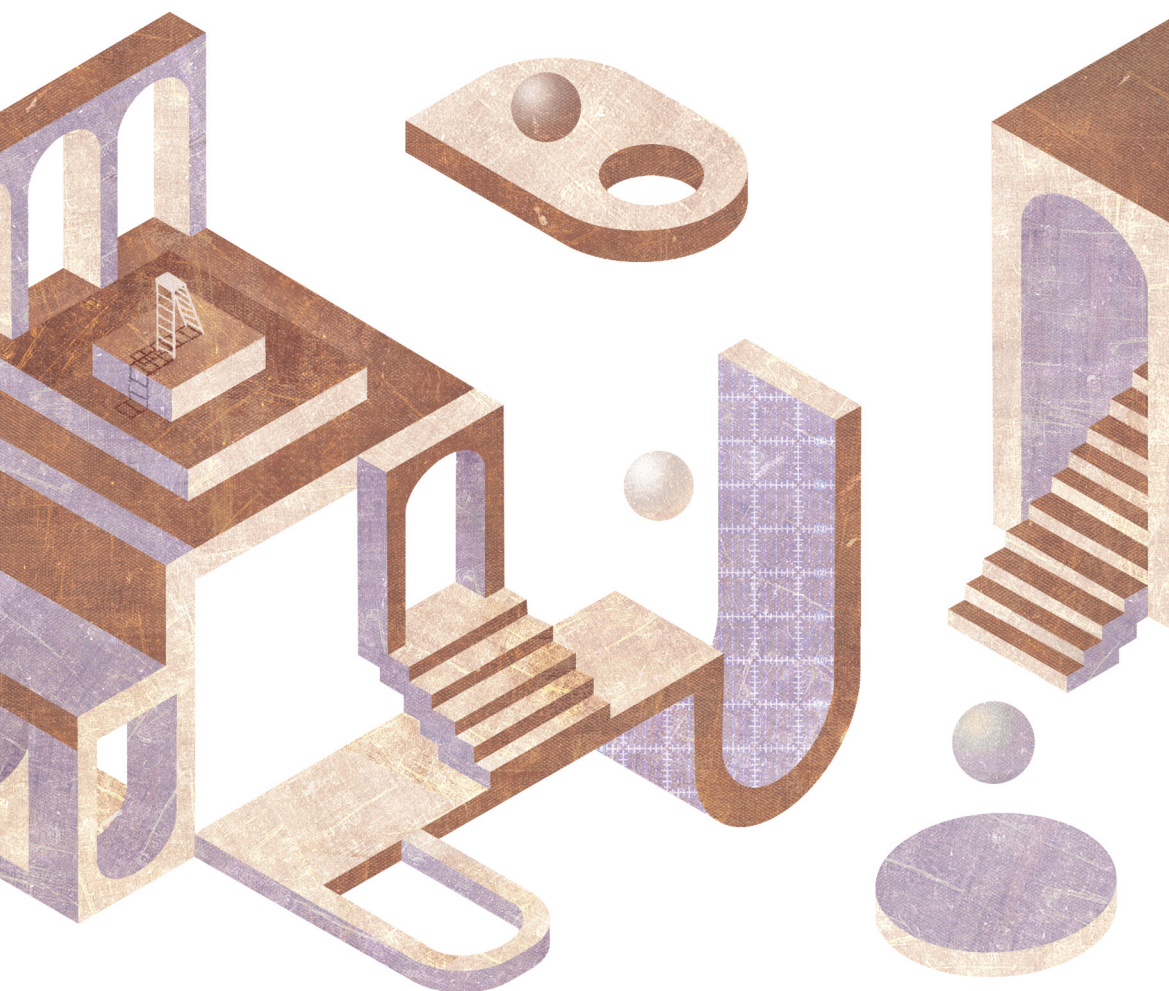


# MULTIPLE-SCALARITIES

Environmental systems as a combination of interior design,  
services, communication and technologies



edited by Giulia Gerosa, Andrea Manciaracina



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Environmental systems as a combination of interior design,  
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edited by Giulia Gerosa, Andrea Manciaracina

D.I. **FrancoAngeli**   
DESIGN INTERNATIONAL



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# Introduction

*Giulia Gerosa, Design Department – Politecnico di Milano*

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Interior design is less and less reduced to the mere physical component of space. It is instead increasingly projected towards an ‘environmental system’ made up of space, services, communication, and technology, capable of illustrating a multi-scalarity and trans-disciplinarity typical of a project devoted to innovation. This change of focus, from the prevalence of the interior physical component to the dominance of a polyvalent system, has generated a series of changes, including those affecting the project’s area, which shows a progressive rise of the informational-cognitive component where the control of the net of human interactions involved becomes extremely important.

The theme of scalarity runs through the studies on the relationship between man and space, from representation to design, and helps interpret environmental systems differently by relating practices and techniques from different disciplinary fields. Through multi-scalar and multi-disciplinary approaches, it is possible to understand that the design of an environmental system (be it a room or a university campus) must establish a relationship with the context in which it is inserted and that at the same time, the relationships between user, environment, technology, and services are a lens through which to interpret space and its shapes.

The concepts of scale and measurement are indispensable for correlating, from a systemic perspective, the particular with the general, the detail with the whole (De Giovanni & Sposito, 2020), for interpreting and representing, for discretising and recomposing elements and parts with each other in a hierarchical or interconnected relationship, for investigating the physical and the social, for outlining criticality and potentiality (Russo, 2015).

Multiscalar applications are connected to an adaptive concept of design make places and make deeper connections between spatial form, usage, and meaning, framed within a process of hybridization (Leveratto, 2019). Through a multi-scale approach, it is possible to interpret an ecology of the project in which, through the multiplication of the different scales of intervention, it is possible to generate relationships between space and user, not only placing them within complex systems but recognising them in mediated design “patterns” from technology.

Technology and its use made of it are essential elements of a complex environmental system. Through technology, it is possible to help the user to use the space; it is possible to expand the space beyond its physical boundaries, it is possible to interconnect different services, and it is possible to create networks of spaces. The design scale affects the design outcomes, and “thanks to the progress of technology in the field of design at all levels, it is probably the component of the project on which the designer works the most, simultaneously coordinating real and virtual relations” (De Giovanni & Sposito, 2020).

The volume collects various design experiences within heterogeneous research groups of the Design Department of Politecnico di Milano and talks about experiments in designing spaces and services on a different dimensional scale that have impacted various types of users. Through the recounting of these experiments, the book highlights the close interconnections between the design of spaces, the creation of services, the application of communication systems, and the exploitation of technologies, allowing us to reveal the tensions and interactions that are unleashed depending on the prevalence of one or another design discipline and the scale (from XS to XL) at which they take place.

The different chapters focus on a design process aimed at users both as individuals and as communities. We can find evidence of disciplinary and design specificities and recurrences of particular approaches, methods and tools regardless of the specific themes, contexts and scale of intervention. These specificities are explicitly linked to the thematic, contexts and scale.

What emerges here is a rich and varied picture of examples of possible modes of intervention by the discipline of spatial design in dialogue with other design disciplines, including services and communication, as well as a comprehensive set of disciplinary approaches and

tools, each time punctually selected, adapted, hybridised, combined and, finally, adapted to the individual cases narrated in this publication.

The first chapter (XS), dealing with the smallest dimension of the multi-scalar project, namely that of the space delimited by a portion of an exhibition environment, describes a single installation with extreme care; on the other hand, it introduces a vast richness of reflection and perspective, influencing not only functional but also environmental and social dimensions. The Norman Foster Foundation and the Guggenheim Museum Bilbao invited students from 15 design and architecture schools on four continents to envisage the future of mobility on the occasion of the exhibition “Motion. Autos, Art, Architecture”. Responding to this call, Politecnico di Milano has designed “Autofficina Futuro”, an interactive exhibit that responds to people’s presence and gestures with multimedia content.

The second chapter (S) switches its emphasis to public interiors by describing the “Salone del Futuro” design created for the Milano-Monza-Brianza-Lodi’s Chamber of Commerce. The initial premise of the project is that the digital world is radically altering how services are given (constantly becoming more efficient, accessible, and swifter). Chamber of Commerce and Politecnico di Milano collaborated using systemic and spatial co-design methods that blended diverse roles, characteristics, sizes, and contexts to propose how public interiors may be modified in response to new tendencies in the digitisation of public services. The subsequent pandemic intensified shifts in the demand for and types of physical presence, allowing for new and enlarged uses of spaces and meanings of public services and jobs.

The third chapter (M) addresses the topic of the spatial redevelopment of abandoned structures in cooperation with the municipality of Lentate sul Seveso and with the involvement of the local administration, the principal stakeholder, and private sector players. The old military park requalification project detailed in this chapter exemplifies a concept of sustainable urban transformation based on building renovation and civic engagement. The concept offers the construction of student houses combined with multipurpose spaces for local populations to preserve the territory’s resources and history and foster educational and economic growth. It adheres to the ideas of the National Recovery and Resilience Plan, beginning with the relocation of innovative processes from large cities to smaller communities.

The fourth chapter (L) examines how spatial and technological innovation change learning environments to foster active pedagogical approaches. The future of design education will trigger new reflections due to the changing needs of users and the introduction of updated learning approaches. Moreover, the efficacy of universities revolves around the equilibrium of three fundamental elements: pedagogy, space, and technology. This chapter addresses the concept and development of four unique classroom pilot projects. Four spatial solutions to experiment with and engage all users in a participatory implementation of the University's (Engineering, Architecture, and Design) new requirements. Innovative classrooms are dispersed over the campus through a fluid multi-scalarity that connects interstitial spaces to shared spaces, thus promoting social and active learning strategies through technology.

The fifth chapter (XL) examines the synergy of several entities (physical, functional, and human relationships) that have emerged in the decision to relocate the science faculties of the Università Degli Studi di Milano to a new location – the 2015 Expo Area. Spaces can become symbolic sites of belonging for the community that inhabits them, where hopes, fresh aspirations, and future possibilities might fester and grow. Nevertheless, when confronted with a substantial change, they might symbolise their members' and potential communities' concerns and resistance. The study project conducted at the Politecnico di Milano attempted to balance the correct size of a forthcoming community based on quantitative analysis and the appropriate atmosphere due to inclusive co-design methods. The outcome was to function on a meta-design level. As a technique, the approach created a “conversation space” for future campus residents, where participants were free to disengage from current limitations and begin imagining possible alternative outcomes.

The sixth chapter (XS > XL) discusses the subject of multiscale in cultural heritage valorisation projects. The design field and practice have a well-established history of valuing cultural heritage, referred to as Design for Cultural Heritage. Some years later, it is given that Design-typical concepts, processes, and tools (e.g., co-design, participation, scenarios) may be successfully implemented in the cultural sector. Interaction design is no less involved in this process, and the human-centred perspective to incorporating digital technology in the cultural arena is now regarded as standard practice. Five initiatives are reviewed

critically, beginning with an interactive exhibit and progressing to a citywide interactive experience. This chapter aims to highlight the constant and variable features of the design-driven method at various intervention scales.

## References

- De Giovanni, G., Sposito, C. (2020), “Editorial”, *AGATHÓN – International Journal of Architecture, Art and Design*, 7, pp. 3-5.
- Goidea, A., Floudas, D., & Andréen, D. (2022), “Transcalar Design: An Approach to Biodesign in the Built Environment”, *Infrastructures*, 7(4), 50.
- Leveratto, J. (2019), “Learning from Interiors. *Toward a Multiscalar Approach to Adaptivity*”, *International Journal of Interior Architecture + Spatial Design*, VI, pp. 8-15.
- Russo, M. (2015), “Multiscalarità. Dimensioni e spazi della contemporaneità”, *Archivio di studi urbani e regionali*, ISSN 0004-0177, 113(2015), pp. 5-22.
- Scholte, J.A. (2019), “Civil society and global governance: Exploring transscalar connections”, *Interest Groups & Advocacy*.





# 1. XS: Autofficina Futuro: an interactive cultural experience to expand our vision into the future of mobility

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## Abstract

With the involvement of new technologies, an ever decreasingly Euclidian is emerging, and a new concept of mobility is appearing, leading us to ask ourselves: ‘What will the future of the automobile be 200 years after its birth? Will new forms of movement emerge?’.

Based on these questions, the exhibition *Motion. Autos, Art, Architecture*, the Norman Foster Foundation, and the Guggenheim Museum Bilbao invited a younger generation of students from 15 design and architecture schools on four continents to imagine what mobility might be. Among them, Politecnico di Milano presented *Autofficina Futuro*, an interactive installation that, with multimedia content, responds to the presence and gestures of people. It recalls the idea of the *carrozzeria* (auto body shop) as a place of production and experimentation, but it looks far into the future, narrating multiple scenarios for tomorrow’s individuals and users.

This transdisciplinary project works on different dimensional scales and plays with extremes. On the one hand, it fits the smallest scale of the book (XS), being designed as a single installation with high attention to detail; on the other hand, it opens up a considerable complexity of thought and vision (XXL), affecting not only functional but environmental and social issues. *Autofficina Futuro* makes us think that mobility is now inextricable from the collective dimension and the sense of responsibility. How we reinvent our ‘movement’ is a crucial aspect of a global society.

## **The occasion.**

### ***What future to explore? Look ahead to 2086***

“Everything we see, hear, smell, and touch has been designed. Even the seemingly accidental is a consequence of a human act. So, we can design well, badly, or create mediocre. It is a choice. When design satisfies all the senses and lifts our spirits, we know it is good even if we do not consciously acknowledge the fact; it may be subconscious. Technology is an inseparable part of every aspect of our lives. The same is true of any work of art, including automobiles. It starts with the first tool and the act of making” (Foster, *The science fiction of my youth is the reality of today*, 2022).

According to Norman Foster, architecture and mobility are close relatives. They have many connections, some visual, some obvious, and others more subtle. Automobiles symbolize modernity as an object and as the personification of speed, motion, and interconnectivity. We take them for granted, but they are unique to our age and touch every aspect of our lives. Foster, one of the most renowned architects on the international scene, has always been fond of car design, and he curated an exhibition from April to September 2022 dedicated to the relationships among vehicles, art, and architecture at the Guggenheim Museum Bilbao. Entitled *Motion. Autos, Art, Architecture*, it celebrates the artistic dimension of cars. It brings together close to forty vehicles centre stage in the galleries. It puts everyday objects, such as automobiles, in dialogue with not only their history but also with the artistic spheres in order to open the eyes and minds of those who visit. The designed exhibit surrounds its viewers with significant works of art (Alexander Calder, Christo, Andy Warhol, and so on) and architectural projects. Most of these are being presented for the first time to a wide audience, as they have previously remained in the private collections or public institutions to which they belong.

The exhibition path is divided into different themes in a series of thematic titled rooms that run chronologically: the beginnings; the beauty of forms; the evolution of the vehicle; the symbol of national pride and its subsequent popularization; how the design of

racing cars broke away from the creation of road cars; the rise of visionary vehicles; and how cars became protagonists of American culture.

The visit ends in the Gallery of the Future, the section dedicated to the works of new generations of students who were asked to imagine what mobility might be like at the end of this century (Foster, 2022), coinciding with the 200th anniversary of the birth of the automobile. The Gallery of the Future grew out of the desire to give the young generations of design students a voice. Fifteen schools of design and architecture<sup>1</sup> on four continents were invited to imagine what mobility might be in the near or distant future; to look ahead to 2086, investigating how the status and *raison d'être* of the car are changing (Ceppi, 2022). They were given complete freedom to share their visions, through models, audiovisuals, renderings, drawings, and writings, which reflect the collaboration that has existed between the students, researchers, and various members of the industry – designers, artists, and architects.

