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Acting Responsibly
Design as a Sustainable Practice for Society

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Keywords
Hybridization of Skills, Ways of Doing, New Media, Advanced Manufacturing, Online Community.

Abstract
The rapid rise of emerging issues, often linked to the absence of sustainable action, exposes society to unexpected and unwanted risks. Today, more than in the past, this condition of fragility places at the center of the design debate the need to build a critical point of view, concerning some production actions that still accept the inevitability of environmental damage, whose resolution is postponed to pursue economic growth.
Only through responsible action will it be possible to predict the effects and design the remedies useful for reconciling the relationship between human beings and the ecosystem.
In this perspective, it is the convergence between different disciplinary skills that offers a sustainable and effective response to urgency, shortening the supply chain that goes from creation to production of the artifact and reducing the gap between market and consumer. Thanks to the methods of Ethical communication and the techniques of digital manufacturing and prototyping machines, fashion, and more generally the textile sector, could lead to the creation of valuable products considered as communication tools useful for the common good of society, not only in socio-cultural terms but also in terms of sustainability and circularity.

1. Introduction[1]

In recent years, a portion of the world has become increasingly concerned about pollution, climate change, and other *permanent* and widespread emergencies that threaten society (Piscitelli, 2019). The growing number of disastrous events, often linked to the neglect of the environment, and which are generating, for example, desertification, melting of Arctic and Antarctic ice, water pollution, fires, as well as the spread of epidemics, are just a few catastrophic events that impose a great challenge for contemporary society, both in socio-cultural terms and linked to the combination of economic development / public health system, in an attempt to manage emergencies (Hu, Zeng & Zhao, 2009).

The great disasters are accompanied by the dustier ones, linked to everyday life and the impact that simple gestures can have on ecosystems.

The worsening of the conditions linked to ecological changes, often due to factors related to the acceleration of economic development that acts indifferently in the stages of the first, second and third world, supported and implemented by poor practices and invasive cultures (Konatè, 2019), highlights the need to adopt radical measures to solve the environmental crisis and reconcile the relationship between human beings and the ecosystem. As Abdoulaye Konatè states "Man must be

1 This article was discussed and agreed by the two authors and was written having shared the bibliography, readings, researches and reflections. Gabriele Pontillo is responsible for the in-depth study of the paragraphs: "Digital technologies for a more sustainable fashion supply chain", "Advantages, disadvantages and potential of 3D printing applied to the fashion supply chain" and "The challenge for the near future: emergency and sustainability management". Roberta Angari is responsible for the in-depth study of the Introduction and Conclusion, and the paragraph "Between innovation of the supply chain and dissemination of knowledge: ethical communication as a strategic choice".

able to live in harmony with his environment and this is the only hope for life to be made of happiness and prosperity" (Konatè, 2019, p. 14).

As a reflective discipline, design cannot fail to think on the different aspects of the *great changes* "often sudden, violent and frightening, but also regenerative" (Langella, 2020, p. 31). The starting point consists in the delineation of a globally shared intervention, also based on the greater integration between the artificial and the natural world (Ranzo, 2007): to outline new ways of doing and acting through design, to reverse the production structures and more generally the economy, starting innovative processes and determining identities and values useful for restoring centrality to people and communities, as well as the relationship they have with the surrounding environment (Trapani, 2013).

The recovery of an ethical sense behind the project, which becomes its promoter, can be an opportunity for an economic, social, individual, and collective rebirth, especially if we are confronted with one of the most incisive phenomena of the transformation of every day, based on widespread digitization, on digital manufacturing, on the *Internet of Things* (IoT), on open source and on online communities, which not only constitute the field of experimentation in which the new generations of designers and innovators express themselves, but above all have represented, and still represent, the evolutionary force that is reformulating interpersonal relationships and intangible assets, "recoding the DNA of contemporary objects" (Langella, 2020, p. 32).

