieve the Digital Maturity – intended as a “continuous and ongoing process of adaptation to a changing digital landscapes” (Kane, 2017). The conclusive chapter explores the topic through 3 main dimensions: Regenerative Creativity that unfolds a new perspective of creativity as a result of an assemblage of human and non-human agency, Digital Creativity that defines how both humans and digital technologies can be creative and Future Thinking which generates a more exhaustive, innovative and forward-looking approach to the topic. The second and conclusive part of the volume highlights the potential and the great impact that Design has in the post-anthropocentric perspective. Its culture and practices have always played a prominent role in binding different disciplines, and now more than ever they can lead the path to envision the richness of the still-unexpressed future which is ready to be explored and designed.

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## 6. Post-anthropocentric creativity: new skills for a just digital transition

*Marita Canina\**, *Carmen Bruno\**, *Tatiana Efremenko\**

### Abstract

The Post-Anthropocene era profoundly influences human beings who need to develop new competencies and skills, among which human creativity is the most important (WEF, 2020). Indeed, in this digital and green transition, creativity has been recognised as one of the most distinctive human skills to reach a Digital Maturity defined as a “continuous and ongoing process of adaptation to a changing digital landscape” (Kane, 2017). Reaching a Digital Maturity through creative and design empowerment allows continuously understanding and possibly anticipating the foreseeable opportunities and the threats that the digital evolution will offer, developing a strategic approach to the adoption and application of such technology.

Today creativity is a requirement to face the complex social and sustainable challenges of the uncertain future moving towards a just and inclusive digital and green transformation. However, along with digital progress, creativity is also transformed, acquiring new forms and playing the leading role. We should start to ask ourselves how to expand the definition of creativity to make it more inclusive to non-human agents and rethink its values and ethics involved in the process? What new skills, methods and approaches do we need today to design for a more-than-human world?

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This chapter presents the three relevant dimensions – and their balanced relationship – that redefine creativity in the post-Anthropocene era from the authors’ perspectives, which are: Regenerative Creativity, Digital Creativity and Future Thinking.

It is in this context that the IDEActivity Center research group is active, dedicated to innovation studies driven by creativity through design, focusing on the contemporary digital changes (Canina and Bruno, 2018, 2021; Bruno and Canina, 2019a, 2019b).

## **6.1 Introduction**

The digital transformation of the European economy is crucial for preserving international competitive advantages. Companies and public sector organisations need to integrate digital technologies into their business processes, products, and services to fully benefit from the efficiency gains and innovation they may bring while remaining environmentally sustainable and reducing greenhouse gas emissions.

Indeed, a green and sustainable transition is also a crucial step for Europe which is pushed and supported by new dedicated policies. With the Green Deal communication of December 2019, the European Commission has defined a set of concrete measures to get no net greenhouse gases emissions by 2050 and decoupling economic growth from resource use. Meeting these objectives will require significant technological advances in several areas where digital technologies will be a key tool to improve the efficiency and sustainability of every aspect of our lives. Emerging digital technologies are considered a critical enabler for attaining the sustainability goals of the European Green Deal in many sectors.

The global pandemic of COVID-19 has accelerated everything that was already changing. Without any doubts, 2020 was a year of upheaval, uncertainty and unknown territory, disrupting routines and daily life, affecting the way we spend our time and creating, for many, new realities and habits. Businesses had to respond quickly to change, adapting and becoming vehicles for new ways to entertain, shop, meet, exercise, seek medical care. From technology and business perspectives, COVID-19 has been a catalyst for change.

The digital transformation process involves strategic vision, or-

organisational aspects, people empowerment, technologies, and data, which drive companies towards improving their Digital Maturity level. Digital Maturity is a concept emerging along with the growth of the digital economy and industry 4.0 (Aslanova and Kulichkina, 2020) as a response from an organization to cope with rapid technological development through an adequate reaction.

They will have to adapt continuously to never-ending permutations and engage in a never-ending adaptation. The consequence of this is a holistic approach of companies' performance, including internal dimensions of business management and product manufacturing, as well as service delivery, both the relationship with customers and their expectations.

