

# From Empathy to Inclusive Design: Multisensory Solutions for (Not Only) Socially Sustainable Projects

**Federica Delprino**

Università di Genova

federica.delprino@edu.unige.it

ORCID 0000-0002-8098-2213

## **Abstract**

Solutions designed for specific niches have over time become integrated into common use, while others have remained the sole purview of small groups, defining and stigmatizing them. Through an analysis of the process that has made many technological solutions created for the disabled into common use for the majority, it is possible to understand when and how designers should intervene in creating their projects to guarantee the accessibility and usability of the resulting artefacts. There are ways to 'empathize' and consider users based on their general abilities and technological skills, so as to broaden the meaning and the sphere of accessibility. Deepening users' needs and ways of interacting, shaping 'personas' according to their abilities and not just difficulties, can help design more inclusively. This approach makes possible not only the scalability and inclusiveness of the end result but also of the design tools, focusing on specific needs without being exclusionary.

## **Keywords**

**Design for all  
Assistive vs Mainstream  
Design thinking  
Touchless**

## **From assistive to mainstream: designing for the few for the common benefit**

Several technologies (both analogue and digital) designed to support vulnerable users have been integrated into *mainstream* use over time. Identifying and recognizing them allows us to examine the factors that made them so popular and used, and to reintroduce them. In this way, society may succeed in reducing the stigma towards objects created for disabilities thanks to the awareness and spread of widely usable devices. The knowledge that many traditional artefacts work on similar principles and technologies to those used specifically for users with disabilities is useful for end-users but primarily for designers. This opens the door to broad-spectrum solutions, those “that produce buildings, products and environments that are usable and effective for everyone, not just for people with disabilities” (Steenhout, 2010).

It is based on principles of sustainability and agility at a tangible and community level but also on the development of economic models able to bestow companies with a broader target audience, linking profitability to a social goal. Taking into account various disabilities and making users belonging to minorities part of the designing process is essential but cannot solve every problem on its own. Indeed, there is no point in this involvement if one always designs specifically and separately. This in fact tends to separate, while in many cases opportunities emerge to converge skills and needs on a large scale. There are such examples in everyday objects (e.g. curb cuts, proximity sensors in sinks and automatic doors,...), and devices or interaction systems related to aid or compensation for a disability, but also in the field of multimedia arts (e.g. voice synthesis and recognition, motion sensors,...), where immersive experiences are based on technologies that have a strong inclusive power precisely because they are already multimodal and multisensory (Delprino, 2022).

The designer's approach to inclusion is crucial, along with user familiarity and drive towards unity. “Design is much more likely to be the source of exclusion than inclusion” (Gilbert, 2019). The design process may, in many cases, create artefacts perfect for specific demographics but at the same time forget about others. Developing ideas and solutions for different people take the risk of relying on biases and preferences or on only partial target analysis and empathisation.

This process can start with a renegotiation of the terms ‘assistive’ and ‘mainstream’ both for designers as they approach a method that wants more cohesive and inclusive results as well as for the awareness of the end-users themselves. It's been considered, in this perspective, “assistive” as any tool that can increase, maintain, or improve the functional abilities of people with disabilities (Mangiatordi, 2017) and any technology that enables someone to accomplish something they could not normally do (Lischetti, 2007). On the other hand, “mainstream” would be that shift from a design approach that focused specifically on separating elements and “special needs” to a more cohesive inclusive design approach, incited by people themselves (Fleck, 2019). In this sense, the goal of bringing technologies and design solutions born to compensate for specific needs within

a broader pool of users, leads to working from the particular to the general in order to normalize and make more widespread solutions that can benefit not only the minority for whom they were designed.

In this sense, the purpose from the design point of view should be precisely to bring together abilities of different users, finding in those specific solutions a way in which they are integrated into the concept of normality on a broader level. And, on the other hand, to embed this vision and objective already in the process of design, rejecting approaches that associate a deficit or a very specific requirement with a consequent exclusion.

Indeed, “design is much more likely to be the source of exclusion than inclusion” (Gilbert, 2019) even if the design process may, in many cases, create artifacts perfect for a specific demographics but at the same time forget about others, or focus their solutions on specific groups by devising rather separate and divisive designs.