### **Politecnico's proposal.**

#### ***Autofficina Futuro. Not just an auto body shop***

“Museums have always been a part of the society they serve, and as society changes – for political, economic, or social reasons – museums too must change to serve society's new needs” (Bradburne, 2002, p. 214).

The decision of the Guggenheim in Bilbao to host the exhibition *Motion. Autos, Art, Architecture*, makes us reflect how, more than ever, society should use its museums as a *'motor for the learning society'* (Bradburne, 2002). Mobility will affect environmental issues, the design of our cities, our notion of community, the deep-seated ethical needs

1. Internationally renowned universities, i.e., Art Center College of Design (USA), Delft TU (Netherlands), ETH Zurich (Switzerland), Hongik University (South Korea), MIT Media Lab (USA), Royal College of Art (UK), Tecnológico de Monterrey (Mexico), Tokyo University (Japan), Tsinghua University (China), UMEA University (Sweden), Yale School of Architecture (USA), University of Cape Town (South Africa), University of Mondragon (Spain), University of Navarra (Spain).

of our society, and people's desires. According to Martha Nussbaum, mobility is one of the people's core capabilities. Mobility encompasses broad and complex challenges.

Indeed, this is more than just a practical and functional matter. Mobility *is* culture (Casicci, 2021) and it touches on deeper values. In the current research, mobility appears, in multiple forms, reticular and relational, prompting us to gaze into the distance and ask ourselves what sort of future awaits the car 200 years after its birth. Will it still be as dominant as in the past, or will new forms of movement replace it? Is mobility paradigm shifting? And if yes, how?

In the *Gallery of Future*, Politecnico di Milano, in close collaboration with the artistic collective CamerAnebbia, presented *Autofficina Futuro*: an interactive installation that discusses these central topics and responds to visitors' presence and gestures. It reacts to their actions, offering them a multimedia experience full of video content. It is careful not to weary the visitors since they are at the end of the exhibit's path and have already been deeply engaged by the visual and cognitive stimuli in the previous rooms. It resorts to user-friendly perceptual expedients by adopting natural interfaces, as well as detailed and concise video stories (Bollati & Tolino, 2022).

*Autofficina Futuro* recalls the idea of the *carrozzeria*. According to the 'Made in Italy' tradition, *carrozzeri* are professionals who work with cars and embody cutting-edge technologies, style, performance and aesthetics, functionality, attention to detail, and dreams. Hence, *Autofficina* represents not just an auto body shop but a place for continuous technological and aesthetic-innovation experiments; a place where cars are produced, repaired, improved, and modified in a fertile and vital dialogue with the customer. It aims to be a symbol of production and experimentation. It represents the idea of sophisticated, almost sartorial elegance, cognitive and innovative exchange, of the realization of unique pieces responding to people's desires.

A large neon sign with lettering almost 3 metres wide rests on top of five 2-metre monitors. They perceive the human presence, and as soon as a visitor approaches, they start to tell their stories. Fitted with

Kinect sensors, *Autofficina Futuro* encourages the visitor to make changes as (s)he goes along, getting closer and, thus, discovering it completely. In this way, visitors' movements allow many stories to be revealed about the future of mobility, transforming the auto body shop into portals of knowledge for tomorrow. Multiple scenarios appear on the screens and tell the stories behind the students' projects, explaining how they were created to meet the needs and wishes of individuals who will inhabit tomorrow. Images, sketches and films made by the students outline an array of different and possible futures.



*Fig. 1 – The sensitive installation. neon sign with lettering on top of five 2-metre monitors. Ph: Gabriele Carbone | Lab Immagine, Politecnico di Milano*

## **Students' projects.**

### ***To give younger design generations a voice***

As in a design anthology, the installation gathers various professors' and researchers' approaches together with students' projects. Four different design classes were involved, from both Bachelor's

and Master's courses. Their thoughts, insights, and digressions were collected, and the selected projects organized into five dimensions and scales of mobility impact: the environment and its global challenges; a society with its special needs (for instance, taking care of people with disabilities); the design of complex urban contexts of megalopolis and cities; and the idea of the community including both the desires of individuals and performance of their bodies.



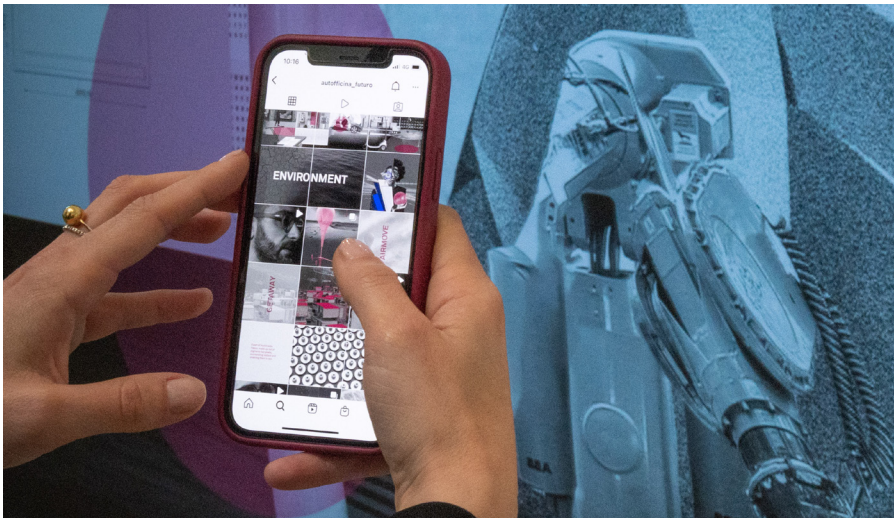
*Fig. 2 – Multiple scenarios appear on the screens. visitors' movements allow many stories to be revealed. Ph: Gabriele Carbone | Lab Immagine, Politecnico di Milano*

Among them, for example, the 4senses project proposes a solution that takes advantage of the features of automated driving to enable the use of the vehicle by people who are blind or have significant visual impairments while amplifying the experiences connected to the other senses. Jewl.in, on the other hand, is an autonomously driven electric urban mobility vehicle for elderly people who do not wish to give up the enjoyment of an active life facilitated by individual mobility.



*Flò* proposes an elliptical-shaped cabin space to facilitate the use of the vehicle as shared urban transport, allowing interaction and socialization among its users. Its concept draws inspiration from the convivial spirit of people around a bonfire. *Eswers* is a seductive vehicle, refined and mysterious in its appearance as a monolith with no visible passenger compartment (Brevi & Gaetani, 2022).

Finally, each project presented by *Autofficina Futuro* can be further investigated through a QR code revealing additional content, students' video interviews, and a virtual exhibition hosted on a dedicated Instagram page and visually designed feed. It encourages a twofold dimension of the cultural consumption of the exhibition: a present and a distant way of visiting, to be experienced independently or used together to increase the experience.



*Fig. 3 – QR code reveal additional content, students' video interviews, and a virtual exhibition hosted on a dedicated Instagram page Ph: Gabriele Carbone | Lab Immagine, Politecnico di Milano*



## **Conclusions.**

### ***Autofficina Futuro plays with different dimensional scales***

Autofficina Futuro is a transdisciplinary project that works on different dimensional scales and plays with extremes. As a result, it fits the smallest scale of the book (XS scale), being designed as a single installation with high attention to detail; it is a short-lived project. It lasts just the time of a temporary exhibition. Autofficina Futuro can be experienced during the time of a museum visit.

As a process, Autofficina Futuro was developed to give a voice to this multitude of actors by presenting a choral project. It involves the entire School of Design (M scale), consisting of more than 160 tenured professors, 350 adjunct professors, and 4,200 students (Collina, 2022). Far from being a single-author installation, it gathers contributions of different kinds and degrees of maturity, ranging from the three-year degree courses to the production of an MSc thesis; an intensive multidisciplinary laboratory to an advanced workshop as part of the MSc degree. The resulting approach in selecting and producing multimedia content is heterogeneous. It wants to ensure the plurality of contexts and teaching methods and the multiplicity of results achieved. Autofficina Futuro represents a complex and multi-faceted community's identity.

Not only does Autofficina Futuro open up a considerable complexity of thoughts and visions (XXL scale), affecting not only functional, environmental and social issues, Autofficina Futuro also makes us think that mobility is now indistinguishable from the collective dimension and the sense of responsibility. How we reinvent our 'movement' is a crucial aspect of a global society. It helps us reimagine mobility's future as a prophetic responsibility at the collective level (Manuel, 2022) (Campagna, 2021). It is not only a question of how we will move, and be moved, tomorrow or decades after tomorrow, but it invites us to think about how the future will evolve and to use speculative imagination. Autofficina Futuro talks about the future.

If the future can be imagined but not foreseen, it is also true that design deals with how things could be.

## References

- Bollati, I., Tolino, U. (2022), “Cinetica e Progetto: attivatori di conoscenza”, in L. Collina, L. Bollati (a cura di), *Autofficina Futuro. Un panorama interattivo sulla mobilità che verrà*, Electa, Milano, 32-47.
- Bradburne, J.M. (2002), “Not just a luxury... The museum as urban catalyst”, *Urban Renaissance: Glasgow: lessons for innovation and implementation*, Organisation for Economic Co-Operation and Development (OECD), Paris, pp. 214-226.
- Brevi, F., Gaetani, F. (2022), “Autofficina Futuro. Un panorama interattivo sulla mobilità che verrà”, in L. Collina, L. Bollati, *Tratteggiare il futuro del design della mobilità*, Electa, Milano, pp. 86-99.
- Campagna, F. (2021), *Prophetic Culture: A Recreation for Adolescents*, Bloomsbury, London and New York.
- Casicci, P. (2021), “Siamo il modo in cui ci spostiamo”, *Interni Magazine* ([www.internimagazine.it/approfondimenti/mobilita](http://www.internimagazine.it/approfondimenti/mobilita)).
- Ceppi, G. (2022), “Protagonisti di ieri e fruitori dell'auto del domani”, in L. Collina, L. Bollati, *Autofficina Futuro. Un panorama interattivo sulla mobilità che verrà*, Electa, Milano, pp. 65-85.
- Cirauqui, M. (2022), “Motility of the Future”, in N. Foster, *Motion. Autos, Art Architecture*, Ivorypress, Madrid, pp. 245-246.
- Collina, L. (2022), “Tratteggiare il futuro del design della mobilita”, in L. Collina, L. Bollati, *Autofficina Futuro. Un panorama interattivo sulla mobilità che verrà*, Electa, Milano, pp. 16-28.
- Foster, N. (2022), *Motion. Autos, Art Architecture*, Ivorypress, Madrid.
- Foster, N. (2022), *The science fiction of my youth is the reality of today* Iberdrola, [www.iberdrola.com/culture/exhibition-norman-foster-motion-autos-art-architecture](http://www.iberdrola.com/culture/exhibition-norman-foster-motion-autos-art-architecture).

## **2. S: Salone del Futuro: Open, Connected, and Extended: A new sense and purpose for the Chamber of Commerce of Milan**

*Peter Di Sabatino, Design Department – Politecnico di Milano*

*Claudia Mastrantoni, Design Department – Politecnico di Milano*

### **Abstract**

The “Salone del Futuro” ambitions arose from the Chamber of Commerce’s (Camera di Commercio di Milano, Monza Brianza, and Lodi) recognition that the online, digital world is increasingly changing how services are provided, constantly becoming more effective, accessible, and faster. These are features that the Chamber’s clientele are looking for, that public administrators and staff can benefit from, and that offer an opportunity to re-envision spaces, services, and systems. Hence, the Registry Office (Salone Anagrafico) in Milan’s Palazzo Turati, a symbolic space and functional base for the commercial and entrepreneurial fabric of the territory, sought to create a more open, contemporary environment that supports and facilitates contact and dialogue between the institution and its citizens. The Chamber of Commerce and Politecnico di Milano worked together with systemic and spatial co-design processes that merged multiple functions, features, scales, and contexts in proposing how public interiors can be transformed following new trends in the digitization of public services. Shifts in the need for, and typologies of, physical presence, amplified by the eventual pandemic, allowed for new and expanded uses of spaces and transformed definitions of public services and work. Since much of the digital services could address routine and simpler operations, opportunities opened for a higher order of work and engagement between the public and staff, and an extended connection to more of the public with new services, systems, and spatial typologies.

Beyond working directly with the administration and staff at the Salone, the faculty and students from PoliMi's School of Design were able to directly engage the clientele, the general public, and various professionals related to media and communication design. Specific didactic engagements included design studios with undergraduate students in Interior and Product Design, plus graduate students in the Product Service System Design (PSSD) Master's Degree program.

## **Interiorization of Public Domains**

The concept of “interiors” as the embodiment of a new type of “public sphere” materialized in Europe between the 18th and 19th centuries as a result of the development of new commercial and industrial institutions in spaces provided by buildings, such as public administrations and local governments (Hertzberger, 1991). These spaces were used for education, tourism, production, and consumption. The development of such interiors as settings for public performances provided the city with a succession of locations at which a variety of collaborative projects could be carried out (Pimlott, 2007). As technology and the physical arrangements of management improved, public and communal activities began to be situated inside structures in increasing amounts. This “interiorization of public life” (Cicek *et al.*, 2018) illustrates how some parts of the city are in a continuous relationship with certain interiors, or, as Koolhaas (2002) refers to them, “infrastructures of seamlessness”, in which the boundaries between places are no longer clearly defined.

## **Salone del Futuro: A new purpose for the Chamber of Commerce of Milan, Monza Brianza, and Lodi**

Since 2019, the Design Department at Politecnico di Milano and the Chamber of Commerce of Milan, Monza Brianza, and Lodi have been collaborating on research and design for the *Salone del Futuro*. Participating members from both institutions share an innovative systemic approach to rethinking the services offered to businesses, trades, and tourism constituents, as well as to the study and implemen-

tation of processes that would re-conceive and re-functionalize existing products, services, systems, and spaces to make improvements at the Chamber of Commerce.

Through this study, it was possible to investigate the concept of digital transition from a variety of angles, including possible “revolutionary” ideas as a facet of the transformation of spaces and services: as a catalyst for experience and social engagement; as a means of communication and a “blurring” of the boundaries between public institutions and the community, and to provide remote training to companies and individuals via advanced technologies.

The need for the Chamber of Commerce to redesign its Registry Office (*Salone Anagrafico*), a historic space used to promote and administer the commercial and entrepreneurial fabric of the territory, gave rise to the *Salone del Futuro* project. The goal of the project was to create a contemporary place with the purpose of enabling support and facilitating contact and dialogue between the institution and its citizens. The Chamber of Commerce is gradually migrating its physically-based services into online formats, thereby reducing the requirement for the current physical space to be used in mostly very basic and repetitive administrative operations.

The Chamber of Commerce promotes a progressive digitization of its offered services with the goal of facilitating and improving its relationship with its users and the broader community. This also facilitates important advancements and efficiencies, such as reductions in costs, optimization and simplification of processes, and improvements in the quality of the Chamber’s offered services.

As a result of the directions provided by the Chamber of Commerce, the design of the initiative for the *Salone del Futuro* needed to adhere to three primary guidelines:

- **Flexibility** and **Adaptability** including workstations and presentation spaces that need to be able to reconfigure themselves easily and quickly so that more services and activities can be provided at the same time, or updated according to new/future uses.
- **Continuity** the Chamber of Commerce needs to continue to be the point of reference when it comes to providing services that are devoted to the expansion of businesses, and to become recognized as a leader in innovative methods and content while engaging current and future technological advancements servicing its constit-

uents and the community through relevant products, systems, services, and spaces.