This process has been formalised as Digital Transformation, representing “the continual process aimed at reaching the moving target of Digital Maturity” (Deloitte, 2019) since the operational background is not fixed but rapidly evolving. Such improvement means applying and using modern technologies in the organisation's business processes, services and products to achieve its goals and increase efficiency (Aslanova and Kulichkina, 2020) sustainably and ethically. Improving the output of the digital process means increasing partly the level of maturity.

To ensure a transition toward a Digital Maturity in the Post-Anthropocene era, a new set of skills is needed by humans.

### ***6.1.1 Why new creative skills are needed in the post-anthropocene?***

Human-Centred Design (HCD) is founded on the perception of the human as a discrete, individual subject. Yet, our new relations to the natural world and socio-technical systems call these previous understandings into question. The use of HCD methods allowed (technology) companies to move from technocentric to human-centric approaches. What new skills, methods and approaches do we need today to design for the post-human world? Why and what type of creativity? The strategic approach based on human-centred design, increasingly adopted by companies, has proven to be the most suitable

to navigate complexity and the uncertainty of innovation and to transform the surrounding world issues into business opportunities, helping to explore problems and co-create solutions.

Today, more than ever, this approach becomes a fundamental tool that should be expanded and integrated to meet the post-anthropocentric complexity (Davidova and Zavoleas, 2020). Equally crucial is the adoption of certain skills that can provide valuable support in managing uncertainty.

According to the World Economic Forum, creativity is among the top three skills needed to get through these transformations and manage such complexity. Other fundamental skills are critical thinking and the ability to solve complex problems, be comfortable with ambiguity and uncertainty, flexibility, resilience, envisioning and anticipatory abilities necessary for people to bridle the first 5-10 years of the post-pandemic world (Paraboschi and Dalla Rosa, 2016) and be prepared for multiple perspectives in the future.

The new reality we are experiencing has highlighted the need for companies to creatively redesign their processes and go outside the “known”, quickly discover what works for them and what does not. Only those organisations that are able to understand this quickly and orient their activities accordingly will be able to manage the transition in the best possible way.

Creativity is a requirement in the post-Anthropocene era. It helps to face the complexity and move towards a just and inclusive digital and sustainable transformation.

Therefore, it is essential to understand how digital technologies are transforming creativity and how they affect the creative process of individuals or teams, thus, the impact on the practices and tools required to perform it. The emerging digital technologies pervasiveness, their accelerated evolution and the effects they produce, the rapidity with which they change are key characteristics that affect our reality. These circumstances create new cyborgian configurations of living and artificial systems and undermine traditional models of cognition, action, expertise, learning and consequently, creativity (Roudavski, 2016). This chapter presents the relevant dimensions and agents that redefine creativity in the post-Anthropocene era from the authors’ perspectives. An overview will be presented in section 2

using the metaphor of the lever to describe the balanced relationship between three fundamental dimensions: Regenerative Creativity (expanded in section 6.3) that unfolds a new perspective of creativity as a result of the assemblage of human and non-human agency based on the ethics and values of ecological intelligence, Digital Creativity that defines how both human and digital technologies can be agents of creation (expanded in section 6.4) and Future Thinking (expanded in section 6.5) which generates a more exhaustive, innovative and forward-looking approach to the future approach balancing the two dimensions mentioned above.

## **6.2 Creativity for a just digital transition: post-anthropocentric creativity**

Creativity has been widely studied for a long time, and many definitions have been proposed. Since it is a complex and multidimensional concept, its understanding is constantly changing according to the socio-cultural environment around us (Runco, 2014). The definitions of creativity evolve and fluctuate over time. In the last decades, with the advent of Information and Communication Technologies and the acceleration of emerging digital technologies important influences have been registered on the creative process, from the identification of a problem to the acquisition of knowledge till the generation of an innovative idea and its implementation. Also, the cognitive, motivational and environmental components involved in the creative thinking process are strongly impacted by the ongoing changes. These changes need to be understood as it is a fundamental skill that can guide human evolution.

Therefore, to address today's needs of developing creative skills to meet the significant challenges of digital transformation and sustainability, it is imperative to observe existing creativity concepts with the post-anthropocentric perspective. There is a need to reconsider the implications of post-anthropocentrism in relation to human creativity, which is credited as the dominant, yet hugely destructive, influence on the planetary environment (Roudavski and McCormack, 2016). Post-anthropocentric creativity will be explored along two

paths identified by Roudavski (2016). The author suggests thinking about post-anthropocentrism by considering (i) agents, recipients, and processes of creativity alongside its (ii) purpose, value, ethics and politics. According to Roudavski, non-human entities can be seen as creative agents, which will create new set of ethical values and purpose behind such creative output. At the same time, post-anthropocentric creativity must include the process of digital transformation in creative process to address the future challenges.