### **Physical and digital spaces as an extension of the possibilities of inclusion**

Foremost, to identify a common advantage, it must be taken into account that this actually lies between shared benefit and standardization, just as part of that process that makes projects scalable from the specific to the general Fig. 1. This consequently requires an intersection of practices which pertain to the physical as well as the digital world, tending towards continuity and not separation, seeking integrated and integrable ways of interaction Fig. 2.

The pandemic period has made it clear that technology itself may be a discriminating factor, not just a means of integration and inclusion. In this regard, it seems appropriate to ask what inclusion really means in an era that is pervaded by technology: which ones are the fields of action and ‘reality’ and consequently the tools.

The pandemic period has made it clear that technology itself is a discriminating factor for including people in the workflow of study, work, and leisure: architectural barriers and digital spaces designed for users with specific abilities and knowledge can be equally exclusionary elements for certain categories, without taking the others into account. “Physical space can cause difficulties as the world of web platforms if they are not optimized for the needs of different users” (Morozzo et al., 2021, p.19), so much so that it is essential to consider the continuity of interactions between physical and digital, analogue and connected environments. Otherwise, not considering multiple ways of interaction at the beginning of the design process, will not only exclude users with different physical abilities or technological knowledge but will also make projects less scalable. Considering multi-sensory solutions allows to address various needs and overcome limitations.

When it comes to inclusion therefore, it is not possible to divide between digital and analogue, in-presence, and virtual experiences, because the moment one is in a space is mostly the possibility of interacting elsewhere at the same time. This can be a strength in the moment it is able to multiply the possibilities of access to a project,

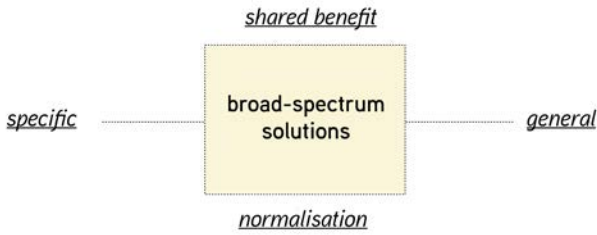


Fig. 1

Fig. 1  
 Indicating the requirements and terms for broad-spectrum solutions, scheme credits: Federica Delprino.

Fig. 2  
 Inclusive intersection of accessibility possibilities between physical and digital, scheme credits: Federica Delprino.

Fig. 3  
 Process proposal scheme for building inclusive personas based on the multiple modes of interaction and subsequent choice of enabling technology, scheme credits: Federica Delprino.

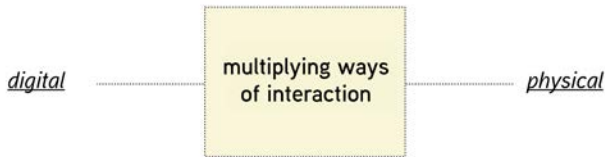


Fig. 2

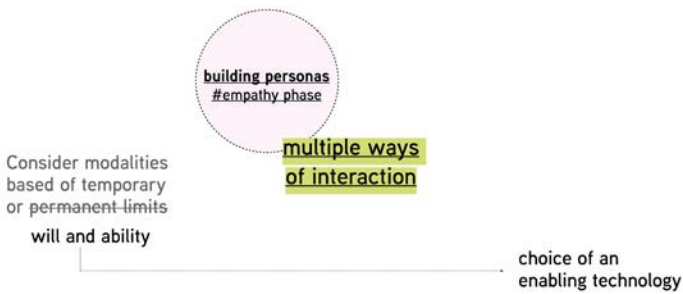


Fig. 3

to a location, and having an experience of it. It thus turns out to be necessary to design inclusive 'phygital' interactions, in which is meant interconnection between the physical and digital layers that enhance the meaning and value of the original object (Lo Turco & Giovannini, 2020), in which the real and digital worlds more than overlap exist in the continuity of identity and interaction.