- **Innovation** the space needs to acquire a broader and more contemporary sensitivity, with new services and forms of technology that also engage new constituents beyond the current business community. The recent digital transition of some services, and the addition of new services, revealed the need for new and sophisticated digital media offerings, including highly mediated objects, surfaces, and spaces that can accommodate these new changes and opportunities.



*Fig. 1 – Pictures of the registry office before the restoration*

The PoliMi team<sup>1</sup>, adopting the role of facilitator and sometimes mediator, brought together individuals with little-to-no design expertise to co-design spaces and services, beginning with these three design elements described above. Space-specific co-design tools, such as visual materials containing spatial schematics, an inventory of potential furnishings, and 3D models, were developed.

1. The research team: Luisa Collina, Peter Di Sabatino, Laura Galluzzo, Claudia Mastrantoni, Vanessa Monna, Ambra Borin from Design Department of Politecnico di Milano; With the collaboration of Umberto Tolino for the communication and Francesco Murano for the light design.





*Fig. 2 – Pictures of the Co-Design session held in the Chamber of Milan, Monza Brianza and Lodi offices, in Palazzo Turati, Milan*

The foundational base of the research and design included “Open, Seamless, Extended, and Connected” as the principle keywords and concepts for the specific project internally, and importantly, to the immediate and broader (external) context and communities. These key ideas and key words were present and served as drivers for all partici-

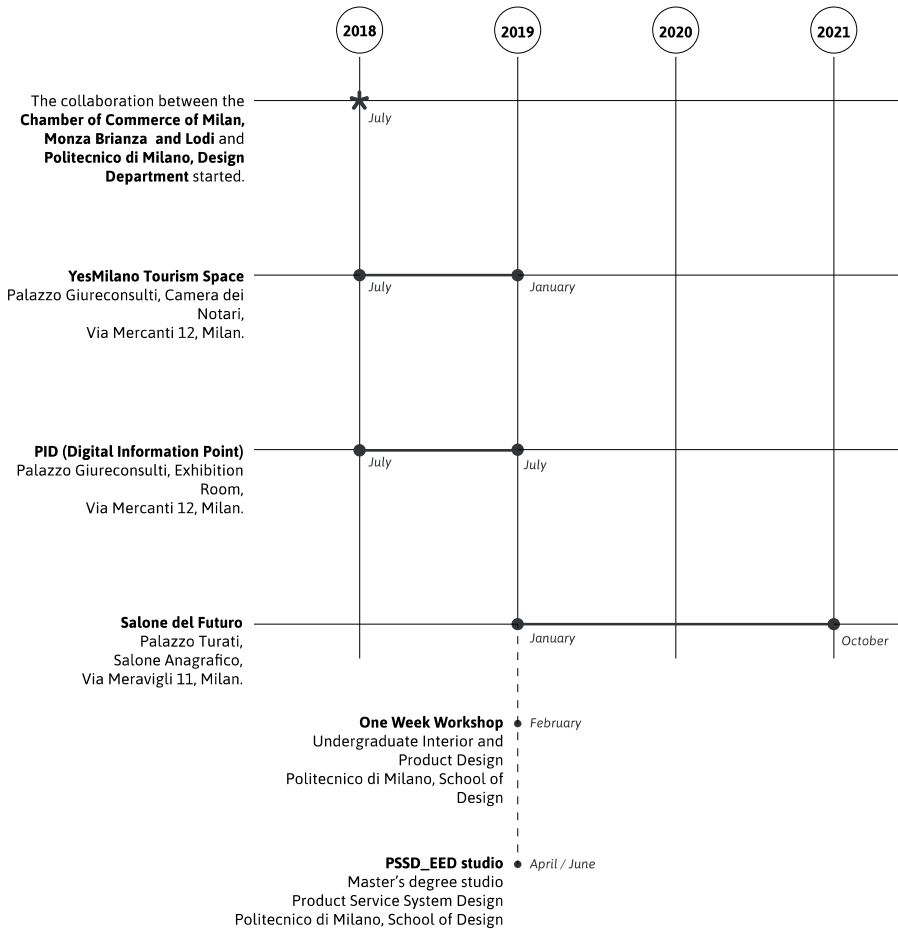
pants involved with envisioning the Salone del Futuro throughout its process. The research started in 2019, but experienced numerous interruptions in development and implementation due to the Covid emergency, especially in 2020. However, the new spaces of *Salone del Futuro* opened in October 2021.

In November 2021, during the conference “The Hybrid Age – Dialogues for Enterprises on the Eve of a New Era”, held in the newly inaugurated *Salone Futuro*, Carlo Sangalli, the President of the Chamber of Commerce of Milan, Monza Brianza, and Lodi, declared that the time had come to make a qualitative leap in three major areas: digital, environmental, and administrative. In his speech, he stated that digital transitions play a crucial role in reviving the nation’s economy, which has a positive effect on the competitiveness of Italian businesses. He felt that the new *Salone* (hall) of the Chamber of Commerce encompassed these three transitions.

Adoption of innovative technologies broadens the scope of available digital services and is consistent with the European “green deal” objectives of sustainability and zero climate impact. One of the salone’s main attractions is the new “hybrid human and digital counter system”, which, thanks to advanced organizational processes, enables services that are even more effective, quick, transparent, and accessible to all.

During the same conference described above, Elena Vasco, General Secretary of the Chamber of Commerce of Milan, Monza Brianza, and Lodi added that “among the objectives of the Salone del Futuro is the aim to attract new users; and not only those who come to do an administrative practice, but also those who, for example as in this case, come to listen to a conference session, or to learn more about how to launch a business, or for the first time approach a range of digital activities”.





*Fig. 3 – Timeline of the scientific collaboration between the Chamber of Commerce of Milan, Monza Brianza and Lodi, and Politecnico di Milano, Design Department. Three main research projects: YesMilano Tourism Space and PID at Palazzo Giureconsulti, and Salone del Futuro at Palazzo Turati. Two didactical engagements for the Salone del Futuro project: one-week intensive workshop and two-months studio, at Politecnico di Milano, School of Design*

## **The Didactic Engagement: Salone del Futuro – Connecting Commerce**

Several phases of investigation and effort led to the successful implementation of the project, including the following phases:

The 1st phase included preliminary investigations, the analysis of the Chamber of Commerce administrators' and customers' spaces, services, functions, and their requirements.

The 2nd phase included the gathering of all available resources and the planning of project research activities.

The 3rd phase included field research consisting in the very first instance of interviews with current users, and ethnographic observations.

The 4th phase included Co-Design activities that comprised the “heart” of the investigation. These activities intended to develop primary design solutions for services and user experience based on the concepts of stakeholders.

In the phase of concept generation, undergraduate students in Interior Design and Product Design, of the School of Design of Politecnico di Milano were involved<sup>2</sup>. The phase focused on the analysis of the space's present condition and the development of initial working concepts, assumptions, and strategies from the perspectives of Interior Design and Product Design, with particular attention to the design of furniture and opportunities for interaction<sup>3</sup>.

In a more advanced and detailed stage, fifty international graduate students in the Product Service System Design (PSSD) Master's Degree design studio at Politecnico di Milano's School of Design were asked to work from a more developed and structured co-designed brief. They focused on the systematisation and preliminary design development of the first results, while identifying and finally selecting the most promising project guidelines while developing the design proposals in a more comprehensive manner.

2. Intensive one-week workshop at Politecnico di Milano, School of Design, led by Prof. Peter Di Sabatino, and Claudia Mastrantoni as Teaching Assistant, entitled “Salone del Futuro: Connecting Commerce”.

3. Selected excerpts from this intensive design workshop can be found in Di Sabatino, P.A. (2020) (more). *SoftAssertions: A Progressive Paradigm for Urban Cultural Heritage, Interior Urbanism, and Contemporary Typologies*. In *Cultural, Theoretical, and Innovative Approaches to Contemporary Interior Design* (pp. 315-354). IGI Global.

The students were tasked with expanding their knowledge of the previous state of the Salone Anagrafico in terms of services offered, as well as formulating initial working hypotheses from the perspective of service and spatial design, with a systemic orientation and a global perspective. Specifically, the type of content and requirements of the registry office, a compilation of national and international case studies, and the initial hypotheses of design concepts for services and user experience were analyzed and developed.

The April-June 2019 studio examined how environment and experience design can merge with Product Service System Design (PSSD) to create an understanding of how place, space, and experience can be potent and memorable elements of a comprehensive product service system design strategy. In other words, how does PSSD affect or influence spatial design, and how does space, location, and spatial environments and experiences affect or influence PSSD?

In addition to typical and perhaps novel PSSD processes and outcomes, the studio investigated the relationship between PSSD and spatial design, which could be expressed as PSSD\_EED (Environment and Experience Design). The studio included physical and digital modeling, inclusive of drawing and diagramming, merging with sketches and immersive renderings to articulate the intended environments and experiences, and further demonstrating the relationship and dialogue between PSSD and spatial design, and how the design of environments and experiences can be an influential component of a comprehensive product system service design proposal.

### ***The conceptual framework:***

#### ***OPEN\_transparent, light/lightness, layered, de-material***

Within the studio key words, key concepts, and key strategies served as an operational context and as project drivers. These key concepts can be summarized under the broad concept and strategy of “Open or Openness”, and perhaps accompanying tactics engaging transparency, light/lightness, layering, and maybe even de-materialization.

The semi-public, administrative area of the Chamber of Commerce's registry office has been an interior space of about 1500 sqm hosting and providing various services to more than 4000<sup>4</sup> visitors per month in Palazzo Turati since 1954. Built around 1875, the palazzo's central location in Milan provides a perfect location for international and Italian businesses to interact within a formal setting. Over a thousand events of all types are held at the building each year, including gatherings, seminars, conferences, workshops, formal banquets, talks with representatives, training sessions, new product debuts, displays, fashion shows, showcases, performances, and film sets.

The aim of the design project was to open these spaces, and hence also a significant piece of architectural and cultural heritage, with newly transformed services, systems, and products to articulate a more contemporary and "open" sense of Milan and its transparency and accessibility to all. Hence, "openness" is an all-embracing attitude and manifestation for both the Chamber of Commerce and the city at large:

- open to hybridization of functions: to be open to new programs, to several activities and functions means to be more attractive to the rest of the community, to new actors, and not just to those related to public administration.
- open as accessible and permeable: compared to a public open space, accessibility to a public interior may at times be restricted for practical reasons: they are surrounded by walls and entrances, which are often closed at night or on weekends, and since the definition of accessibility and permeability include the ability to enter a space without hesitation or effort (Poot *et al.*, 2015), the idea is to create a more seamless environment that enables a broader community to enter more freely into these spaces.
- open spaces and lightness: before the restoration the Salone inner spaces had little value in terms of illumination, acoustics and the distribution of elements in space, including waiting spaces.

4. This data goes back to the Chamber of Commerce's internal analysis of the 2018 registry hall space turnout. Data that were shared with the group of researchers from the Politecnico di Milano, Design Department, and later with the students of the two courses, as preliminary documents.



*Fig. 4 – Area of study diagram: Product Service System Design\_Environment and Experience Studio (PSSD\_EED), from April to June 2019, entitled “Salone del Futuro: Connecting Commerce”, led by Prof. Peter di Sabatino, Prof. Stefana Broadbent, Prof. Laura Galluzzo, and Ilaria Bollati, Claudia Mastrantoni and Vanessa Monna as Teaching Assistants*

### ***Student’s outputs: four areas of study***

The studio was composed of fifty students divided into eleven groups to produce diverse proposals of stand-alone services and systems and/or new or transformed services and systems intimately entwined with products and spaces. In this essay, student work has been selected and grouped according to the conceptual framework of “openness” which contains four main sub-categories: FLUID – flexible, adaptable, moving, non-static; PUBLIC – community, communal, connected, engaged; SMART – technological, mediated environments and experiences; NATURE – natural, fresh, healthy, sustainable, ecological.

- **FLUID – flexible, adaptable, moving, non-static**

Anchoring empowerment processes, political capabilities, and social engagement, the revitalization of underused public buildings through cultural and creative activities and enterprises is becoming a readily available and approachable resource for a variety of subjects and communities. Especially since 2020, the impacts of the epidemic caused by the Coronavirus have strengthened the requirement for the creation of an environment that is more adaptable, which Sennett (2016) refers to as “open urbanism”. In this respect, “hybrid spaces” of urban experimentation and social integration achieved through culture and innovation have the potential to play an important role.

As an example, the Municipality of Milan, from 2012, started to create a digital registry specifically committed to this type of socio-cultural innovation. It is a tool for tracking the existing conditions throughout the city called *Rete Spazi Ibridi*<sup>5</sup> (Hybrid Spaces Network), with the objective of evaluating them and establishing their societal influence as well as the impacts that urban revitalization may have. It combines social innovation, cultural activities, and new forms of commerce, sociality, and aggregation through the rehabilitation of abandoned structures and metropolitan areas.

As the first example among the interpretations of PSSD\_EED studio, the student project entitled *INHUB*, offers a service that creates a dialogue between experienced companies and local hubs to become a territorial touchpoint for business training. The ultimate goal of *INHUB* is to create a cycle where rising businesses, research departments, and all of the actors of business innovation can maintain high quality standards to become business leaders in the future.

5. *Rete Spazi Ibridi della Città di Milano – Comune di Milano* (2022, February 4). <https://economiaelavoro.comune.milano.it/progetti/rete-spazi-ibridi-della-citta-di-milano>.



*Figs. 5-6 Images from “INHUB” project, by Lu Ming Keng, Jin Young Jae, Vaccaro Daniela, Sacchetti Nicole, Mayer Paul Richard. Product Service System Design\_Environment and Experience Studio (PSSD\_EED), 2019, Politecnico di Milano – School of Design*





*Figs. 7-8 Images from “La Casa del Commercio” project, by AmendolagGINE Guido, Sokolij Milosh, Michelini Bianca, Nunziata Federico, Baj Chiara. Product Service System Design\_Environment and Experience Studio (PSSD\_EED), 2019, Politecnico di Milano – School of Design*

The hub, in this context, is seen as an element able to catalyse the dissemination process, through the variety of its stakeholders. In the spatial configuration of this service, the students envision the hub as a fluid space, made by common ground of informal social



space where people can freely work and dialogue, dotted with more closed elements, placed on different levels, where meetings take place in a more private, although still collective and collaborative, manner.