The proposal of the contribution explained below is to start from the need to find contact points between the development of advanced technologies and the world of experience, in an attempt to identify a way to be able to integrate the slow times of the earth and those dynamics imposed by progress (Ranzo, 2007). To do this, thanks to the analysis of the logic of consumption that has characterized the last few years, it was possible to identify the orientation of the contemporary production scenario from which to start to trigger possible vectors of change towards future scenarios.

The choice of proposing a methodology based on the convergence between visual communication, and more specifically ethical communication, and the *materiality of doing* (Mari, 2011, p. 112) close to digital manufacturing and rapid prototyping, as well as communities made up of Makers, stems from the understanding of how this relationship can affect not only the quality of the products, shortening the supply chain that goes from the creation to the production of the artifact, but also the relationship that individuals establish with the artifact itself and with the environmental system, demonstrating the need for a less ephemeral and more *anthropological* dimension (Branzi, Linke & Rabottini, 2013) of the project, which moves towards an ecological but efficient reconversion of production systems, attentive to the social production of goods and services responding to new demands and capable of guaranteeing social cohesion, as well as territorial eco-development programs, which favor the sustainable use of local resources and promote the potential of networks (Manzini, 2009, p. 19).

In this perspective, design, thanks to digital - understood as an environment and design technology - and to methods more intrinsically linked to sustainable practices and social innovation, has not only the ability to generate new forms but above all the responsibility to support more promising innovations and direct them towards favorable outcomes, promoting new dynamics of sustainable change, coherent with the new contexts in which it operates.

The definition of Eco-Design, outlined by De Benedetti, Baldo, Foschia, and Rossi (2009, p. 29), and due to the introduction of environmental variables in the product design phase, sees its methodological boundaries expand thanks to the evolution of design thinking and of the entire supply chain, which through new technologies, digital simulation environments, identification of new materials or application of alternative materials, as well as the implementation of communication practices designed to make motivations linked to the production context more accessible to users, determine a significant transformation of the impact on the environment and society of the production of goods and services.

2. Digital Technologies for a More Sustainable Fashion Supply Chain

One of the endemic condition of contemporaneity, is the omnipresent diffusion of digital. What characterize the production system in recent years, it is precisely the ability of digital tools to insinuate themselves into every activity of the production system and daily life. Nonetheless, this drive towards dematerialization is counterbalanced by production possibilities that are expanded in the analog dimension thanks to new

processes and manufacturing methods which for the world of design constitute a vast panorama of possibilities and stimuli. Digital manufacturing through 3D printing, as well as robotics, artificial intelligence, digital co-design platforms, raise the expressive and executive possibilities with which design can respond to daily needs (Langella, 2020).
The same technologies also find application in the fashion sector, in which numerous brands and designers use additive technologies to create prototypes, customized products, and artistic pieces. On the runway, high fashion designers displayed intricate 3D printed clothing and accessories, as evidenced by the collaboration between Stratasys, Francis Bitonti, and Michael Schmidt Studios, whose dress worn by Dita Von Teese was one of the most iconic of 2013 New York Fashion Week (Binns, 2015; Bodhani, 2014; Kurutz, 2013; Reilly, 2014). Other examples are brands such as Continuum that offers customizable 3D printed products, such as jewelry, shoes, and swimwear, Timberland and Nike, that use 3D printers to compare three-dimensional prototypes with CAD drawings (Hindman, 2013).

From this point of view, additive technologies seem to be mainly used to push the frontier of fashion design towards product and system innovation, which thanks also to design software, allow the development of complicated geometries, often sculptural, easily customizable based on requests and measurements of the body of each individual through the use of a 3D body scanner (Zolfagharifard, 2013).
Despite the potential offered by such technologies, seems to be missing the pretext full of meaning useful to reconnect the

consumer with the ecosystem through innovative products and sustainable market dynamics.
In this perspective, the role of designers becomes central to the structuring of possible innovative supply chains that effect a paradigm shift from the classic dynamics of the fashion industry, exploring and applying approaches that create new hybrid skills between traditional designers - eg. creative designer and product development - and maker - eg. mechanical, electrical and computer engineers - predicting what it will be like and how it will live in the near future.