### **Multiple ways of interaction through “personas”: what we need to consider to design inclusively**

The possibility to offer different interaction modalities to the potential user, visitor or inhabitant allows the latter to choose how to relate to the device, the object, or the experience, according to his or her perennial (e.g., permanent disability) or momentary (e.g., transitory deficit, preference, need of the moment) needs. This also makes a project scalable, durable, and more resistant to adversity as it is accessible in many ways. It also makes the use of a space or an object a real experience, which can be varied at will. It's a competence of each designer to impose what is 'usable' and 'normal' in the context in which they move since the latter is the one who decides how his design - whether it be an object, a building, an interface, or a service - is used. This is simply defined: by majorities; by the technology and the modes of interaction adopted; by the selection of the context and the construction of the personas for which one decides to design.

The personas approach intends to involve the designer in the daily lives of potential users, submerging them with a kind of 'projection foil', so as to identify behavioural patterns and possible future actions (Gaiser et al., 2006). It is as crucial as it is complex to have a standpoint on personas that is free of stereotypes and that can really bring out the necessities to be addressed in the project. On a professional as well as an individual level, it is vital to develop skills related to specific resources in order to stimulate empathy and to be able to cross-fertilise needs for project purposes. An empathic cognitive style towards personas could mitigate an egocentric approach and help to understand users through personas (Marsden et al., 2017). The qualitative approach, while within a model for a shared tool that can still be adapted as needed, is important because a massive data analysis can indicate trends in specific actions, not actual behaviour (Brewer et al., 2017) and especially the underlying motivations, intentions, and exigencies.

Still keep in consideration, on the other hand, that the very way one does research and includes any information may vitiate the point of view regarding personas and stereotype them, disregarding what they may have in common. For instance, creating different targets does not necessarily mean producing distinct solutions; on the contrary, it is possible to intersect them in such a way as to find sustainable meeting points. One of these, for example, is precisely the ability and capacity to interact in a context.

There is the opportunity of considering the most appropriate modes of interaction as we build our personas from the users' abilities.

It may be added to the perspective of “Persona Spectrum” held in “Inclusive: A Microsoft Design Toolkit” (Holmes, 2018), which reminds the designers how certain solutions can fit broad and complex situations and the needs of various individuals. Indeed, it “aims to understand related maladjustments and motivations through a range of permanent, temporary and situational scenarios”. If one adds to this principle the conspicuousness of different modes of interaction and put the capabilities together, the design trend may naturally tend towards inclusivity.

Starting from the concept of including different ways of interaction as a means of generating not only basal accessibility and thus a purely practical and basic compensation of enablement, but also togetherness and a certain level of engagement, it is essential to work on the users from the outset, thus identifying the personas with these premises. Hence, one speaks of a design action that from the very first phase of empathisation, even before the identification of the solution, bases the design line on the possibilities of interaction of the users with their surroundings as well as their will and inclinations, in order to fulfil a series of needs but also to achieve involvement purposes. It will therefore tend to consider not only modalities based on temporary or permanent limits, but also will and ability [Fig. 03]. This will consequently lead to the choice of enabling technology, or at any rate a set of solutions based on inclusion and accessibility requirements that are tailored to people’s capabilities rather than halting at those limits that tend to separate them.

### **Touchless solutions: voice interfaces and gestures at the service of inclusion**

Expanding interaction modalities gives the opportunity to include and entertain at the same time, making the same concept usable and durable in various circumstances.

Thanks also to the period of health emergencies, in recent years there has been a clear need to explore antifragile solutions (Taleb, 2014), capable of adapting to difficulties by foreseeing them at the design stage. It’s an approach also tending towards a “blue economy”, with the will to pool resources alongside people, highlighting a thousand today for a hundred problems. If we address this by uniting people, we move towards a system capable of so-called autopoiesis, i.e. the ability to regulate itself, to adapt to interruptions, disturbances and shocks, and to thrive within such distinct boundaries (Pauli, 2017).

When trying to limit a virus that is also transmitted through surfaces, all non-touch solutions are effective: voice assistants, interfaces managed through sound, motion sensors, etc., which have the characteristics to include and bring together categories of users that were previously often separated by different needs. The latter, however, thanks to these multimodal solutions can meet in (physical and/or) digital spaces designed to unite and relate them - in the broadest sense of the term. The use of touchless technologies can be found in medical contexts, within many private homes but also in exhibitions

and museums. They are an effective means of enabling a user to use a service or space, as well as entertaining and engaging solutions for a wide audience.