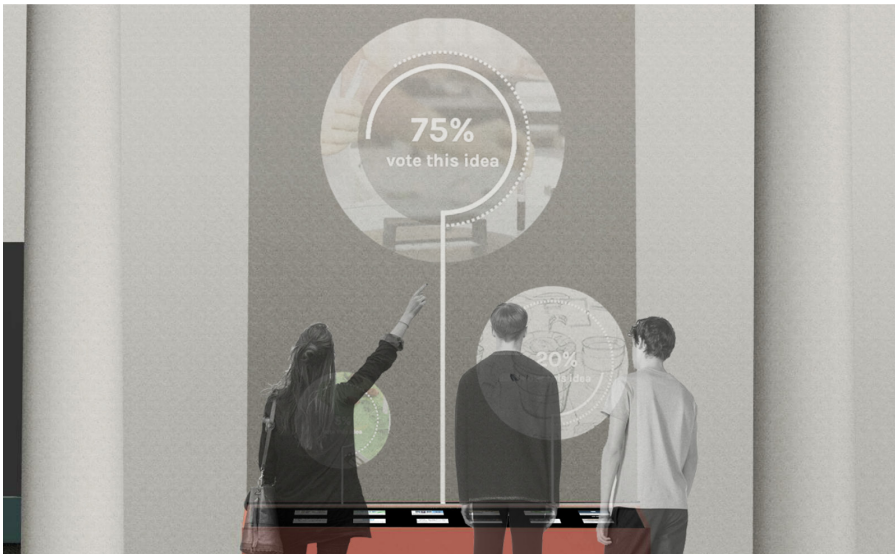
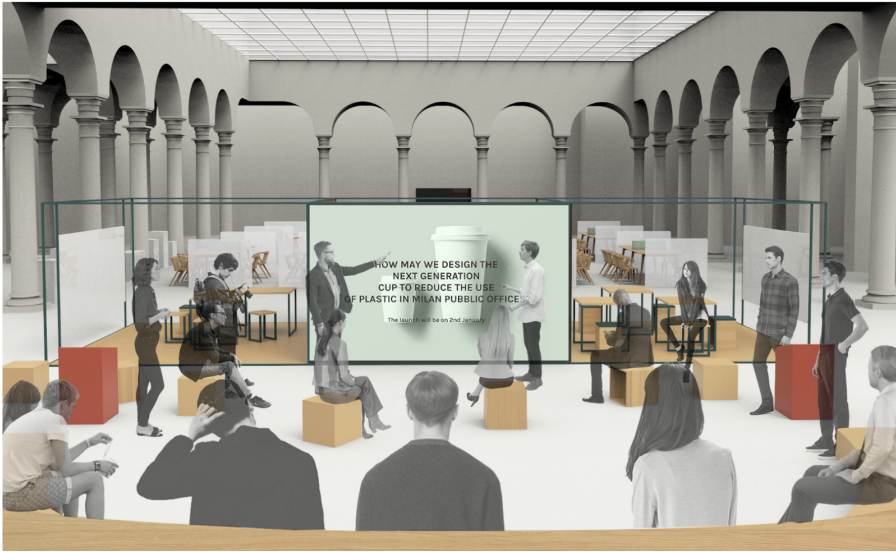
Another example among the interpretations of the students in the context of fluidity and the idea to build hybridity is the theme of the Chamber of Commerce as the *Casa del Commercio* (Home of Commerce). The domestic adjective applied to the administrative context implies the need for a more accessible model, at everyone's reach, and where one can "feel at home".

To transform the Chamber into a "home", the students in this team centered their services around family and care (both for others and for oneself), two of the most important characteristics of a home. The "Casa" employs a family of actors, each with a distinct role. The small business proprietors are placed at the center of a support network consisting of Casa personnel and representatives of the four organizations that grew out of the Chamber of Commerce. The project's objective is to create a nurturing environment for the dwellers who "inhabit" it.

- ***PUBLIC – community, communal, connected, engaged***

"Contemporary Architecture still attributes its own foundation to the acts of building, constructing visible spaces; metaphors limited to a single building and single typologies, and does not take the opportunity to represent a dispersed, inverted, and immaterial urban condition" (Branzi, 2006).

Today's expanding cities have reshaped their relationships with public places, but only a few public spaces today satisfy the criteria for being considered "public" despite new modes of communication and social interaction that have emerged. Indeed, the new digital dimension has created new design opportunities in areas leaving behind a spatial heritage that has to be reallocated. Now, more and more, physical touch-points are intended to attract or support new and developing activities. These places, identified in 1999 by the sociologist Ray Oldenburg as "third places" (where first places are homes, and second places are workplaces) serve as "anchors" for communal life, facilitating and fostering more expansive, creative connections.

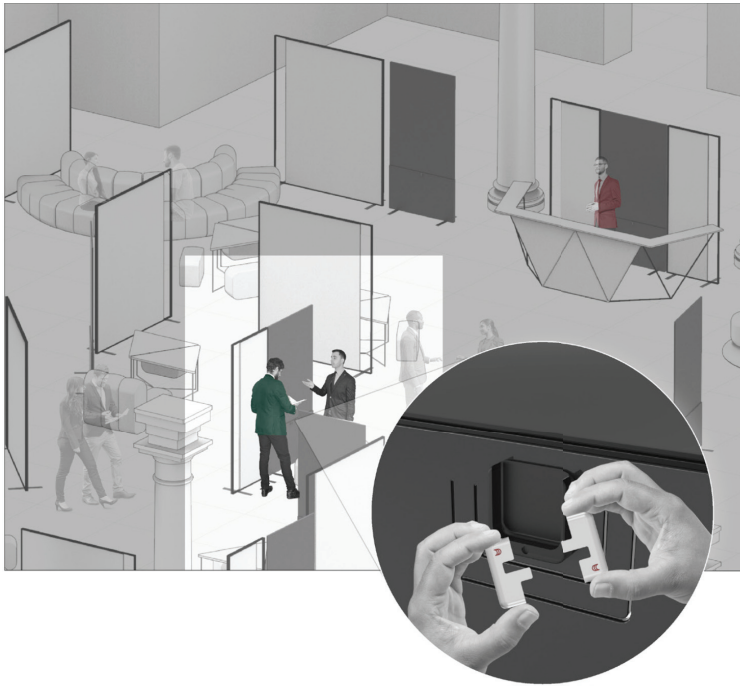


*Figs. 9-10 Images from “Phub” project, by Nguyen Hoang Lan, Wan Xiaoqing, Stanga Margherita, Ritella Carlotta, La Grasta Rosanna. Product Service System Design\_Environment and Experience Studio (PSSD\_EED), 2019, Politecnico di Milano – School of Design*

The student's project entitled *Phub* enhances the communal manner through the concept of cross-fertilisation. The idea beyond their project is to bring people together, making peer-to-peer activities, allowing diverse knowledge and skills to influence each other, and triggering employees into different ideas and new ways of thinking. *Phub* also fosters functions related to the enhancement of cultural heritage and the development and promotion of tourism. In their proposal, the growth in the market is connected to the stimulus for many companies to start new experiences, inserting managerial teams of people with different backgrounds, identifying best practices, and transferring them within the organisations. In their spatial configuration they envision the *Arena* as the heart of cross-fertilization and where ideas can be shared and developed in co-learning actions. It is a new semi-circular area where conferences, conventions, and more informal interactions can take place. It is reminiscent of the forms and activities of the *Roman Arena*. In fact, Milan's historic Roman Arena, an area of about 450 sqm, is within the underground spaces, and directly below the new arena, of Palazzo Turati, which, in agreement with the Superintendence for Archaeological Heritage of Lombardy, offers the public the opportunity to be visited with advanced reservations.

- ***SMART – Technological, mediated environments and experiences***

The profound impact of technological advancements and digital transformation on our daily lives is evident in the way we conduct ourselves, our behaviors and practices, and our perception of our environment (Castells, 2000). Due to their ability to streamline daily activities and facilitate tasks, technology has become an integral part of our lives, leading to a dependence on its services that both satisfies and generates our demands (McLuhan, 1964). Upon further elaboration, it can be posited that a shift in the role of technology has been observed, whereby its focus has rapidly transitioned from problem-solving to the fulfillment or elevation of needs (Hassenzahl & Tractinsky, 2006). Adopting a user-centric approach, advancements in technology have facilitated the dissemination and accessibility of information, significantly transforming our literacy practices (Jenkins, 2006).



*Figs. 11-12 Images from “CdC Care” project, by Yu Ching-Chun, Penaranda Trillos Ivan Ernesto, Fu Chelsea, Dell’oro Anastasia, Scrignar Elisa. Product Service System Design\_Environment and Experience Studio (PSSD\_EED), 2019, Politecnico di Milano – School of Design*

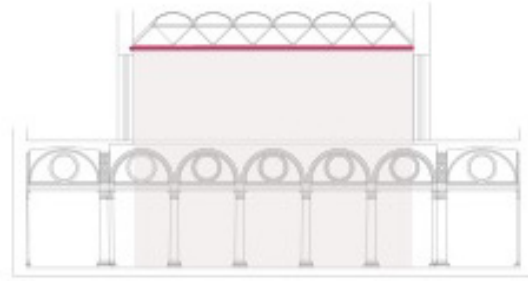
One possible use of smart technology is interpreted by the project named *CdC Care*, intended as a “smart hug”. *CdC Care* wants to let the clients know it’s there for them. This care is represented by one of the closest human interactions, the hug. Hugs are used as an expression of warmth, kindness, and friendliness; and they provide a sense of intimacy. *CdC Care* wants to replicate this feeling for the clients and make them feel important and looked after. *CdC Care* adopts a human-centered approach, with the whole system revolving around the client. The client has access to an online platform, available through app and website. The data collected by the platform is used to provide customized services. The staff dispenses knowledge, while the client provides useful data on services through various feedback loops. External partners also contribute their expertise, promoting themselves and reaching a wider audience at the same time. The space provides a flexible environment for services that interact with a newly designed *CdC Care* keycard device. This product enables online and offline seamless connectivity and facilitates the client’s interaction with the space and other companies beyond the space. The key replaces the other tokens previously used for digital signature and identity, and triggers interactions with the different digital interfaces in the system.

- ***NATURE – Natural, fresh, healthy, sustainable, ecological***

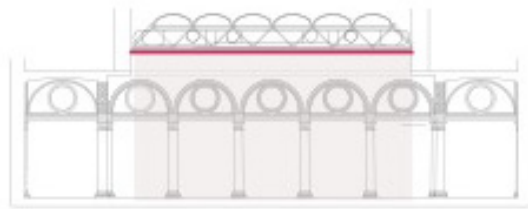
“Nature” typically refers to physical features and processes of nonhuman origin that people may be able to perceive, including, for example, the quality of air, weather, and landscapes. Nature is often situated and simulated in built environments, as with indoor plants and trees. Similarly, community gardens and urban parks comprise natural features, appear ‘natural’, and provide opportunities to engage with and follow natural processes, but they are typically designed, constructed, regulated, and maintained by humans (Hartig *et al.*, 2014). They are ultimately human constructs.

One of the natural elements that was given greater emphasis within the *Salone del Futuro* project was light and its adaptation into space. Due to various adaptive interventions, the registry hall includes an added roof/ceiling assembly that has undergone numerous transformations over decades (the court was originally open to the sky), including major projects elaborated by well-known architects: the first design

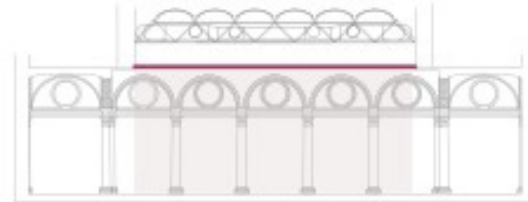
**1929/1931 - Progetto Mezzanotte**



**1954 - Progetto Castiglioni**



**Current**



*Fig. 13 – Diagram of the ceiling transformations during the years: starting from Progetto Mezzanotte 1929-1931, passing through Progetto Castiglioni 1954, to the current state of the ceiling which include also the renovation made during the Salone del Futuro lighting system project, made by the light designer Francesco Murano. Drawings made by the authors*

intervention, *Progetto Mezzanotte*, is from 1929/1931 when the hall was configured as a full-height space with balconies looking toward the center and covered by a metal and glass ceiling/roof assembly that allowed natural light and air to flow into the interior. The *Castiglioni Project* of 1954 transformed the hall to no longer be full-



height; it but *was* lowered by a new glazed ceiling. In later years the glazed ceiling was replaced by an opaque construction, completely eliminating the inclusion of natural light inside the offices and the central hall<sup>6</sup>.

The design of the *Salone del Futuro* in the students' proposal, *Greenhouse of Commerce*, involved restoring the 'idea' of natural lighting through the use of artificial light fixtures (and mediated possibilities in some other proposals), which simulate a natural luminous opaque sky, so as to restore environmental comfort within the new spaces. *Greenhouse of Commerce* is an example of a project that prioritises the importance of nature, not only as a non-human element but also as a concept on how nature can be used as a metaphor into a company lifecycle. This metaphor translates to aspects including how we can take care of companies, clients, and communities, and how we may find new fertile ground, sustain the new buds, and possibly graft new companies and opportunities.

6. Perhaps a note on the exclusion of extensive restoration or new construction of the ceiling/roof assembly in the Salone del Futuro is relevant, and may serve as a possible soft, well-intended, criticism on 'experimentation' (see remarks in the conclusion below). While budget and time constraints may have prohibited the restoration of the earlier versions – or a completely new proposal – the lost opportunity of re-valoring the space and palazzo in this instance is unfortunate for many reasons. There are the obvious historical and heritage aspects, but also ecological, environmental, spatial, and technological aspects as well... and the fusion of old and new. With current materials and technologies available, the space would not have only achieved its former, and formal, beauty and significance, but would have become an additional public icon in Milan, the economic and design engine of Italy, as both the new heart and soul of the Chamber of Commerce and a new 'open' place and venue for the city and its citizens. But of course, there can be future stages and budgets to develop the project, as this too is a process, and a part of a robust culture of change, innovation, and experimentation. Perhaps an incremental strategy of development is best, especially in light of the difficult circumstances of the project due to the Covid pandemic and limitations in budget and time... and perhaps a possible conflict with the focus on digital transformations driving the project. Sequentially, this could become a "Phase Two" project that could focus on greater public involvement within the spaces after verifying the benefits of the first round of transformations.



*Fig. 14 – Image from “Greenhouse of Commerce” project, by Liu Qianyu, Crippa Federico, Tang Xiaojuan, Bosetti Silvia, Zhou Yifan. Product Service System Design\_Environment and Experience Studio (PSSD\_EED), 2019, Politecnico di Milano – School of Design*

## **Recent Evolution of Technologies and Digital Transitions in the Italian Context of Public Administrations**

A confluence of factors had dampened Italy’s ability to capitalize on the many opportunities offered by the digital revolution in general, with the Salone del Futuro offering a clear alternative case study. For example, Italy has experienced relatively lower rates of productivity and economic growth in comparison to other European nations. In the year 2020, the Gross Domestic Product (GDP) of Italy dropped by 8.9 percent, which was much more than the 6.2 percent drop that occurred in the European Union. This particular drop was compounded by the COVID-19 pandemic and Italy’s specific relationship to the very early years of the pandemic. The first round of local lockdowns started in February of 2020, and in March of that year, Italy became the first member state of the EU to implement a widespread lockdown. The resultant lag from inadequate productivity and performance has been problematic in many ways, including the absence of sufficient ability to address infrastructural needs and desires overall. Additionally, the nature and structure of the productive fabric of Italy,



which is characterized by a prevalence of small and medium-sized enterprises, has been another contributing factor. These businesses have traditionally been slow to adopt new technologies and to transition towards production with higher value-added content.

However, progress has been made, and at the beginning of the year 2023, additional inputs have emerged. A new program, the European Union's Next Generation EU (NGEU), has been created in response to the pandemic. It is a significant effort in terms of magnitude and intentions. It will provide funding and changes to accelerate and advance, among other things, digital shifts and worker training. Italy understands the opportunities of the NGEU initiative in terms of potential growth, investment, and modernization. And, in fact, Italy is the first country to get assistance from the NGEU's two main tools: the Recovery and Resilience Facility (RRF) and the Recovery Assistance Package for Cohesion and European Territories (RAP). (REACT-EU). The RRF asks member states to come up with a plan for investments and reforms called the National Recovery and Resilience Plan (PNRR). The plan's goals include technology, innovation, economy, culture, and tourism.

More specifically, this plan demonstrates that Italy's efforts towards change and advancement are aligned with the three European strategy axes: digitalization and innovation, ecological change, and social inclusion.

Digitization and the creation of processes, goods, and services are important components of Italy's advancement. In this area, Italy still has significant work ahead, but this also includes much potential in terms of the use of digital technology in industry and public services. Filling this gap and spending more in digital technologies, networks, and processes will help make Italy and Europe more competitive. It will encourage the development of strategies for diversity, and make them more adaptable to changes in the market and society at large.