Methods such as automated digital production and distributed production lead to rapid changes in the traditional supply chain, favoring shorter development times, and increasingly intimate interactions with consumers (Amed et al., 2017). This means that the traditional, fragmented and articulated supply chain, as it is based on a complex network consisting of various distinct functions and roles divided between the individual industries involved in the creation of a product, is replaced by a new supply chain becoming the key to allow a reduction in the complexity of the networks, through the identification of a more local production model that guides reshoring opportunities (World Economic Forum, 2017).
The overseas approach which involved the hiring of industries for the development of components or the transformation of materials and substances of components, in other countries, such as China and Vietnam, mainly due to the reduction of labor costs (Sun & Zhao, 2018), gives way to a *local-for-local* approach, in which through the integration of different digital technologies, it would be possible to optimize direct labor,

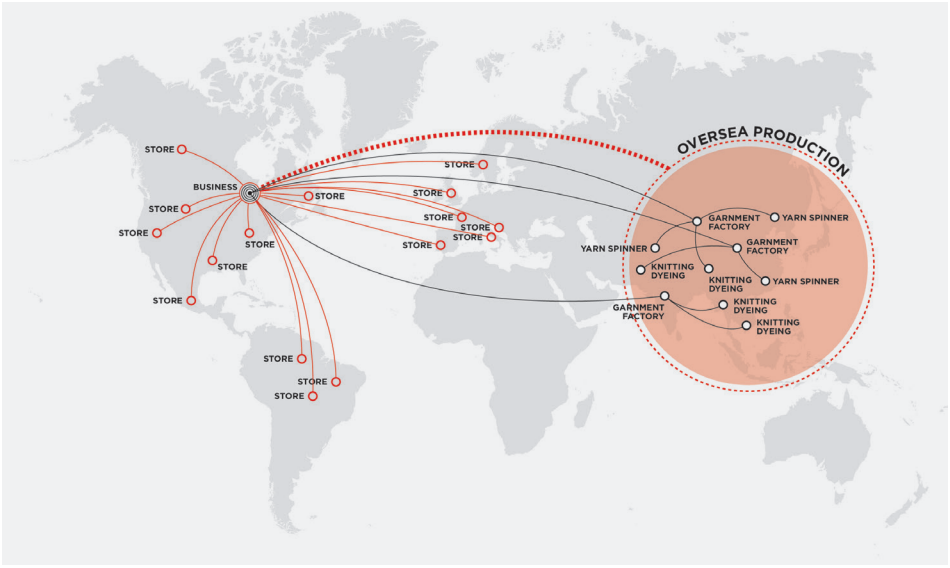

Figure 1. Self-production, Data visualization of overseas approach. 2020.