Touchless is an example of a mode of interaction that is not purely visual-based that can increase interactions and access possibilities, towards a common benefit. Touchless gestures may seem relegated to the imaginary connect with dystopian entertainment pieces and tv shows such as 'Black Mirror', which nevertheless shows some application examples that can be used in the Graphical User Interface (GUI) and that can be included in the Natural User Interface (NUI), an intuitive interface that eliminates the need for physical and mechanical devices such as mice, keyboards,... and have the advantage of being intuitive, such that the user does not need to learn specifically how to work with it (Chuta, 2019). Similarly, one has to consider a verbal interaction of Voice User Interfaces (VUI) that can be provided by Voice-first devices or Voice-enabled devices (Van der Linden, 2019), which have different inputs and outputs and again require different mental and bodily engagement.

Although the technology for touchless gesture input has been investigated, there is room to investigate meaningful, practical and intuitive implementations for touchless gestures; what needs to be explored pertains to feedback (Olofsson, Söderberg, 2013). It is true that a strength may be precisely the lack of pre-requisites and thus make way for an easier inclusion; on the other hand, it is relevant to strive for accurate and meaningful gesture recognition and to identify vocabularies of natural, intuitive, and meaningful gestures suitable for the tasks at stake" (Sukeshini, 2011).

The contribution in this instance seeks to place an emphasis rather than on the technologies themselves that include touchlessness, more on the opportunity that may create to foresee in the design solutions the possibility of interaction based on different senses and abilities, with the possibility of actually making a choice of relation with the surrounding space and artefacts.

From this point of view, touchless, in the wake of widening solutions and changing habits in the post-pandemic era, may be among the interaction solutions that deserve a focus on their inclusive potential. Even more so if the talk about hands-free and voice interaction is directly related to user profiling from its inception and not inserted as a fallback possibility or without a specific reason.

## Conclusions

Expanding the modes of interaction and considering 'inclusive skills' from the design 'empathize' phase can result in more inclusive projects. This may ensure a role for all actors in a system, making it more sustainable in both social and economic ways.

This is fundamental to unite minority groups to mainstream solutions to embrace normalization: not to produce just specific products and thus create separation, but also unnecessary and unsustainable in both environmentally and socially ways. This is also

crucial to generate systems that can withstand periods of crisis. A clear example is *touchless*, a modality of interaction that includes many users in previously exclusive experiences and so has become central in solving problems related to touching potentially infected surfaces. This is not a definitive, all-encompassing solution, but a clear indication of the importance for an inclusive perspective of broadening the modes of interaction from the very beginning of the design process, and an example of how a solution that was in many cases niche has become truly useful at the moment of a paradigm shift, which has made its feasibility clear.

It is therefore essential to look from the *particular* to the *broader* right from the design phase, ensuring a role for all actors in a system, who can then support and embrace it.

Alongside, it's very important and not implied to carry out this step with a focus on design tools, so as to provide ways to work on user needs and target segments not in a stereotypical way that necessarily induces different outcomes. Bearing in account the opportunities for inclusiveness offered not only by technology but by the concept of interaction with space itself in various vocal and gestural manners, the personas tool can be proposed and reconstructed in a different guise and implemented according to abilities and ways of interaction.

These premises were, for instance, declined within the experimentation of a version of the personas tool called 'Inclusive Multimodal Personas' (Delprino, 2023), which provides a checklist and parameters for generating dynamic and inclusive user profiles and verifying the systemic accessibility of projects, within different phases of experimental workshops. The contribution thus proposes a path from empathy to inclusive design, placing knowledge of common and fluid user needs side by side with multisensory solutions, so that these may be sustainable from a social point of view but also from an economic and technological perspective. The framework results as the foundation of a mindset and approach that, as future steps both already ongoing and to be developed, see the implementation of design tools in a variety of areas, project types and in the education field.

**Federica Delprino**  
PhD in Design at the University of Genova, where she is and has been subject expert and assistant in "Interaction Design" and in "Design Fundamentals"; tutor in 'Service Design'. Her research, as a Multidisciplinary Designer, focuses on inclusive design processes and tools for empathizing based on multi-sensory and multi-modal interactions.