The Digital Transition is a digital revolution at the least, and Italy has made significant progress recently; however, it still lags in terms of digital adoption and technological innovation. In 2022, Italy was ranked 18th out of the 27 EU Member States (up from ranking 25th in DESI 2017) on the Digital Economy and Society Index. Promisingly, the Italian government aspires to make Italy a leading country of the European Commission's new Communication "2030 Digital Compass"

Goal. It strives to create a fully digital society by 2030. So, the PNRR is full of technology and innovation intentions, actions, and goals, and things are improving.

## Conclusions

The *Salone del Futuro* and its project team of researchers, designers, practitioners, and students, demonstrates the multidisciplinary aspect of the design system, while maintaining a robust, comprehensive and holistic approach merging product, system, service, and spatial design features, and also including graphics/communication design, experience design, interior design, and lighting design, in a transdisciplinary manner. The Chamber of Commerce and Politecnico di Milano teams worked together with systemic and spatial co-design processes that merged multiple functions, features, scales, and contexts in proposing how public interiors can be transformed, particularly provoked in this case by new trends in the digitization of public services. These efforts and processes also helped to develop the relationships between Product, Service, System Design (PSSD) and Spatial Design (including interiors, architecture, and urban design), and to bond these two disciplines with other professions. This occurred, for example, in the participatory sessions and project scope created, and therefore fostered a merging disciplines and typologies, while blurring typical disciplinary and professional boundaries.

The “Digital Transition” trend will lead to growth and transformation opportunities for public administrations and public spaces. With increases in online, digital services and systems, fewer people will need to go to government offices in the same manner as before, and therefore there will be increased opportunities to use those spaces in diverse and improved manners for the community. The previous registry office, and its spaces renovated as *Salone del Futuro* are not an exception. In the future we could experience more and more digitalization and transformations in both tangible and intangible domains of PSSD and spatial environments. Indeed, it is likely that we will see an increasingly necessary renaissance of even more potent tangible elements and a heightening of the physical experience. Services and systems transform, and environments remain, even along with their

stories and memories. As we have seen from examples tested in the PSSD\_EED studio, space can manifest itself in different forms according to service transformations at times.

The project and process also had various collateral and transversal benefits, including that manifesting positive change may assist in efforts to establish a culture of innovation and experimentation. By direct demonstration of, and commitment to, infrastructural and technological developments that provide positive transformations, there is tangible evidence of embracing and fostering an open, participatory environment and culture of change and innovation. Executing a project based on transformative processes and actions demonstrates real commitment beyond intentions and words. It underlines the possibility of tangible benefits through real actions, especially moving from a banal and bureaucratic environment of impersonal and distant ‘sportelli’ glass-windowed counters that diminished and degraded public engagement, integration, and value. This is magnified further as the benefits also include the ecology and environment; the buildings and its spaces; and the staff, users, and broader community. Additionally, the project contributes to the collection of “best practices” and “case studies” in the typology of Public Administration spaces and buildings. The process itself, hence, helps to construct cultures of change, innovation, and experimentation at the Chamber of Commerce and in the city. There are signs, signals, and actual physical manifestations that the government is increasing accessibility, diversity, inclusion, and transparency in a positive, progressive, and proactive manner for the benefit of all.

The design process, in the Salone del Futuro, and consequently, its didactical outputs, is advantaged by a multi-scalar approach: from small-scaled objects and products such as smart totems and terminals to larger-scaled surfaces such as media monitors and smart mediated walls and screens that not only increase in scale but also in impact and spatial effect, to the scale of larger spaces and spatial conditions. At the same time, the adaptive reuse process related to the architectural and cultural heritage of the *Salone*, brought another new life to Palazzo Turati inner spaces, also bonding a broader community and fostering seamlessness from the public interior into the rest of the urban context, into the city.

## References

- Adebajo, A. (2018, July), "The role of service design consultancy in public sector: Inferences from KIBS and service innovation perspectives", in ServDes2018, *Service Design Proof of Concept*, Proceedings of the ServDes. 2018 Conference, 18-20 June, Milano, Italy (No. 150, pp. 572-581), Linköping University Electronic Press.
- Attwill, S. (2011, October), *Urban Interior: interior-making in the urban environment*. In *Proceedings of the 2011 IDA Congress Taipei Education Conference*, Taipei, Taiwan, 24-26 October, pp. 217-224.
- Bachelard, G. (1969), *The Poetics of Space*, Beacon Press, Boston.
- Branzi, A. (2006), *Weak and Diffuse Modernity: The World of Projects at the Beginning of the 21st Century*, Skira, Milan.
- Castells, M. (2000), *The Rise of The Network Society: The Information Age: Economy, Society and Culture*, John Wiley & Sons.
- Cicek, A., Grafe, C., Mandias, S., & Rosbottom, D. (2018), "Microcosms: Finding the City in Its Interiors", *Oase: tijdschrift voor architectuur*, 101, 2-5.
- Friedman, K. (1997), "Design Science and Design Education", in P. McCrery (ed.), *The Challenge of Complexity*, University of Art and Design, Helsinki, pp. 54-72.
- Friedman, K. (2002), *Towards an integrative design discipline. Creating breakthrough ideas: the collaboration of anthropologists and designers in the product development industry*, Bergin and Garvey, Westport, Conn.
- Hartig, T., Mitchell, R., De Vries, S., & Frumkin, H. (2014), "Nature and health", *Annual review of public health*, 35, 207-228.
- Hassenzahl, M., & Tractinsky, N. (2006), "User experience-a research agenda", *Behaviour & information technology*, 25(2), 91-97.
- Hertzberger, H. (1991), *Lessons for Students in Architecture*, Uitgeverij 010 publishers, Rotterdam.
- Jenkins, H. (2006), *Convergence Culture: Where Old and New Media Collide*, New York University Press.
- Koolhaas, R. (2002), *Junkspace*, October, 100, 175-190. <https://doi.org/10.1162/016228702320218457>.
- Lynch, K. (1960), *The Image of the City*, The MIT Press, Cambridge, Massachusetts and London, UK.
- Meroni, A., & Sangiorgi, D. (2011), *Design for Services*, Gower.
- Norberg-Schulz, C. (1971), *Existence, Space and Architecture*, Praeger Publishers, London.
- McLuhan, M. (1964), *Understanding Media: The Extensions of Man*, The New American Library, New York.

- Oldenburg, R. (1999), *The great good place: Cafes, coffee shops, bookstores, bars, hair salons, and other hangouts at the heart of a community*, Da Capo Press.
- Pallasmaa, J. (2011), *The Embodied Image: Imagination and Imagery in Architecture*, John Wiley & Sons.
- Pimlott, M. (2016), *The Public Interior as Idea and Project*, Jap Sam Books.
- Pimlott, M. (2007), *Without and within: Essays on territory and the interior*, episode publishers.
- Poot, T., van Acker, M., & de Vos, E. (2015), "The Public Interior", *Idea Journal*, pp. 44-55. <https://doi.org/10.37113/ideaj.vi0.52>.
- Rasmussen, S.E. (1964), *Experiencing Architecture*, The MIT Press, Cambridge, Massachusetts.
- Sanders, E.B.-N., & Stappers, P.J. (2008), "Co-creation and the New Landscapes of Design", *CoDesign*, 4(1), 5-18, <https://doi.org/10.1080/1571088070187506>.
- Sennett, R. (2016, April 26), *Interiors and Interiority*, in Harvard GSD. Retrieved from YouTube. [www.youtube.com/watch?v=hVPjQhfJfKo](http://www.youtube.com/watch?v=hVPjQhfJfKo).

### **3. M: Urban Regeneration project of a Former Military Park in Lentate sul Seveso**

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#### **Abstract**

The increasing number of abandoned buildings and disused spaces in our cities represents an opportunity to counter the waste of resources. The former military park requalification project described in this chapter shows a model of sustainable urban transformation based on building recovery and community involvement. The project proposes the realisation of student residences integrated with multifunctional spaces for local communities aimed at enhancing the territory's resources and history, as well as enabling educational and economic development. It follows the principles of the National Recovery and Resilience Plan, starting with moving innovative processes out of big cities and into smaller places.

The project was conceived by a team of researchers from the Design Department of Politecnico di Milano, in collaboration with the municipality of Lentate sul Seveso, owner of the properties subjected to requalification, engaging the participation of the local administration, the major stakeholder, namely Polo Formativo Legno Arredo school, and actors from the corporate sector. The partnership between Municipality and University represents a significant connection in the development of the territory. Service and Spatial Design has a key role in responding to the need to rethink public space according to new forms of social engagement and interaction.

## Introduction and methodology

The design of the former military park afforded the chance to combine research and experimentation on topics such as regenerative and sustainable design, participatory actions with local actors, and in dialogue with local administration, and public policy defined in Italy's National Recovery and Resilience Plan (PNRR)<sup>1</sup>. All of these different scales, within which the project is situated, come together to form a Medium Design Scale, which investigates the role of design in the process of city-making and the revitalization of disused public property spaces.

In Italy, abandoned private and public properties are becoming a challenging issue due to their increasing diffusion. The phenomenon could be looked at from both an urban and a public policy point of view, since most of these situations have a strong effect on the environment and policies are needed to stop and control them. When we talk about unused or empty public property, even if it is in a good state of maintenance, we have to consider it a wasted resource. Even more so if the property in question is unused, in a poor state of maintenance, or abandoned altogether. It becomes an element that negatively affects the common interest; it becomes a collective problem (Bellè, 2020). According to the most recent report from the MEF (*Ministero dell'economia e delle finanze*, in Italian), reporting data from 2018, the public administration's property holdings consist of over one million buildings. Seven percent in terms of quantity and four percent in terms of surface area of this heritage is unused. This quantity is not negligible, especially when considering the 19 million square metres of land occupied by these buildings, valued at 12.1 million euros (Carapella, 2018; MEF, 2021). This unused heritage has a lot of potential for sustainable developments, and urban regeneration is a viable response to the waste of resources. Cities are drivers of a regenerative design that promotes active collaboration among diverse stakeholders, integrating different perspectives of knowledge and expertise (McCormick *et al.*, 2013), and encouraging experimentation with

1. Piano Nazionale di Ripresa e Resilienza (Italy's Recovery and Resilience Plan): [www.governo.it/sites/governo.it/files/PNRR.pdf](http://www.governo.it/sites/governo.it/files/PNRR.pdf).



sustainable solutions and approaches. In the case of the former military park project, the distinctive cultural legacy of the structures and the growing demand for the repopulation of these vacant spaces are what are driving the research.

The regeneration of the former military park is a research project conceived by a group of researchers from the Design Department of Politecnico di Milano, in partnership with the municipality of Lentate sul Seveso, the owner of the properties that are being submitted for requalification. Different institutions, such as the municipality and university, worked together to address the need for local transformations, replacing the traditional “researcher” and “researched” relationship with a more collaborative interaction (Murray *et al.*, 2010). The result of this coordination laid the groundwork for “macro-transformations” through “micro-transformations and local systemic discontinuities” (Manzini, 2006).

The primary issue that needed to be addressed is the integration of temporary living spaces and territorial development, recognizing the student housing research as an inclusion of “housing issue” and “urban regeneration” (Bellini, 2015). The expected results of the project were to contribute to the definition of new solutions, in terms of service and spatial design, for unused places of public property, enabling the educational and economic development of the territory. For this reason, together with the engagement of local authorities, the design strategy included participatory actions promoting an exchange of actually enforceable solutions.

The research began by assessing the current state of the abandoned building and the context of intervention. A field research conducted in collaboration with the local administration and stakeholders resulted in a project proposal based on the definition of the potential users’ profile. After its validation, the proposal was developed at the level of the feasibility study. The latter phase was concerned with the services provided and the spatial layout. The feasibility study was based on a strategy that reflects the fundamental principles introduced by the PNRR, focused on achieving the goals of ecological and digital transition in future development. The directives of the PNRR have also stimulated construction and production activity by allocating substantial funds to improve the quality and quantity of education and training services.

## **Student dorm scenario and urban regeneration opportunities according to public policies**

The initiatives of recent years by subjects of national and international relevance highlight the important role of student housing in the qualification of the dwelling offer, in the typological and technological renewal and in the transformation of the social and urban fabric (Faroldi, 2020 cited in Bologna, 2022, p. 199).

Almost two years after the outbreak of a global pandemic, we know that the pandemic has irrevocably altered some aspects of our daily lives, whether we are talking about a domestic environment or a public space. As COVID-19 grew, the city became less appealing, and during quarantine, apartments got stuffy and couldn't be lived in. A portion of the population abandoned cities and relocated to suburban homes and more rural environments, also thanks to the diffused opportunity of smart-working (Borin, 2022). The meaning of "private spaces" changed, with everyone virtually entering our space and also due to the use we make of it. So did the meaning of "public space", because the pandemic affected relational behaviour, resulting in significant changes in public space use and design. Temporary housing, in which the line separating the public and private spheres is frequently difficult to delineate, requires the exploration of new design possibilities on the social and spatial dimensions.

Gainsforth and Peverini (2022) gave an accurate picture of the situation of student residences in Italy, a nation that ranks last in Europe for the number of graduates. The lack of affordable housing threatens social mobility and the right to education. On the other hand, it encourages certain speculative dynamics in the private market.

In Italy's university dorms in 2020, there were 42,732 beds. This is less than a third of the beds available in France and Germany. Sixty-eight percent of university students in Italy live with their parents, compared to the European average of 33%. Only 5% of students have housing in a university residence, against a European average of 17%. Only 40,000 of the approximately 400,000 students living away from home are housed in public or semi-public university housing. Only one-third of scholarship-eligible and out-of-town students benefit from housing (Gwosc *et al.*, 2021).

Italy's National Recovery and Resilience Plan (PNRR, in Italian) wants to close the gap with other European countries by providing both regulatory measures and substantial investments. The plan, strengthening the supply of education services (Component 1 of Mission 4), aims to raise the number of beds from around 40,000 to 105,500 by 2026. Housing policy, even if it is not explicitly or referenced to a single mission, is one of the two major themes, along with urban regeneration, that the country has decided to develop through the investment of PNRR resources (Baratta, 2022).

Since public space allows for the practical application of new urban and social models, it serves as a major source for the improvement of the city as a whole. Therefore, it is crucial to restore a connection between public space and the people who reside there by creating a system of proximity that emphasises both human and non-human elements and thereby links services, relationships, and opportunities (Galluzzo, 2022). Promoting projects for the regeneration, enhancement, and management of the great heritage of history, art, culture, and traditions in small Italian towns, integrating cultural heritage protection objectives with the needs of social, economic, and employment revitalization is another goal provided by the PNRR (Borin, 2022) on which the project of the former military park is based.

## **Designing new ways of temporary living**

One of the main characteristics of con-temporary homes is their temporary nature, whether it be a temporary use or a temporary and ephemeral structure. [...] The reasons we experiment with temporary housing today are varied, and obviously the phenomenon of new-nomadism is central in this (Galluzzo, 2022, pp. 71-72).

Residence halls are typically permanent structures used for temporary periods, making them effectively temporary houses. The type of resident of these structures can be defined as a non-resident who lives for longer or shorter periods outside its home town. These non-residents can be students, workers, or people in temporary need for any reason. In some cases, the service is intended for just one type of user; in other cases, it can involve a variety of users. Some existing examples of hybrid offers are the 21 House of Stories hotel

that has high-tech rooms and a co-living and coworking space for brief or long stays for temporary periods, designed for the needs of those who are away from home for work or study reasons. It is similar to Camplus, which offers a place for students, young professionals, and travellers, founded to help people “feel at home away from home”. The Student Hotel recently became The Social Hub to underline its efforts to improve society by establishing itself as a community. It’s a hybrid space with hotel rooms for tourists, co-living for travellers, coworking for digital nomads, and a creative playground for entrepreneurs and locals.