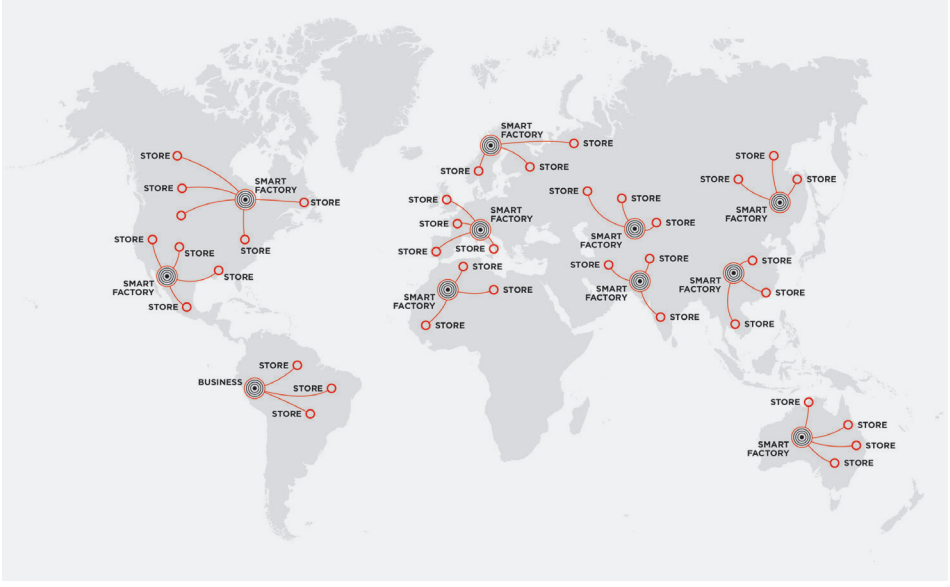

Figure 2. Self-production, Data visualization of local-for-local approach. 2020.

local resources, and adopt a renewed set of procurement strategies of renewable energy, for a more sustainable, agile, and versatile supply chain. In this way, 3D printing moves production closer to the final consumer and redefines the roles of designers, producers, and users (Sun & Zhao, 2018).

2.1. Advantages, Disadvantages, and Potential of 3D Printing Applied to the Fashion Supply Chain

The fashion retail industry has experienced a tumultuous period in recent years, supported by rapidly evolving technology. Through additive manufacturing, robotics, artificial intelligence, augmented and virtual reality, and other emerging digital tools, fashion is radically transforming, changing the production chain, and getting closer to consumers, who are offered complimentary services and experiences that go beyond individual products (Sun & Zhao, 2018).
While the fashion capitals become digital, we wonder how digital technologies can have a sustainable impact on the production chain, starting from the location of production outlined above, and more generally what are the advantages, disadvantages, and potentials offered by 3D printing applied to the fashion industry.

The analysis of the relevant scientific literature highlights how clothing made with the aid of 3D printers are more sustainable than normal clothing (Vanderploeg, Lee & Mamp, 2016) for some reasons, including: 1) reduction of waste raw materials, since cutting the fabric leads to residual pieces (Mau, 2013; Parker, 2016); 2) 3D printing is not only sustainable because it requires fewer resources, but also for the entire

life cycle of the product, it requires less energy expenditure during production, it also triggers changes in the structure of the production chain, shortening it, thanks to more digital and localized supplies (Gebler, Schoot Uiterkamp, & Visser, 2014); 3) some projects, thanks to the material used, can be completely recycled and used again for printing other objects thanks to recycling processes which have little impact in terms of environmental sustainability.

Nonetheless, there are some doubts regarding 3D printed materials, as they may not be comfortable and flexible enough for everyday use (Yap & Yeong, 2014), while optimal materials, such as textile fibers, are still under development (Rosenau & Wilson, 2014).

In this regard, the qualitative study conducted by Perry (2017) precisely on the advantages, disadvantages, and potential of the application of 3D printing to the fashion industry, highlights how there are discordant theories between the target identified for the administration of the survey for data collection. In particular, the findings of the survey highlight that users are more willing to accept 3D printed accessories rather than clothing.

Despite these criticalities, it is the process of creating a product using 3D printing that constitutes the real strength of this technology: the speed in managing and verifying the designed product through prototyping, subsequent modification and rectification, as well as the recyclability of the prototype, and at the same time, the customization of the geometries based on the needs of the end-user are just some of the characteristics of the additive technologies that are useful to the emergence of a scenario that is more attentive to environmental sustainability.

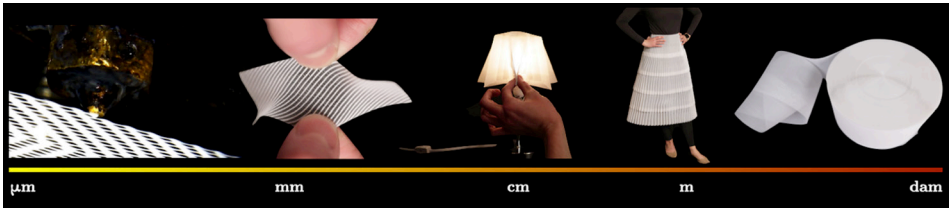

Figure 3. Jack Forman, DefeXtile, different applications of printing technique applied to furniture and fashion design. 2020.