To visualise and easily understand the mutual relationships between these dimensions, we decided to adopt the metaphor of the lever, showing also that the balance can be achieved. The first dimension, named Digital Creativity, includes the first line of enquiry that consider the agents, recipients and processes of creativity where both human and digital technology are creative agents. The second dimension, named Regenerative Creativity, includes the second line of inquiry that considers the assemblage of human and non-human agency to drive the creative process, underpinned by the set of values and ethical principles. Ecological intelligence is seen as a symbiosis of human, biological and technological domains driving the creative process.

These two dimensions represent the two ends of the lever as they are equally crucial for creativity in the post-Anthropocene. Therefore, they should be balanced through the Future Thinking dimension intended as the strategic approach and vision that shape the future (Fig. 6.1). If one dimension becomes predominant, the equilibrium is lost. In our vision, the post-anthropocentric creativity is shaped by these three dimensions crucial to managing the complexity of cutting-edge digital technologies towards a just and inclusive green and digital transition, i.e. a Digital Maturity. It is wise to extend creativity research toward complex and hybrid creative processes that implicate broadly heterogeneous actors including all forms and systems of life, algorithms and mathematical models, computational objects, physical entities and cultural constructs.

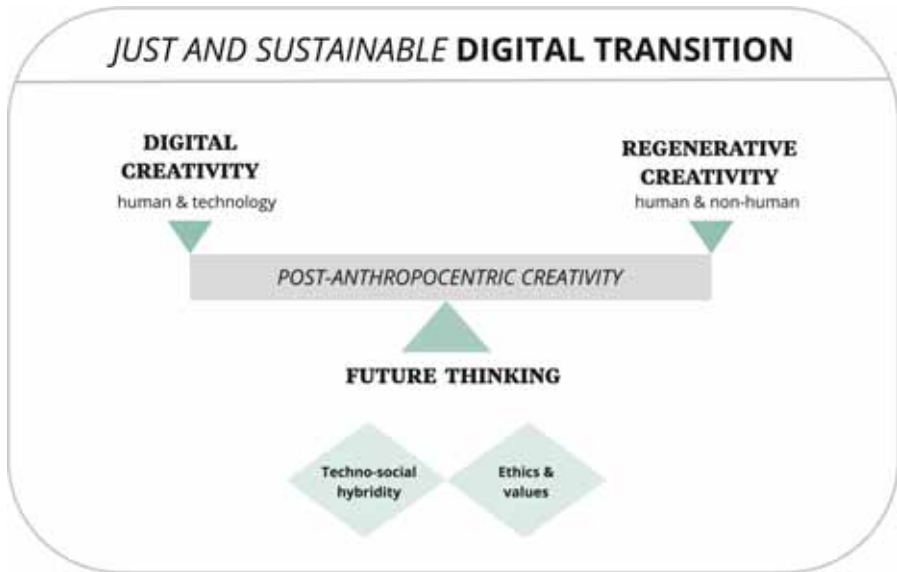


Fig. 6.1 – The three dimensions of the post-anthropocentric creativity.

The following sections provide a detailed description of the 3 dimensions, the skills and the perspective that shape each of them to give a deep understanding of the new conception of creativity in the post-Anthropocene era.

Edward Wilson (2017) defines creativity as a “unique and defining trait of our [human beings] species”, where it is exclusively attributed to humans and make us search for “the innate quest for originality”. Thus, creativity can be regarded as one of the central components of anthropocentric thought. How can we expand the definition of creativity to make it more inclusive and rethink its values and ethics involved in the process?

### 6.3 Regenerative creativity

There is no doubt there has been an immense devastating impact on our environmental and social systems. Resource extraction, over-consumption, and industry production have produced degradation of the systems. Transition to just and sustainable societies will demand

to shift from degenerative to regenerative ways of living and creating. However, this transition requires new design approaches informed by different values, knowledge, and practices. Post-humanism is an attempt to address the anthropocentric discourse by creating a new conceptual approach to rethink human relationships with the environment. We need to redefine our social practices and systems, behavior, as well as develop a new set of definitions, skills, methodologies and ethical concepts to approach future challenges.