Bologna (2022) explains this idea of “community”, bringing attention to the fact that public spaces outside the residence can “create landmarks and an identity in the urban fabric”. He also gives two examples: La Presentazione residence, where the large inner courtyard becomes a space of strong aggregation, it relates to the city fabric as the outdoor area becomes a real urban park that the community can access. The Ex-Ospedale Militare residence in Trieste provides many places for students to study and relax, as well as community services like a convention hall and co-working and start-up spaces.

In this scenario, the project proposal for the former military park is presented as a renovation of the area with the aim of combining student hospitality with services and spaces for interaction and social cohesion – environments capable of building local community relationships. Student residences can serve as urban hubs for synergistic links between the space-service and the neighbouring urban areas. They are community hubs that can hold daily life services and activities. They can be flexible in scheduling and access, open, active, and a living reference point in the area (Collina *et al.*, 2018). Designing new ways of temporary living must mean designing an integrated synergy between spatial design and design for service favouring a sustainable and inclusive space/service. Postell *et al.* (2022) claim that today the design of collective (small) living spaces must include essential concepts such as multifunctionality, nature, and ethics, embodying “a wide spectrum of opportunities for shared activities and a hybridization of purpose and use”.

## ***Context and assessment analysis***

The project of the Former Military Park takes place in a small context that is decentralised from a major urban centre but well connected to northern Italy's main cities. This connection makes it a strategic place with a high territorial value on both a local and supra-municipal scale. The area of intervention is strongly and historically defined by the wood furniture industry, where methods developed and applied by old master carvers helped shape the furniture sector. In this scenario, the Polo Formativo Legno Arredo, a high school that trains young people to work in the sector, was born. We could define it as "rurban" (rural+urban) referring to a geographic territory/landscape that has the economic characteristics and lifestyles of an urban area while maintaining the fundamental rural area characteristics (OECD, 2020 cited in Borin, 2022).

The former military park is located near this school, attracting people from all over the country, and also near the train station, connecting it to the city of Milan. After serving as a military accommodation, the site has been left in an abandoned state. The buildings are partially damaged and uninhabitable, surrounded by shrubs and brambles (Figs. 1-2). Their historical and architectural significance serves as a strategy for the expression of cultural identity characteristics and the economic and practical enhancement of heritage. Moreover, the value of the site lies not only in its architectural qualities but also in its naturalistic potentialities. Indeed, the 3,500 square metres of greenery bordered by the presence of the river Seveso should not be understated.

The need for student residences arises from the vision of growth of the Polo Formativo Legno Arredo, not only at a national level but also at an international level, with the primary goal of enhancing the area's cultural, historical, and industrial value. The field investigation phase also showed a high level of association activity in the area, with a huge number of cultural, sports, and voluntary associations identified in a population of almost 15,000 people. As a result, the need for a community and meeting place was also identified.





*Fig. 1 – Pictures of the state of the art of Lot A's buildings of the former military park in Lentate sul Seveso*





*Fig. 2 – Pictures of the state of the art of Lot B's buildings of the former military park in Lentate sul Seveso*



## **Target profiles**

The context analysis allowed for the creation of a profile of potential temporary residents, from which the hospitality offer was created. The profiles that emerged were primarily related to the presence of the Polo formativo Legno Arredo school. This included national and international students (aged 19-29), who would use the residence for short or medium-to-long periods, attending entire courses or single seminars at the school. Lecturers or experts in the field who could remain in Lentate to attend or lead a workshop, a conference, a course of study at the Polo formativo school, or other types of events related to the school. Furthermore, the property's proximity to the Camnago/Lentate railway station does not rule out the possibility that these same types of users (students, lecturers, and professionals) are not only connected to the Polo Formativo in Lentate, but also to other nearby sectors' realities. The accommodations served as the hub of a hospitality system for educational institutions in neighbouring municipalities and Milan.

The primary focus of the design is the places' adaptability to the diverse requirements of their inhabitants; creating transformative places also contributes to the sustainability of those spaces, making them suitable for longer (Collina *et al.*, 2022). Even if existing conditions change in the future, the flexibility of the space will ensure that it is never rendered obsolete. The feasibility study has already considered the hypothesis of accommodating other types of users, including those in a difficult situation that require temporary housing, such as individuals undergoing divorce, as well as older people who may have specific needs and requirements for housing.

The flexibility of the space is intended "in terms of usability and the different degrees of appropriation (individuality and sociability) of the residence's interior and exterior public spaces by users other than students" (Bologna, 2022, p. 205).

## ***Promoting sustainable and inclusive spaces through accessibility***

The correlation between accessibility to a space and its sustainability is increasingly recognized as a critical factor in designing and operating spaces that promote sustainable outcomes. Accessible spaces can promote social sustainability by promoting inclusivity and reducing disparities in access to resources and opportunities (Kadir & Jamaludin, 2013). In the case of the former military park, the intervention gives special emphasis to the theme of accessibility, ensuring that all spaces are accessible to a wide range of users, including those with disabilities, and that such spaces can promote sustainability and inclusivity. The implementation of circulation, layout, and dimensions that meet accessibility standards is not only important for social sustainability but also for economic and environmental sustainability. Spaces that are flexible and accessible tend to be more sustainable because they enable a wide range of users to access and utilise them in ways that meet their specific needs. The accessibility of the renovated former military park is designed not only for the current residents, who are primarily students, but also for the future integration of services for the elderly. Moreover, flexible and adaptable building designs can reduce the need for costly and wasteful renovations over time. The goal is to create a new educational environment that promotes ecological terms and sustainability as life choices, incorporating it into teaching, research, design, construction, and operation of university facilities and infrastructure (Bellini *et al.*, 2015).

### **Spatial and service transformation**

According to these premises, the design of the former military park led to a radical reconfiguration of the spatial and services characteristics. Applying an S+S approach to design, we consider spaces as supporters of social practices that operate through flows and enablers of the service network (De Rosa, 2022).

The site of intervention is divided into two parts: “Lot A” and “Lot B”, plus a third part complementary to Lot B (Fig. 3).

The purpose of the project is to designate Lot B for residential services (for students, professors, and visitors of the adjacent school) and to designate Lot A for local community-related functions, including a playroom for children, the house of associations, and a cafe/social club. The complementary area to Lot B is needed to extend the existing parking lot.

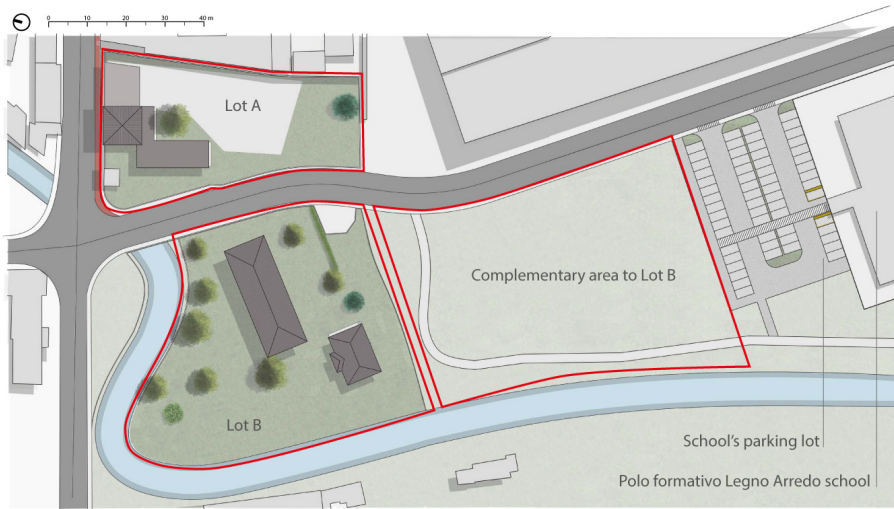


Fig. 3 – Planimetry of the former military park’s state of the art

### **Three level of hospitality**

Student housing consists of a coordinated collection of individual units and common areas, each with its own set of amenities and design considerations (Rizzo & Ajroldi, 2004). Particularly, for the former military park project, three levels of hospitality have been defined (Fig. 4), each accommodating different needs and adaptability to future needs depending on the type of user and length of stay:

- The first option is the one that provides the highest level of comfort. It’s a “Two-room” accommodation, consisting of a single room with a private bathroom and kitchen. This option is designed for a single guest, who can be a teacher, a professional or a person in need, regardless of the duration of the stay (Fig. 5).



Fig. 4 – Hospitality Offers’ Schemes



Fig. 5 – Planimetry of an example of the “Two-room” accommodation typology

- The second option, “Small Size” accommodation, provides a good level of privacy while also offering spaces/opportunities for socialising, all while maintaining a medium-high level of comfort. This type of accommodation consists of two types of rooms, single room and twin room, each with its own private bathroom. They share a kitchen in groups of no more than three or four. This solution is a compromise between the private dwelling and the hostel model and it is designed for two different types of users depending on which building it is located – for students who stay for a medium-long period and for faculty, professionals or people in need who use it for short periods (Fig. 6).
- The third option, “Maxi Size” accommodation, with its eleven rooms and one common area, is the solution that most closely resembles the traditional student residence model. However, thanks to the reduced number of rooms and the presence of private bathrooms in each one of them, the level of comfort remains high. This option is intended for students who would stay for a medium/short period (Fig. 7).



*Fig. 6 – Planimetry of an example of the “Small Size” accommodation typology*



*Fig. 7 – Planimetry of the “Maxi Size” accommodation typology*

The common kitchens (Fig. 8) are places where people get to know each other and sometimes have small fights. It is the place where differences in cultures and habits most often cause discomfort. For this reason, both the kitchens of the small and the maxi accommodations are equipped with refrigerators for individual use and personal compartments.

The spatial configuration of the buildings also guided for the distribution of these three different services. The number of beds obtained by this internal reconfiguration and regeneration of the buildings is 23. All rooms in the distinct types of accommodation are designed with basic, linear furniture that doesn't dominate the space so that residents can customise it (Figs. 9-10). The room proportions are variable and widely



*Fig. 8 – Project Visualisation: Common kitchen of the “Maxi Size” accomodation*



*Fig. 9 – Project Visualisation: single bedroom of the “Small Size” accommodation*





*Fig. 10 – Project Visualisation: twin bedroom of the “Maxi Size” accommodation*

available compared to the square meters mandated by law n.338 of 14 November 2000, taking into consideration the PNRR-promoted student accommodation adjustment standards, with the goal of reducing the current legal requirements for student common spaces in favour of a better-equipped (single) room.

### ***Creating Connections through Residential and Community Services of Lot B***

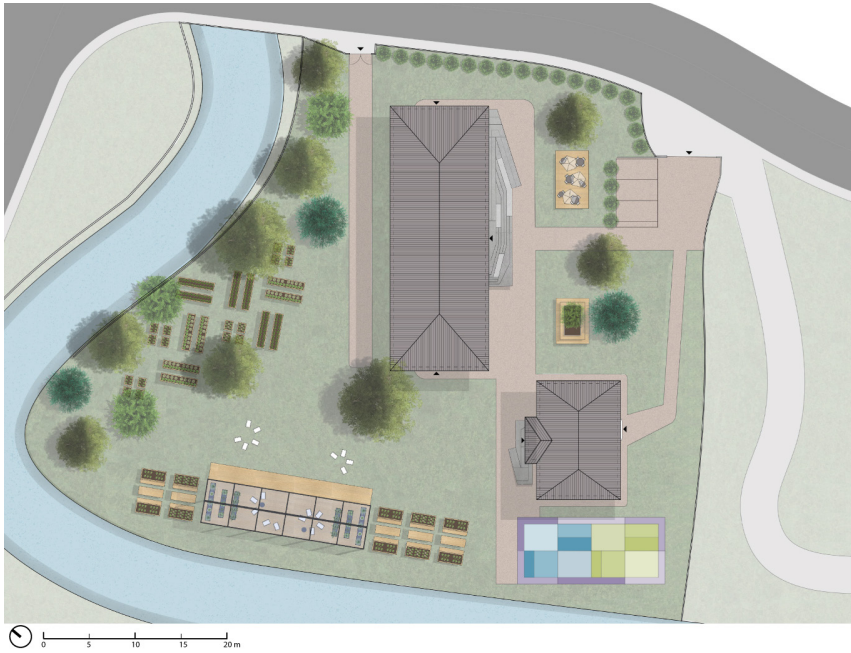
The definition of services within the context of this project holds significant importance. The classification of services comprises two broad macro-categories, namely, residential services and community services. Residential services cater to temporary inhabitants, while community services are open to everyone, with an emphasis on integration and inclusivity with the local community. Although the two categories possess distinct features, they often overlap to facilitate



the establishment of connections between transitory residents and the territory.

The study identified several residential facilities, including the Library of Objects, where temporary residents can borrow a wide range of items and equipment for various occasions, reducing the waste of resources and promoting the circular economy. Laundry facilities for autonomous use, and Car-Sharing and Bike-Sharing services that enable visitors to travel independently. Additionally, a Bike Room is available for storage, maintenance, and service assistance. The Bike Room is open also to the local community as a place to foster social inclusiveness by providing a meeting place for people of different ages and skills to share their knowledge and repair bikes.

Moreover, the research identifies several community amenities that are accessible to both temporary residents and local community. These amenities include an Event Room with a fully-equipped kitchen located in the central core of building B2, which serves as an ideal location for congregating, celebrating, coordinating training courses, meetings, and other activities. The garden area (Fig. 11) is thought of as a gathering place for residents of the dormitory and the surrounding neighbourhood, promoting social interaction and community building. It also helps to establish a connection with nature and host events thanks to the community vegetable garden (Fig. 12). Lastly, a multi-sport field is available for outdoor physical activity. It provides a space for individuals to engage in various physical activities, such as soccer, basketball, and volleyball, promoting an active lifestyle, improving health and well-being. It is also a way to facilitate social interaction and team-building, promoting positive relationships and a sense of community among participants.



*Fig. 11 – Planimetry of the project proposal for the former military park's Lot B*



*Fig. 12 – Project Visualisation: the community vegetable garden*

## ***A hub for social engagement: the proposed Multifunctional Space of Lot A***

The study presents the proposal for the multifunctional space of Lotto A, which encompasses three primary services: the children's area, the bar/circle, and the house of associations. Additionally, the outdoor area can also serve as an event space, suitable for activities such as outdoor cinema, concerts, theatrical performances, and more (Fig. 13). The proposal was developed based on the analysis of the context, which revealed the presence of a dense associative network in the area that lacks adequate spaces to conduct activities, the expressed need by parents for a dedicated space for their children's activities outside of school hours, and the local community's desire for an aggregative centre. Each of the three services has independent entrances and management and is designed with specific spatial characteristics.

The children's area consists of both an interior space, on the ground floor, and an external area. The interior environment is characterised by the large hall that can be divided according to different needs, thanks to blown textile doors (Fig. 14). The space can be configured to host, for example, parties or recreational activities.

The bar/circle is designed as an informal meeting place, on the two floors of the building. The lower floor features a multifunctional and flexible space suitable for circle activities, while the upper floor includes the bar with a large terrace (Fig. 15) equipped with tables and sofas as the main spatial element.

The House of Associations occupies a separate building portion. The interior space is versatile and can easily adapt to different functions. Perimeter stairs make it an excellent arena for meetings and associative events. The space can be divided, thanks to blowing textile doors, in case of multiple activities.

The project aims to establish connections with the territory and create shared social well-being by requalifying the former military park.