Figure 4. Jack Forman, DefeXtile, a full-sized DefeXtiles skirt produced in 36 hours in a single print. The skirt was expanded like a telescope to reach its full height. 2020.

3. The Challenge for the Near Future: Emergency and Sustainability Management

Based on contemporary scenarios, the academic world highlights two key trends that are focused once on eco-fashion, the other on techno-fashion, which rather than diverge, should have symbiotic relationships (Choi, 2018). In this regard, Scaturro (2008) suggested the concept of eco-tech fashion, which is based on ecological practices applied through new technologies, developing a line of recycled prêt-à-porter clothing aimed at promoting the upcycling process to potential users.

Many experiences conducted in the field of fashion design, and beyond, increasingly consider design practices that are environmentally friendly, ecological, and ethical, integrating these issues into academic design curricula at both national and international levels (Pasricha & Kadolph, 2009).

This is aligned with the fact that already in the early 2000s, the UN had declared the period 2005-2014 as the decade for Education for Sustainable Development, a program in line with the survey on social responsibility in clothing and textiles education conducted in 2002, which reported that 78.2% of educators felt it was important to address environmental degradation, including product disposal and recycling (Dickson & Eckman, 2006). The development and design of sustainable products was therefore already a central issue, and yet today we still find ourselves anachronistically thinking about the same issues, which shows that more needs to be done. Added to this is the fact that not only sustainability but also urgencies and emergencies, place the attention of de-

signers on *responsible action* as a necessary and necessarily shared mode of intervention, as it is capable of overcoming those difficulties that characterize contemporaneity.
For this reason, although conventionally the textile and clothing sector has followed a business-centered model, based on innovation, target market and profit, and study of trends, it is necessary to change the model and include global citizenship skills to counter the global challenges (LeHew & Meyer, 2005). The need to align curricula in design with sustainable education is felt all over the world, as is the social and economic sustainability that should increasingly be intersected in design study courses and design practice, to trigger a systemic change focused on responsibility.

4. Between Innovation of the Supply Chain and Dissemination of Knowledge: Ethical Communication as a Strategic Choice

When the dialogue on sustainability began in the 1970s, the focus was mainly on solving the problems of waste caused by industrial production. In recent years, however, *environmental thinking* has been dealing with the search for a balance between the sustainable use of economic, social, and environmental resources, while paying attention not to destroy the ability of future generations to meet their needs in a sustainable way (Niinimäki, 2013). The notion of sustainability, therefore, is enriched with ethical thinking based on values, in an attempt to solve *concrete* problems related, for example, to overproduction, to the consumption of non-renewable energy sources, to environmental pollution, also through new design methods and creative solutions (Thomas, 2008), innovative

technologies, as well as through the involvement of consumers in sustainable transformation processes.

In this perspective, visual communication, and in particular ethical communication, provides the paradigm from which to start, for a clearer and more complete transmission of knowledge. As Jacobs and Karpova state, knowledge is represented by the awareness and/or understanding that individuals can acquire through direct experience or the study of a phenomenon (2019), and for this reason, it is closely linked to "know-how and know-why" (Gurteen, 1998, p. 5).
Knowledge can be explicit and tacit (Pellegrino & Hilton, 2012), in the sense that it is possible to choose the most suitable means for their transmission. Explicit knowledge is formally structured, therefore returned through easily accessible dissemination tools such as platforms and digital media, which return more complete mappings for information, both through data visualizations and various types of media content - eg. images and videos. Tacit knowledge, on the other hand, is deeply linked to the experiences of the single individual, it is defined as *subjective intuition* (Nonaka, Toyama & Konno, 2000, p. 7); it is not easily formalized nor can be shared or communicated, but if acquired in a specific context, through observation and practice, rather than through strategic tools, it can be much more internalized by the individual user, as the metabolization of direct experience makes more conscious use possible (Olson, 2000).