To address acute environmental and social problems, we need to develop new literacy competencies defined by the UN Economic Commission for Europe as (a) understanding complex systems thinking and interconnectedness between generations, class and nature, while (b) emphasizing problem setting, visioning and creative thinking. Thus, the concept of *Regenerative Creativity* is a framework for disentangling systems thinking by incorporating regenerative symbiosis of human, environmental and technological domains. Regenerative creativity embraces the paradigm shift required for the well-being and justice of environmental and social systems. Further, regenerative creativity will be explored through three dimensions: individual level exploring the relations between *humans and non-humans*, societal level addressing the *system of values and ethics* underpinning creativity, and finally the broader symbiotic level embedding *ecological intelligence* as a framework for creativity.

Bruno Latour (1996) has emphasized long ago that both **humans and non-humans** shape the agency. Agency is mostly driven by knowledge, which is assumed to be predominantly a human capacity and defined by human experience. Post-anthropocentrism rejects the idea that humans are the only beings capable of generating knowledge, and allows for other forms, beings, and objects to be included. Scholars within post-humanistic studies try to redefine what and who has the capacity to produce knowledge and engage in the creative thinking process, where new materialism, ecologies, climate, interconnection between elements co-exist (Ulmer, 2017). Thus, what are the mechanisms to activate the different ways of knowing and different sources of knowledge rather than human-induced? How can creativity be fed and stimulated by the new ways of knowing and imagining?

The field of creativity studies has yet much to explore if it expands to the senses and experiences that are unknown to us as humans. In our chapter, we explore the notion of non-human as both including other biological species and infrastructures, as well as technologies that humans interact with. Taking this perspective, creativity can help to enable a more-than-human perspective to challenge our conventional human social practices and beliefs.

Building on that, actor-network theory (ANT) advocates for understanding the relations between assemblages of human and non-human actors which both shape equal agency. In this light, the post-anthropocentric period should not consider creativity merely as a human capacity, but rather treat it as an assemblage between human and non-human entities that produce hybrid knowledge and experiences. Ulmer (2017) points out that the knowledge frameworks that put focus exclusively on the human perspective at the expense of anything else “could be viewed as incomplete”, as well as demonstrate “potential injustice to non-human entities”. By moving away from a preconception that humans are predominantly the objects and subjects of generating knowledge, we open up a broad range of possibilities for creativity that accounts for just and fair consideration to non-human entities.

Design research and practice must move beyond human needs and human experience. It is a challenge to account for non-human perceptions and include non-human entities in the creative and design process. As in the example of designing future cities, non-human perspectives and needs remain largely invisible in the participatory design methods (Rice, 2017). However, nature as a non-human agent

can influence the imagination, too: our experience of or interactions with plants and animals, flooding rivers, disappearing lakes, and rising oceans, soil, mountains and glaciers, weather, climate and seasons, volcanic eruptions, a starry night sky (Milkoreit, 2017).

Imagination and creativity processes need to understand how the interactions between the two domains develop new behaviors and visions for cohabitation. At the same time, digital technologies, as a non-human entity itself, are able to interact with humans or other



non-human entities, such as other species, or infrastructures to produce new forms of knowledge to foster creative thinking process.

While exploring the relationship between human and non-human in the framework of creativity and knowledge production, it is crucial to consider what ethical issues and values such interconnectedness may imply. Roudavski (2020) points out that our current social and political systems have been considering “non-human life to work as capital, commodities, services or labor”. However, post-anthropocentric thinking requires a new understanding of justice that accounts equally for human, biological and technological systems, their interactions, behaviors and cultures. Ethical principles must be based on the concepts of co-creation and fair distribution, without any system taking over the dominant role. As Minati and Pessa (2011) frame that by interacting these systems produce new emergent multiple-systems, as Collective Beings, and not just a new system. As a process, therefore, regenerative creativity stimulates wholeness and connectedness based on mutual reciprocity, where these connections have potential to increase the principles of empathy and fairness.