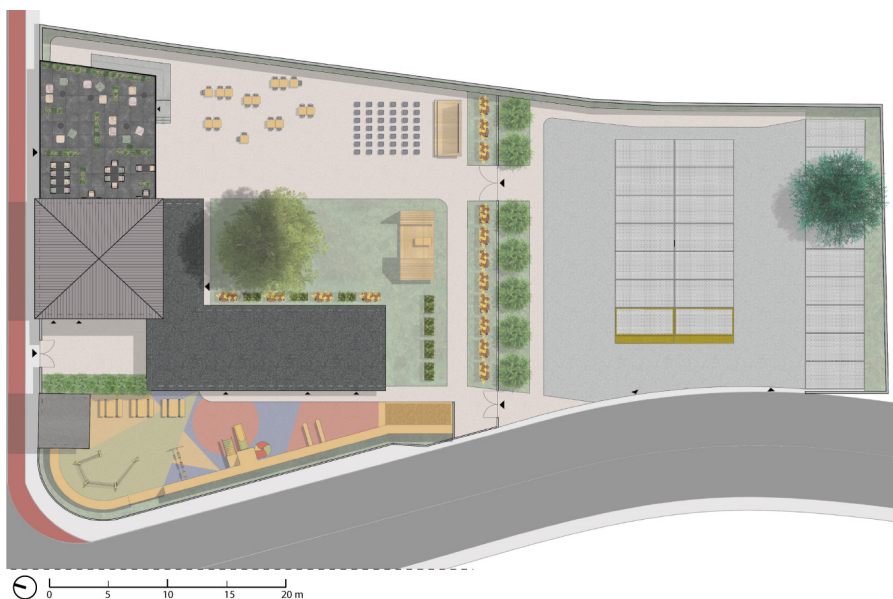


Fig. 13 – Planimetry of the project proposal for the former military park's Lot A



Fig. 14 – Project Visualisation: the children's area





*Fig. 15 – Project Visualisation: the Bar Terrace*

## **Conclusions**

In Italy, there is an emerging focus on utilising existing buildings to reduce the need for new construction and limit the impact on the environment thanks to specific public policies starting from the PNRR investment. The former military park requalification project described in this chapter plays a crucial role in shaping the urban and social fabric. Its strength lies in its potential to foster new forms of social and entrepreneurial collaboration, moving innovative processes from large urban centres to smaller contexts. This decentralisation of innovation has the potential to stimulate economic growth in small areas and promote more equitable distribution of resources and opportunities across different areas, aligning with an additional objective of the PNRR. Restoring a connection between public space and the people who reside there is crucial for improving the city as a whole and creating a system of proximity that links services, relationships, and opportunities. The collaboration between the academic institution and community stakeholders in formulating a project that is in line with

the objectives of the PNRR has contributed to the project's contextual significance.

In the wider context of territorial development, universities can serve as significant contributors to the investment of PNRR funds through the provision of research, expertise, capacity building, and partnership opportunities. One potential avenue for investigation is the examination of sustainable, inclusive, and resilient communities, which are fundamental goals of the PNRR, through research. Universities can act as facilitators for the participation of local stakeholders in the design and implementation of PNRR-funded projects, and also as evaluators to assess their effectiveness. According to Fassi *et al.* (2020) Universities can be regarded as drivers for social innovation, particularly in relation to the urban context, public spaces, and the commons. They have a responsibility to promote social and cultural awareness, in addition to education and scientific research, using their physical space to create an integrated system of services and activities between the campus and the city. By leveraging their physical space and resources, universities can offer a platform for designers to experiment with innovative approaches to urban development. In this regard, Manzini *et al.* (2022) argue that design has a critical role to play in city-making, as it can facilitate a shift from a traditional top-down, deterministic approach to a more flexible and adaptive one. Designers can introduce subsystems or “plug-ins” that generate transformations in the urban ecosystem and enable sustainable ways of life in cities. The relationship between designers' actions and the interdependencies that characterise urban habitats is key to navigating complexity and arriving at effective and sustainable solutions.

## References

- Baratta, A.F.L. (2022), “A new vision of living and living spaces in the RRP (Recovery and Resilience Plan)”, *TECHNE – Journal of Technology for Architecture and Environment*, 24, 20-25, <https://doi.org/10.36253/techne-13435>.
- Bellè, B.M. (2020), “Processi di rigenerazione urbana in edifici pubblici. Il caso dei civic actors in Italia”, *LaborEst*, 20, 43-49, <https://doi.org/10.19254/LaborEst.20.07>

- Bellini, O.E. (2015), *Student housing I. Atlante ragionato della residenza universitaria contemporanea*, Maggioli.
- Bellini, O.E., Bellintani, S., Ciaramella, A., & Del Gatto, M.L. (2015), *Learning and living. Abitare lo Student Housing*, FrancoAngeli, Milano.
- Bologna, R. (2022), “La residenzialità studentesca negli interventi di recupero architettonico e riqualificazione urbana”, *TECHNE: Journal of Technology for Architecture & Environment*, 24.
- Borin, A. (2022), “Temporary Housing Solutions in Extra-urban Contexts”, in *Con-temporary living. Unexpected housing solutions in public spaces* (pp. 306-314), Maggioli.
- Carapella, P. (2018). *Il patrimonio immobiliare della pubblica amministrazione*. Osservatorio CPI, [https://osservatoriocpi.unicatt.it/cpi-Patrimonio\\_immobiliare\\_pa\\_new.pdf](https://osservatoriocpi.unicatt.it/cpi-Patrimonio_immobiliare_pa_new.pdf)
- Collina, L., Galluzzo, L., Mastrantoni, C., & Cinelli, E. (2022), “Sustainable Recovery and Urban Public Transformation of a Former Military Park”, *Beyond All Limits*, pp. 158-163.
- Collina, L., Galluzzo, L., Mastrantoni, C., & Sabatino, P. (2018), *Designing spaces and services. An experimental project for student dormitories: Collective experiences, connected lives and linked places*.
- De Rosa, A. (2022), *S+ S. Spatial Design + Service Design*, Maggioli.
- Fassi, D., Landoni, P., Piredda, F., & Salvadeo, P. (Eds.) (2020), *Universities as Drivers of Social Innovation: Theoretical Overview and Lessons from the “campUS” Research*, Springer International Publishing, <https://doi.org/10.1007/978-3-030-31117-9>.
- Gainsforth, S., & Peverini, M. (2022), “Residenze per studenti tra pubblico e privato”, in *Casa e abitare nel PNRR. Analisi e prospettive* (pp. 33-41), CARITAS Italiana | Servizio Documentazione. [https://archivio.caritas.it/materiali/Italia/qrrp/qrrp\\_num1\\_mar2022.pdf](https://archivio.caritas.it/materiali/Italia/qrrp/qrrp_num1_mar2022.pdf).
- Galluzzo, L. (2022), *Con-temporary living. Unexpected housing solutions in public spaces*, Maggioli.
- Gwosc, C., Hauschildt, K., Wartenbergh-Cras, F., & Schirmer, H. (2021), *Social and Economic Conditions of Student Life in Europe: Eurostudent VII 2018-2021| Synopsis of Indicators*, wbv Media GmbH & Company KG.
- Kadir, S.A., & Jamaludin, M. (2013), “Universal Design as a Significant Component for Sustainable Life and Social Development”, *Procedia – Social and Behavioral Sciences*, 85, 179-190, <https://doi.org/10.1016/j.sbspro.2013.08.349>.
- Manzini, E. (2006), “Design, ethics and sustainability”, *Guidelines for a Transition Phase. University of Art and Design Helsinki (June)*, 9-15.
- Manzini, E., Fuster, A., & Paez, R. (2022), *Plug-Ins: Design for City Making in Barcelona*, Actar Publishers.



- McCormick, K., Anderberg, S., Coenen, L., & Neij, L. (2013), “Advancing sustainable urban transformation”, *Journal of Cleaner Production*, 50, 1-11, <https://doi.org/10.1016/j.jclepro.2013.01.003>.
- MEF (2021), *Rapporto sui beni immobili delle amministrazioni pubbliche – Dati 2018* [Rapporto annuale]. MEF – Direzione VII – Valorizzazione del patrimonio pubblico – del Dipartimento del tesoro.
- Murray, R., Caulier-Grice, J., & Mulgan, G. (2010), *The open book of social innovation* (vol. 24), Nesta, London.
- Postell, J., Borella, M.A., Mangiarotti, R., Scullica, A.F., & Veronese, G. (2022), “Furniture and domestic space as identifiers of time and place”, in *Time-based design paradigms*. FrancoAngeli, Milano.
- Rizzo, A., & Ajroldi, C. (2004), *Abitare nella città moderna: La casa temporanea per studenti: Ideologie, tipologie, aggregazioni*, Grafill.

## **4. L: Space and technology as facilitators of new hybrid learning experiences: the Politecnico di Milano's Innovative Classroom Project**

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### **Abstract**

The future of design teaching is increasingly being faced with new reflections and challenges in the field due to the evolution of users' needs as well as new and updated learning models. Furthermore, the effectiveness of universities is based on the balance of three main essential elements: pedagogy, space, and technology. However, the growing use of new teaching practices necessitates a serious consideration on the design of learning spaces in universities and colleges. Nowadays, existing spaces are generally unsuitable and ineffective in supporting the progress of an educational path based on the comprehensive use of ICTs and digital supports. This lack of appropriate spaces must foster the revision of university environments – classrooms, laboratories, and connective spaces – in terms of flexibility, personalization, and collaboration, creating an envelope designed to support and encourage the different learning practices. This chapter discusses the design and development of four pilot projects for innovative classrooms; four spatial applications to experiment and involve all the users in a participated implementation of the new requirements across all the disciplines of the university (engineering, architecture, and design). They were realized as part of a more extensive innovation programme of the Politecnico di Milano, and they involved different dimensional scales. The space of the innovative classrooms is spreading across the campus through a fluid multi-scalarity that connects interstitial spaces to shared spaces favouring social and active learning approaches through the use of technologies.

The higher education system has undergone numerous changes over the last few decades, many of which have been accelerated by the COVID-19 pandemic. These included moving away from a traditional university learning environment characterized by fixed and predefined infrastructures, and moving towards a new framework of a more flexible space designed according to new user needs.

Consequently, universities, like any other social organisms, have had to implement massive organizational, pedagogical and spatial evolution, shaping themselves according to contextual transformation. According to De Ridder-Symoens (1992), universities have formed the new academic layer, changing the entire structure of society, enriching it, making it increasingly complex, and creating an ever-changing virtuous circle.

What universities are seldom able to transfer to their students today is the ability to deal with the challenges that most work environments present, such as the flexibility to handle multiple issues at once and the ability to develop soft skills and transversal competences (Morrell, 2012). This is often due to the university structure, which is still significantly anchored to the past in many aspects. University training programmes must be able to convey to students a skill set consisting not only of a solid technical and theoretical preparation, but also of a dynamic combination of cognitive and metacognitive, interpersonal, intellectual, and practical skills (Haselberger *et al.*, 2012). Crucial transition towards more personalized, social, open, and dynamic learning models is required, which can be stimulated by the design of innovative spaces (Chatti *et al.*, 2010).

A learning environment is made up of various factors that influence learning (Warger & Dobbin, 2009) in which objectives and design cannot predict everything that happens; some aspects elude control or are, at the very least, unplanned. The environment, then, is a combination of planned and unplanned events, a mix of the intentional and the unintended. Users create positive encounters and “clashes” in order to interact and satisfy their learning needs.

The effectiveness of universities’ innovative learning spaces is determined by the balance of three key elements that can be designed: pedagogy, space, and technology (PST) (Radcliffe *et al.*, 2008). These primary components form a complex organism suitable for the development of fresh, capable, and complete individuals who are able to handle

the challenges of a future society. However, factors such as technological advancement, generational renewal, and new economic systems are urging a faster evolution of today's society. As a result, even today's higher education is becoming increasingly ineffective at its primary task of transferring knowledge to future generations (Zanolin, 2017), necessitates a massive and ongoing update to keep up with the mutable surrounding reality.

It is crucial in the field of university education to keep up with technological innovations that are continually take root in contemporary social structure. The advent of technologies and the birth of the World Wide Web in the last decade of the twentieth century triggered an unprecedented process of change in everyday life. In the context of universities, and education in general, technology has succeeded in providing a series of digital devices for its own use, in addition to expanding the concept of space towards the creation of a virtual environment with endless possibilities of use. To build an effective training offer based on increasingly pervasive Information and Communication Technologies (ICTs), education must be calibrated with the tools provided by ICTs' offer based on increasingly pervasive connectivity (Morrel, 2012).

Classroom environments must engage in connections on multiple levels, creating and encouraging both real and virtual experiences using smart devices and immersive solutions.

## **New learning models**

In recent years, we have experienced the evolution of learning models that can be adapted to new generations of students born and raised in a highly digital environment. In terms of pedagogy, technologies can be identified as a supportive tool for the development and simplification of all the activities that occur between different actors in campus spaces. First, it is necessary to visualize an adaptive curve that has redefined the roles of teacher and students over the last century.

This transition has prompted the creation of new learning models based on the active teaching method, which is defined as *“a method of learning in which students are actively or experientially involved in the learning process and where there are different levels of active learning,*

*depending on student involvement*” (Bonwell & Eison, 1991). The inclusion of this approach, which is much more engaging than a passive model, has shaped the traditional lesson into an educational opportunity based on the sharing of experiences and personal maturation.

Students are guided into a more self-directed path in which they can build technical and logical skills in a variety of circumstances with and without the assistance of others (Milrad *et al.*, 2013). Active learning paradigms, such as participative and cooperative learning, enable the acquisition of knowledge and personal skills through problem-solving, discussion, and cooperation among small groups of individual students, as well as contact with online communities, teachers, and experts. It is feasible to reach a broader and more effective level of maturation and growth by combining more involved activity with the use of increasingly high-performance digital equipment.

Active learning, defined as has been able to alleviate the difficulty of exchanging knowledge between teachers and students by promoting an effective type of learning for the latter that is aimed at a greater implementation of personal skills and communication abilities. The combination of these two types of learning results in a blended model in which the traditional relationship between teaching and learning, as well as the degree of relationship between teacher and student, is challenged by a didactic path that winds through both passive and active knowledge exchange (Maglioni & Biscaro, 2014). This hybridization of the learning system is emerging as a more effective innovation than the passive one at all levels of education (Christensen *et al.*, 2013).

The increasing importance of technology in everyday life has necessitated an essential overhaul of the entire learning system, making it much more dynamic and integrating a significant number of useful tools and virtual layers. This new type of education, which can be collective or individual, is defined by the concept of seamless learning, which is the ability to extend learning across time and space, to access physical and digital worlds, and to use multiple types of devices to integrate different approaches to teaching and learning (Sharples *et al.*, 2014).

Furthermore, a collection of behaviours and human interactions encouraged through the use of technology might initiate a rethinking of the effectiveness of today’s learning systems, thereby delineating a reflection on the shape and usage of places. Similarly, regardless of its intended use, an environment can affect people’s behaviours

(and hence teaching and learning models) that tend to manifest in it (Radcliffe *et al.*, 2009).

New generations of students, born and matured in the digital era, will soon begin an educational journey inside one of the numerous university educational offerings. Future university campus users, who have grown up with smartphones, social media, and virtual worlds, will demand the university experience to resemble the web’s “connected in real time” character. As a result, the future of university education will necessitate a greater emphasis on the figure of the learner, as well as enhanced interactive, immersive, and social activities among users. To address these issues, it is critical to begin rethinking the university environment, attempting to make it more dynamic and adaptable, constantly ready to follow and stimulate students by providing constant access.