## References

- Brewer, J., Joyce, G., & Dutta, S. (2017). Converging Data with Design Within Agile and Continuous Delivery Environments. *International Conference of Design, User Experience, and Usability*, 533-542. Springer, Cham.
- Chuta, D. (2019). Brave NUI World: Rise of touch-less gesture control, *UX Planet*, Retrieved August 30, 2022 from <https://uxplanet.org/brave-nui-world-rise-of-touch-less-gesture-control-882be077cdfa>
- Delprino, F. (2022). Multi-sensory Approaches From Interactive Art to Inclusive Design, *The European Conference on Arts, Design & Education 2022 Official Conference Proceedings*, 271-281, <https://doi.org/10.22492/issn.2758-0989.2022.21>
- Delprino, F. (2023). *Inclusive multimodal personas: tools to interact and enable. Voice and gesture workshops around cultural fruition* [Doctoral Thesis, University of Genoa]
- Fleck, N. (2019). *Are you an inclusive designer?*, RIBA Publishing
- Gaiser, B., Panke, S., & Arnold, P. (2006). Community Design - The personas approach, *E-learn 2006: World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, Honolulu, Hawaii
- Gilbert, R. M. (2019). *Inclusive Design for a Digital World: Designing with Accessibility in Mind*. Apress. <https://doi.org/10.1007/978-1-4842-5016-6>
- Lo Turco, M., & Giovannini, E. C. (2020). Towards a physical heritage approach for museum collection. *Journal of Archaeological Science: Reports*, 34, 1-7, Elsevier. <https://doi.org/10.1016/j.jasrep.2020.102639>
- Holmes, K., Maeda, J. (2018). *Mismatch: How inclusion shapes design*. The MIT Press.
- Ku, B., & Lupton, E. (2022). *Health design thinking: creating products and services for better health*. The MIT Press.
- Kurschl, W., Augstein, M., Burger, T., & Pointner, C. (2014). User modeling for people with special needs. *International Journal of Pervasive Computing and Communications*.
- Lischetti L., (2007). *Assistive Technology - Informatizzando la Disabilità* [Assistive Technology - Computerising Disability]. Retrieved from [assistivetechology.it](http://assistivetechology.it)
- Mangiatori, A. (2017). *Didattica senza barriere: Universal design, tecnologie e risorse sostenibili* [Barrier-free education: Universal design, sustainable technologies and resources]. ETS.
- Marsden, N., Pröbster, M., Haque, M. E., & Hermann, J. (2017). Cognitive styles and personas: Designing for users who are different from me. *Proceedings of the 29th Australian Conference on Computer-Human Interaction*, 452-456. <https://doi.org/10.1145/3152771.3156156>.
- Microsoft Design (2016). *Inclusive Microsoft Design*. Retrieved March 6, 2022 from <https://www.microsoft.com/design/inclusive/>
- Morozzo M.C., Bertirotti A., Delprino F. (2021). Digital and Physical Margins Pre-Visions for New Interactions in the City in Progress. *Athens Journal of Architecture 2021*, 8: 1-24 <https://doi.org/10.30958/aja.X-Y-Z>
- Olofsson, M., & Söderberg, H. (2013). *Investigating Hand Gestures as Additional Input in a Multimodal Input Interface* [Bachelor Dissertation, Malmö högskola/Kultur och samhälle]. Malmö University Publications. Retrieved September 10, 2022 from <http://urn.kb.se/resolve?urn=urn:nbn:se:mau:diva-22973>
- Pauli, G. (2017). *The Blue Economy 3.0. The Marriage of Science, Innovation and Entrepreneurship Creates a New Business Model That Transforms Society*. Xlibris AU. Kindle Edition.
- Steenhout N. (2010). *The evolution of assistive technology into everyday products*. Retrieved March 6, 2022 from <https://incl.ca/the-evolution-of-assistive-technology-into-everyday-products/>
- Taleb, N. N. (2014). *Antifragile: Things that gain from disorder* (Random House Trade Paperback edition). Random House Trade Paperbacks.
- Trip, D., & Badulescu, D. (2020). Touchless Tourism: How New Tourism Will Look like. *Griffiths School of Management and IT Annual Conference on Business, Entrepreneurship and Ethics*, 85-100. Springer, Cham.
- Van der Linden, L. (2019). *humanVUI: Human Centered Voice Design* [Master Thesis, TU Delft].