In this perspective, knowing a product influences how it is seen by observers see and how they interact with it (Walker,

2009), therefore, feeding new knowledge through the experience linked to innovative fashion products both for the supply chain and for technologies, allows facilitating the user in rethinking and reevaluating the aesthetic qualities of a sustainable product (Brady, 2002), detaching himself from the *fast-fashion* model, which in recent years, although it has had the positive effect of democratizing fashion through the supply of low-cost garments inspired by or simply copied from the latest trends, on the other hand, it has undermined the value of intellectual property belonging to fashion designers, greatly expanded the environmental impact through the use of non-renewable energy sources, and promoted a culture of waste (Brewer, 2019).

Through communication and the transmission of knowledge, it is therefore believed that it is possible to put users in a position to evaluate a product based on certain information: its environmental impact during production, logistics, use, and disposal, also evaluating how the product is manufactured, i.e. in what working conditions and where, and if the company has the production based on sustainability.
In this perspective, ethical communication offers a new way to align industrial production with the transmission of knowledge, intending to allow the understanding of material culture and its consequences, as well as cultivating consumer preferences according to sustainability values (Niinimäki, 2013).

5. Conclusion

The culture of the project is now more than ever faced with urgent and emerging issues, increasingly linked to the man-

agement of production chains and the impact they have on ecosystems.
In particular, the global fashion industry must face a series of challenges in terms of sustainability and social responsibility (Chan, 2018), closely linked to overcoming the fast fashion model that generates a series of social and environmental concerns. Intending to outline a new ideology through which to deal with production, it is important to improve business logic, increasing the ethical and social responsibility of companies, also through sustainability initiatives linked to technological innovation, which can help in overcoming inequalities as well as in the improvement of production and conduct standards in the production sector in general and in fashion in particular, on the one hand by shortening the supply chains, on the other by increasing the awareness and participation of consumers starting from the creative process.

The principles of the European Commission related to environmental design (Commission of the European Communities, 2009), would therefore finally find confirmation in a more sustainable fashion supply chain that takes into account the life cycle of the product during all phases: design, production, logistics, retail, use, and disposal. Using new technologies, ecological materials, would lead to a reduction in the use of resources in the creation of more durable, sustainable, multifunctional, customizable artifacts, or even responding in a timely and immediate manner to the needs of users.
Despite the versatility and advantages of these tools in the academic and experimental environments of research centers, again, as highlighted in the previous paragraphs, there is

still a distrust towards 3D printing, motivated mainly by the aesthetic and functional quality of the objects, often still too limited. It is true that the technological advancement, and at the same time of new materials and more performing processes, is rapid and inexorable and soon digital productions will become more and more refined, allowing to produce in an increasingly sustainable and rapid way instant solutions for emerging needs (Langella, 2020).

In light of what has been said, and of the dynamics that characterize the scenario in which converge the environmental threat, the economic crisis, the perception of widespread vulnerability, it is appropriate to ask ourselves how the innovation of processes and products aimed at everyday life, guided by design, from technological innovation, and the diffusion of knowledge through visual communication, can outline a new object scenario, whose peculiarity consists in responsible design action.

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V

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Since 2015 she has been teaching fashion and communication design courses at the Accademia delle Belle Arti di Napoli.
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Among the main projects are the visual identity of the Italian Pavilion at the Venice Biennale (2015) and the creative direction of Milano Book City.
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For several years she led sewing workshops for children and supported the student sewing lab at HAW Hamburg.
Her label PAID VACATION functions as creative platform for contemporary tailoring and made-to-order fashion design.
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