The concept of creativity implies the process of imagination and production of novel ideas. However, imagining and designing, especially for the future needs, is often a site of hegemonic discourse that can be seen as an instrument of power for the one who is in charge. There is an urgent need to shift the notion of imagination to make creative agency more inclusive. Regenerative creativity can help to uncover things and processes that are marginalised and underrepresented. In addition, developing the set of principles for the concept of regenerative creativity, the notion of *responsibility* must be incorporated. Regenerative creativity enhances the notion of ethics and values in design and power domains, where responsibility must be assumed throughout the process. The creative process empowered by human, natural, digital systems need to bear responsibility for pursuing just and sustainable outcomes. In addition, the creative process has a responsibility for its innovations to our future generations and their well-being (Krznicaric, 2020).

Finally, regenerative creativity embeds both aspects, human and non-human agency together with the ethics and values into a symbio-

sis of ecological intelligence. For the first time, ecological intelligence was defined by Bowers (2011) as the capacity to adapt cultural and social practices to the limits and possibilities of a particular bio-region. Ecological intelligence has been practised by indigenous cultures, while western philosophers later took a different path of consciousness and form of intelligence where rational, abstract, and de-contextualized thinking became prevalent. The figure of autonomous individual and centred self-became very powerful in the West as the basis of political and social justice systems. Today, with the ideas of planet-centric design, biomimicry and nature-based solutions, ecological intelligence has a chance to revive again and establish new ethics and values for the assemblage of human and non-human.

Ecological intelligence is not something we have to invent anew, as it has been a long-lasting practice in our societies. The current challenge is to adapt it to the ongoing digital transformation process. Considering the definition of ecological intelligence which adapts social practices to the biological environment, there is a need to expand its definition to incorporate the digital environment, which has become an integral part of human and non-human beings, as well as larger enterprises like companies and institutions. Thus, there is a need to reconsider human functions in relation to biological and algorithmic digital systems by giving equal agency to all of them. Regenerative creativity can help us to develop and implement ecological intelligence and thus move to a new form of consciousness and knowledge formation.

A new approach is especially relevant today to develop the capacity to imagine solutions for challenging environmental, social and economic problems, otherwise being deemed “wicked problems” for their complexity and interdependence. However, design practices and technological solutions developed in the anthropocentric period has been largely focused on the human needs. In order to imagine new solutions, we need to create new narratives, methodologies and tools to redefine our cultural values and behavior. Regenerative creativity is inspired by nature and technology as non-human agents has potential to include diverse voices to ensure just and sustainable transition. However, regenerative creativity requires new methodologies to produce new forms of knowledge and engage in new forms of creativity

processes. There is a need to expand the human-centered approach that focuses on collecting and generating knowledge through interviews, texts, observations, images, sounds.

The new methods need to consider the symbiosis of ecological intelligence, ethics, values and relations between humans and non-humans to produce meaningful creative output to tackle future global challenges.

## **6.4 Digital creativity for a techno-social hybridity**

Being constantly immersed in an “onlife reality” (Floridi, 2015), human beings have undergone critical cognitive, behavioral, and social changes. Indeed, the digital transition is having an important impact on creating and innovating, which involves a continuous movement across analog and digital and across the real and virtual. The democratisation of digital technologies has opened new opportunities for people to engage in creative activities, generating innovative digital ideas and projects, and contributing to an increasingly diffuse manifestation of creative acts. In this context of digital evolution, with the rising of disruptive cognitive technologies, devices that connect us with people worldwide, and ubiquitous digital technologies increasingly within everyone’s reach, creativity is evolving too taking a new shape: Digital Creativity.

Digital creativity requires people – as human agents of creation – to have new skills, a new digital mindset, and a greater awareness of the actions they perform and their implications for others. A human agent should be able to strategically exploit the opportunity of digital technologies to create an innovative original digital outcome (Bruno, 2021) putting them at the service of the community in any field (Lee and Chen, 2015).

We define the Digital Creativity perspective of the human agent a *creativity-driven technologies* that encompass how creativity impacts technologies, exploring, modifying and guiding their development. Empowering such an ability enables humans to mature towards the evolution of digital technologies and adopt them to create more sustainable, responsible, and equal possibilities in the future. It means

consciously driving technological evolution and empowering innovation through digital technology, putting technology at the service of human needs. This ability entails the understanding and application of a human-centred creative process referring to a mental cognitive process happening in the mind of the creator and a practice happening in the material world through a series of individual and/or social activities to produce original and innovative outcomes.

The human minds today depend on technologies and practices of communicating, remembering and planning. This symbiosis with technology, called “human-technology symbionts” (Clark, 2003), undermines the idea of the mind/body duality by making common functions such as communication, perception or memory dependent on various external devices.

Shneiderman (2000, 2002, 2007; Shneiderman et al., 2005) has consistently undertaken studies on Creativity Support Tools (CST) that are intended as tools, user interfaces, socio-technical environments, or software supporting creativity across domains, empowering users to be more productive and more innovative. The goal of CST is to make more people more creative more often, enabling them to face a wider variety of challenges creatively and successfully in many domains.

According to his view (Shneiderman et al., 2005), a CST should enable more effective searching of intellectual resources, improve team collaboration, and speed up creative discovery processes. They should also support hypothesis formation, speedier evaluation of alternatives, improved understanding through visualisation, and better dissemination of results.

Emerging digital technologies augment human ability to generate novel and useful ideas (Amabile, 1988; Sternberg and Lubart, 1999; Runco and Jaeger, 2012), playing the role of a real active partner in the creative process. Humans and computers work as a duo team, supporting and inspiring each other in different steps of the process.

Companies and artists have already started to use and build their own digital interface to support their creative process, as well as to propose tools that can empower human potential, going beyond the natural human capabilities providing new creative possibilities.

A digital agent can become a co-creator partner that *speeds up and amplifies the creative process's earlier steps*: they can generate, evaluate, or refine ideas and bring them to culmination as full-fledged products. It is the most ambitious vision of human-techno interaction for creativity.

This is possible today thanks to emerging cognitive technologies such as Machine Learning (ML) and Artificial Intelligence (AI), which can autonomously learn and interpret information, combine concepts to generate a new idea, or contribute new ideas in a dialogue with humans. Digital technology can be considered a divergent modifier designed to inspire people and support them in divergent thinking. By replicating or enhancing human cognitive processes, such as analogic and metaphorical thinking, conceptual combination, lateral thinking, creative visualisation the digital agent can speed up and enrich human thinking while augmenting work and learning processes.

Some digital technologies, such as Virtual Reality (VR), can provide immersive realities to generate imaginary, symbolic, or a real-world simulation by altering the surrounding space and objects (Fuchs and Moreau, 2006). They can be used to modify the environment and the space in which the creative activity generates digitally created artificial worlds that can inspire the creator and activate curiosity, interest, and inspiration to augment and diversify possibilities.

Individuals should learn how to adopt emerging digital technologies to empower, enhance and stimulate their creative process and the factors responsible for their creative potential. This dependence extends the human into the world making cognition and action radically distributed. Interfacing with such external devices is unavoidable and if one acknowledges that this context has its own histories, tendencies and agencies human cognition and action also emerge as collaborative: co-performed with nonhuman digital entities (Roudavski, 2016)

We define the Digital Creativity perspective of the digital agent as *digitally supported creativity* that encompasses how creativity can be supported and enhanced by digital technologies and how creativity can be transformed and become yet more digital. This overview showed the impacts the digital age is having on human creativity,

contributing to define the main perspectives with which to approach the digital creativity domain.

The concept of Digital Creativity is strictly related to the idea of Digital Maturity, defined as a dynamic state that an organisation aims to achieve, to improve its integration of digital technologies as support for human activities.

Achieving a Digital maturity for the post-anthropocentric future means being able to use our digital skills and capabilities to engage not only with humans but also with other species and infrastructures to expand into the notion of regenerative creativity.

## **6.5 Future thinking balancing the hybridity**

Why creativity is the skill of the future? Futurists foresee that in the near decades the world's community will traverse through a period of rapid technological innovations that will change the foundations of society as we used to know. The company's environment is rapidly changing towards uncertainty and complexity given by technological changes and evolutions that deeply transform the strategic background (Teichert, 2019). Companies must innovate or disappear. They should more than ever be prepared to face the multiplicity of uncertain futures, anticipate possible scenarios to guide innovation, and take full advantage of the innovation capacity of digital technologies.

The ability to set a long-term vision is a key practice that a company should apply to achieve a Digital Maturity. Long-term vision represents the ability of an organisation to plan a strategy of intervention on a period from 5 to 10 years. Playing the long game is an intentional response to the changes a company sees emerging in the digital landscape (Kane, 2017). Embracing the digital transformation will require professionals and employees to be skilled for managing complexity and dealing with a spectrum of probable future scenarios.

When dealing with the concept of future, the verbs used are often to envision, to imagine, to foresee, to picture (etc.). Interestingly, all of them refer to something that can be seen – an image, a representation, a vision. Indeed, describing a future scenario with words is not

as powerful as translating it through images or artefacts (Prosser and Basra, 2019).

As a strategic approach to explore and critically consider future scenarios defining the preferable ones for everyone, Futures Thinking constitutes the most trustworthy process to explore and rethink creativity for a post-anthropocentric context. Futures Thinking aims to provide companies, decision-makers, designers with the capacity to proactively anticipate changes, recognise opportunities and ease the transition towards desirable futures. Indeed, it allows not only to acknowledge changes in the long-term but also, and above all, to inform today's decision-making activities.

In an article exploring the relationship between Design and Foresight, Hines and Zindato (2016) show how the two fields share an essential tool: scenarios. Moreover, they highlight that both disciplines are characterised by a core phase of generation followed by a “final phase of narration and representation” (Hines and Zindato, 2016). These similarities explain the significant relationship between Futures Thinking and Design which, throughout the years, has led to the definition of new design approaches. The most important ones are Speculative Design and Design Futures.

Speculative Design, is a form of participatory design that contributes to the debate on making design more human-centred, elevating it to a dimension of greater social responsibility (Bottà, 2019); this is possible by integrating this approach into all strategic processes for creating products and services. In 2013, Dunne and Raby defined speculative design in contrast to the traditional design thinking approach aimed at achieving goals through problem solving. Speculative design does not aim to solve problems, but to locate them in a space that extends beyond the present, creating narratives of possible future realities that help us to question the impacts of the choices we decide to make, thus being able to avoid less desirable futures (Dunne and Raby, 2013).

It is a form of critical design, that questions the cultural, social and ethical implications of emerging technologies. A form of design that can help us to define the most desirable futures, and avoid the least desirable (Dunne and Raby, 2013).

A second approach, Design Futures is described by Damon Taylor as a form of Futures Thinking that “involves the attempt to discern the possibilities of tomorrow in the culture of today” (Taylor, 2019).

Regenerative creativity, as a concept enabling human and non-human interaction along with ecological intelligence and values, is however still not included in developing future visions. Digital maturity and digital skills have the potential to use their capabilities to engage not only with humans but also with other species and infrastructures to expand into the notion of regenerative creativity.

At the same time, regenerative creativity has potential to inform the Future Thinking process by expanding the notion of “future” which has been dominated by the human perception of time. What if the non-human time scales and perceptions are very different (slower, faster, or fractioned) from ours and they can enrich and expand our approach to long-term and future thinking. We propose that both *Regenerative Creativity* by tapping into new types of knowledge generated both by humans and non-humans, and *Digital Creativity* by enhancing creative process with the help of novel digital technologies can help to expand the field of innovation for companies and designers to tackle the challenges of the future.

Foresight is the Future Thinking skill to empower to deal with the balancing of Digital and Regenerative Creativity, which is aimed at considering the future as something that can be shaped and influenced by present actions.

There are four phases that characterize the foresight process (Voros, 2005). Firstly, there are the **inputs** which refer to the initial phase of information and data gathering. Then there is the actual **foresight work** subdivided into three further steps: the analysis of collected information which leads to the interpretation activity. This step requires to dig deeper into the analysis findings in order to gain more in-depth and useful insights. The third step is called *prospec-tion* and it represents the synthesis of the previous two. This is the moment when alternative futures are created and explored. The most helpful tools in this context are the visioning methods, such as scenario planning.

Next, there are the **outputs** which represent the vast spectrum of options that have been generated by the previous activities. This part



consists in the successful completion of the foresight process: the final outcome, indeed, is an “expanded perception of strategic options available” (Voros, 2005).

The last part refers to the **strategy**: once the outcomes are available and the process is complete, strategic decisions and actions will be well implemented. Most interestingly, the actual objective of strategic futures thinking is considered to be achieved when a wide and inclusive range of possibilities is obtained.

Uncertainty about the future has always been a barrier to long-term forecasting. Moreover, the further forward we project in time, the greater the range of possibilities and pathways, which increases the level of uncertainty. As futures thinkers like to put it, the “cone of uncertainty” keeps widening. Since the turn of the millennium, however, we have shifted from a cone-shaped future to a new era of networked uncertainty: “networked” because the events and risks we face are increasingly interdependent and globalised, raising the prospect of rapid contagion and butterfly effects and rendering even the near-term future almost unreadable.

Futures Thinking has to raise awareness and “make people think” (Voros, 2003; Reeves et al., 2016). Futures Thinking is an analysis and criticism tool, functional as a “design for debate” and understanding the circumstances and future possibilities. For the same reason, Futures Thinking will never have implications for the present. Futures Thinking is pushing designers’ creativity and making them able to face complexity and multiplicity of futures. Since the nature of this approach tends to push the boundaries of what can be designed trying to tackle broader issues (e.g., climate change, health-related consequences of a pandemic), decision-makers might perceive that Futures Thinking proposals are disregarding their company’s core objectives, thus hindering the understanding of the potential of Futures Thinking scenario building (EU Foresight Platform, 2021). To overcome the challenges of Futures Thinking implementation for the companies and decision-makers, there is a need of a balance between the pragmatic aspect of Digital Creativity together with Regenerative Creativity. To achieve this, we need to understand the ethics, responsibilities of designing and living with non-human systems, both algorithmic and natural.

In this regard, these are the tools and methods for managing uncertainties in the future with the help of design by generating discussion and reflection. Empowering design methodologies with methods from Futures Studies generates a more complete, innovative and forward-looking approach to designing products and services for the future (Canina et al., 2021). Expanding on that, in this chapter we made an attempt to include and redefine the notion of creativity to empower methodologies and discourses in the field of design futures.

## 6.6 Conclusions

In this chapter, we have underlined the urgency of redefining the concept of creativity for the post-anthropocentric era, which has been named as one of the top three skills needed for the future (WEF, 2020). At the same time, technological advancement and digital transformation are both required to facilitate green and sustainable transition in European countries. As companies try to transform and achieve Digital Maturity, there is a need to ensure this transition is just and sustainable. Otherwise, innovations addressing acute challenges, but locked in the old systems of thinking and path dependency will not bring us closer to a better future.

Based on the two principal pillars for transition of Creativity and Digital Maturity, we have further explored the new methods and approaches that are needed to address the challenges of Anthropocene and ensure their mitigation for design research and practice for post-Anthropocene. By shifting the agency to produce knowledge and creative outputs from humans to include non-human agents, such as biological entities, technologies, digital tools, objects, data, and others, we expanded the notion of creativity.

Post-anthropocentric creativity is considered not as a mere human capacity anymore, but as an outcome of the assemblage of human and non-human interaction. The framework of Regenerative Creativity also implies respective ethics and values, as well as ecological intelligence that presupposes the symbiosis of interaction between human, biological and digital systems. As a result of a symbiosis of digital and human systems, Digital Creativity enhances new skills

and mindset necessary for a creative process, as well as creative process helps to enhance a symbiosis of human and digital interaction.

Inspired by the metaphor of a lever introduced in the Section 1, two dimensions of Digital Creativity and Regenerative Creativity are seen as balancing pillars to develop a new approach to post-anthropocentric creativity. Future Thinking stands as a foundation to provide the balance for both aspects with the aim to develop strategic future visions. The combination and balance of the three pillars is important for companies to adapt for design and innovation to solve the challenges induced by ecological crisis and fast-developing technological progress.

As a challenging thought for shifting to post-anthropocentric era, what if we see not only our biological and digital systems as innovators for creativity but also if we reconsider the role of humans by shifting away from an ego-centric role that has been developed by the Western philosophers. One of the urgencies of the Anthropocene is the growing world population and depleting natural resources. What if we reconsider and expand the notion of “human” in the human-centric approach and consider humans as energies, equally with biological and technological energies. Considering that there is an abundance of human energies, knowledge, empathy - we need to find ways to maximise and use it. In this scenario, Regenerative and Digital Creativity can help us to identify opportunities not only in relation to nature-based solutions but also to recognize the constructive potential and opportunities of the growing global population.

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