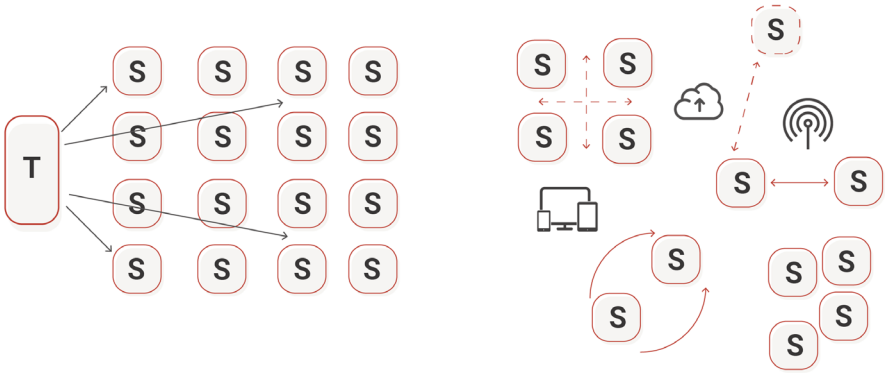


Fig. 1 – A comparison between the previous learning environment and the current needs

These factors are having an impact on the entire structure of learning spaces, which are no longer conceived as a centralizing place for individuals but as a facilitator of sharing and deepening of disciplines: a place for learning that becomes the fulcrum of interaction between students.

The dynamic confluence of space and occupancy as social and spatial practices is used to investigate space and its occupation. Rather than restricting students to a passive experience, we must investigate ways to fully involve them in learning activities.

## New models of learning spaces

With the rise of education that is mostly based on the development of group projects, the demand for larger, hybrid, and flexible environments that allow for active and collaborative learning becomes apparent. Conventional classrooms and libraries are no longer able to sustain new teaching approaches due to architectural constraints imposed by the previous historical context.

All the spaces designed for other kinds of functions – such as cafeterias, bars, and green areas, as well as all the connective and transit fabric – appear to be more equipped to intercepting the changes imposed by innovative technology learning resources.

Currently, most of the time spent studying and learning takes place outside the classroom, in informal external places where new modes of cooperation are possible, due to both tech devices and the consequent redesign of the classical concept of space.

It's remarkable to see how the huge growth in hybrid space users, a result of the novel idea of activity-based working (ABW), is made possible by computers and tablets. This function is evolving as a nomadic type of activity that does not require traditional spaces designed for a specific activity, but rather hybrid environments that provide individual spaces and shared infrastructures to which all users have quick and easy access. In the activity-based context, the single user chooses the best position to work from based on his/her needs and requirements: the space is subordinated to the activity because it can potentially be applied everywhere.

University campuses are no longer conceived as a series of “educational” buildings, but as a holistic collection of spaces, each having the potential to contribute to the educational impact. They must be defined as *“a complete network of connected learning environments [...] where the learning process does not exist individually but takes place within a range of different types of pedagogy, spaces and technologies”* (Radcliffe, 2008).

University campuses are complex organisms with poorly defined interstitial regions between learning and connection spaces. All circulation areas, both inside and outside buildings, must be redesigned to maximize their inherent potential. The construction of corridors equipped for both individual and teamwork can be part of a



strategy aimed at establishing a continuous network of information exchange: the design of these spaces can generate different activities enhancing social relationships. *“Learning happens everywhere, not only in classrooms and libraries, but in corridors, social structures and walkways, courtyards and squares between buildings. Even the academic space as an end in itself is disappearing. There is still room for traditional classrooms, but they too can be remodelled to meet other needs”* (Chatterton, 2000).

The informal space establishes a different relationship between students, and between students and teachers, resulting in a different interaction than that established within a formal educational space. The relevance of students learning together in a collaborative way is often underestimated (Bickford & Wright, 2006), disregarding how much the context can influence interpersonal interactions. The (forced or self-imposed) norms that students and teachers must follow in the formal environment tend to decrease in the informal space, enhancing synergies that boost learning potential.

This concept of being free of regulations is related to the “third place” idea proposed by Oldenburg and Brissett (1982), which is *“a public setting accessible to its inhabitants and approached as their own”* (Hunter & Cox, 2014).

Furthermore, in a community where internet interactions naturally homogenize connections, the informal space encourages unplanned and unexpected contacts, which are essential for democracy and personal growth.

Bennett (2007) identifies other criteria for successful learning environments, including the ability to distinguish between socializing and studying; to enable choice and flexibility in uses; to allow for territorial claims; and to build a sense of community. As a result, the physical qualities of the informal study areas are crucial.

All parts of a campus must become more appealing and provide opportunities to make full and personal use of the available spaces.

These areas must be more equipped, more pleasant, and more productive. It will be crucial to provide the campus with the resources required to animate all the interstitial spaces, thereby establishing small- and medium-sized workstations.

Informal spaces also have other positive consequences on the university system, such as improving students’ sense of belonging to the institution through the experience of space (Morieson *et al.*, 2018).

An important benefit is the rise in reputation because of physical evidence provided by tangible parts of the learning experience, through the impression generated by the space. Enache (2011), quoting Ivy (2008), alludes to the 7 P's of educational marketing (product, price, placement, promotion, people, process and physical evidence). The last, physical evidence, considers all the tangible features of the place that represent the quality of the services that can be physically experienced, as well as all the physical evidence that contributes to making a positive impression on the user. It is accountable for the tangible meaning of the educational product and the reputation of an institution because it is the strategy that has the greatest impact on the sensory aspects of the space.

A pleasant learning environment must therefore be created through the active occupation of the space and the furniture. Users are deeply engaged in the creation of learning environments since learning is a social activity. Interior design, furniture, colours, signs, and social conventions all contribute to the construction of such environments that designers conceive and build, but users actively use, to create the diverse situations in which informal learning occurs (Cox, 2018).

Informal learning spaces become fundamental in this scenario for creating collaborative learning methodologies. Through conversation, engagement, and collaboration, students can create a pleasant atmosphere in which to expand their knowledge and strengthen their community (Jamieson, 2003). Informal spaces, such as learning corridors, must be built in tandem with formal learning spaces, such as classrooms. The collaboration of these two types of spaces can result in complex and resilient learning environments that can fulfil each institution's goal of facilitating the student (Oblinger, 2005). The formal classroom extends outside its walls, not only through technology, but also through the design and furnishings that create comfortable and productive informal places.

## **Learning spaces and technology**

While technology integration has long been a major topic in education, the convergence with the quickly changing educational landscape is shaping education in deep, new ways, according to Groff

(2014). Emerging technologies are forcing a rethinking of teaching and learning, as well as acting as catalysts for transformation and innovation.

When we look at the intersection of pedagogy, space, and technology, we see what is known as “Next Generation Learning Spaces” (NGLS) or “Future Learning Spaces” (FLS), where the three elements create the conditions for social, collaborative, and active learning, and where the use of digital and technological tools (as a support for the various activities) can allow the creation of different creative places within the same space (Lippman, 2013).

The relationship between the space itself and the activity carried out by teachers and students through the use of technology must be considered while designing an innovative and technology-enriched learning space.

Technology may help users in facilitating learning dynamics; improving space comfort (for example, through sensors that enhance the quality of sound, light, and perceived temperature); extending space limits (for example, using immersive technologies that create virtual environments); and maximizing space usage (through the right devices for the requested task to exploit the areas in the desired ways).

Space can assist technology users in enabling convergence between various systems, discovering new applications, developing new kinds of interaction, and improving the “state of the art” of a technological tool.

We are evolving towards a more mixed, blended, virtual and real educational environments that are also more interactive, because the experiential dimension provided by person-to-person and person-to-machine interaction often makes multimedia learning environments effective.

One of the most difficult issues when employing technology to help education in a learning setting is users’ ability to approach technological devices naturally and without any psychological barriers.

If we consider every one of the components, the future technology-enhanced learning space should allow for many techniques and uses, limited only by user imagination (architecture, furniture, and technology). The spaces must include “casual” and supportive technology that is not physically intrusive and does not obstruct the regular flow of creative work.

The affordance concept developed by Gibson (1977) and Norman (1988) is applied here. The affordances method is ideal for a technological learning environment because it focuses on the interplay between information and communication technology infrastructure and people's usage of those technologies (Conole, 2004). The interaction between individuals and technology, as well as their creative and varied collaboration with the learning environment, is prioritized over any consistent reaction to any specific elements of that space.

The educational space should then be designed in a way that the presence of devices is completely integrated with it, so that students, when engaged in using the available technological tool to interact with teachers' contents or requests, are able to operate and communicate their intentions and results naturally and without difficulty. All technology instruments and equipment are merged with the traditional space in the best possible design of learning settings, creating the circumstances for open and unrestricted interaction between teacher and students and between students and peers.

As a result, we can confirm that in an evolved setting, the digital and analogical worlds must collide to create new methodologies. An educational system does not refer to a enforced technological field (technology as an end in itself), but rather to one in which technology is one of the elements that contribute to the development of positive learning dynamics.

The learning environment connects the material and immaterial aspects of identity construction, enabling critical and constructive learning through debate and engagement (Wheeler, 2009).

As a result, technology must be explained in connection with its application (space) and the activity that employs it (pedagogy). As stated before, Radcliffe (2009) created the PST framework, which connects pedagogy, environment, and technology. It extends Oblinger's research by providing a model that integrates technology, space, and pedagogy.

It is a question-driven inquiry process that empowers a wide variety of potential stakeholders to analyze and holistically consider the pedagogical, technological, and physical aspects of teaching and learning spaces and their interactions. The innovation properties (Manciaracina, 2019) associated with the three framework elements were considered for the research effort that is the focus of this study.

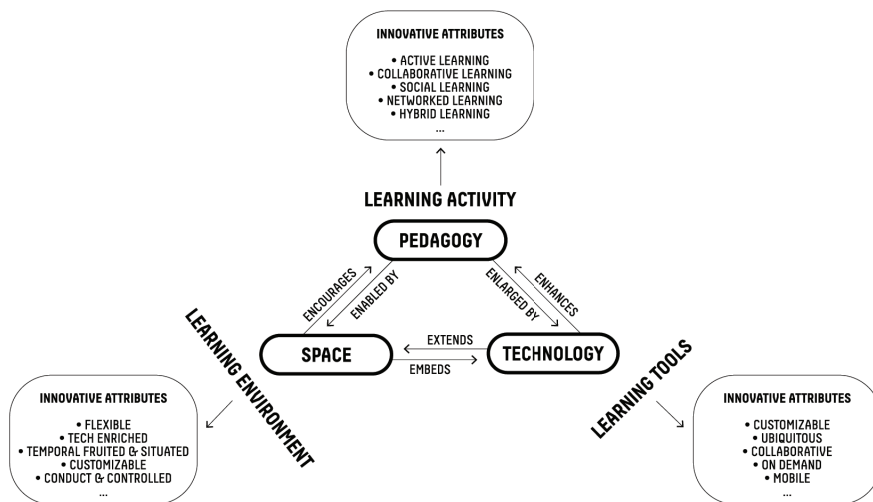


Fig. 2 – PST Framework, edited from Radcliffe et al., 2009

The implementation of technology must be guided by an evaluation of the kinds of activities and people using the space. On the one hand, it is critical to explore the types of interactions that occur between students and educators; on the other, it is necessary to assess the influence that technology can have on the relationship system, both offline and online.

Two key didactic actions can be identified.

First, a teacher-led activity that may be defined using four distinct poles:

- conventional (frontal) didactic activity in which the professor disseminates knowledge to students;
- collaborative pedagogic activity in which the teacher includes students in knowledge-building;
- offline technology;
- online technology.

Second, students engaged in an activity that may be defined using four different poles:

- action in which students exhibit the results to teachers and peers, or only to peers;
- collaborative activity in which students work together to develop knowledge;

- offline technology;
- online technology.

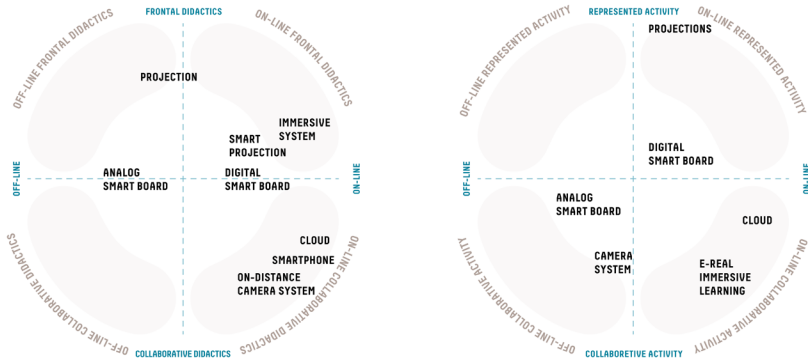
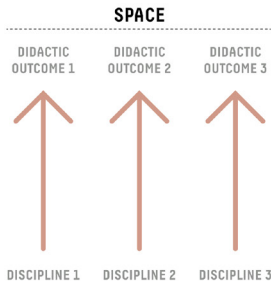


Fig. 3 – Diagram of the technologies dealing with the space and the people’s actions

The technology employed in educational environments must thus migrate from a vertical technology, designed to satisfy the demands of teachers in a limited setting, to a horizontal technology, designed to suit students’ personal needs across different physical contexts (Fig. 4) (Stroup & Petrosino, 2003). Students can employ technology to design their own personal way of creating knowledge and learning outcomes to achieve the intended learning objectives.

**TEACHER**  
VERTICAL USE OF TECHNOLOGY



**STUDENT**  
HORIZONTAL USE OF TECHNOLOGY

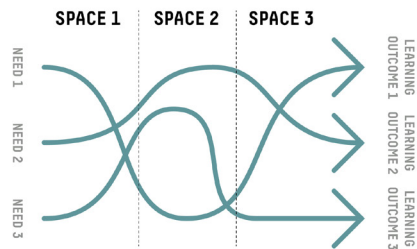


Fig. 4 – Vertical and horizontal uses of technology



## The case study of the Politecnico di Milano

Throughout the design process, it is critical to begin rethinking higher education facilities with practical prototype experience. A significant challenge has evolved from the Politecnico di Milano's current and future intentions, outlining a general programme with these key aims over three years (2018-2021) to answer new contemporary demands on the issue by building various prototypes of innovative university classrooms. It is an in-depth review of its spaces to better understand the needs of all university users and to anticipate new situations that might support developing teaching and educational approaches.

A research team from the Politecnico di Milano has been tasked with defining a set of requirements and needs for the overall organization of the innovative teaching and learning spaces to achieve these goals (Collina *et al.*, 2019). The team has been asked to give an overview on spatial demands, potentialities, new habits, and applications, as well as arranging all spatial requirements into guidelines that will be applied first to the 4 classroom prototypes and then disseminated for large-scale implementation. These are four experimental spatial applications involving all users in a participatory process defining new criteria, including all the university disciplines that are taught at the Politecnico di Milano (engineering, architecture, and design).

Rethinking educational environments requires being aware of changing needs, trends, and other elements that influence how students interact with the university environment. The goal of the research was to analyze these new needs from the standpoint of spatial and service requirements, while considering new habits and educational approaches that all stakeholders face in these spaces. To achieve this objective, the Rector has asked the research team to provide guidelines for the development of classrooms dedicated to innovative teaching. As it has been determined to adopt a user-centred strategy, categories of study participants have been created to incorporate them in the research process (Fig. 5).

They can be classified into four categories:

- internal actors with experience in teaching activities;
- internal actors with experience in innovative teaching;

- internal actors responsible for the maintenance of teaching spaces; and
- external actors with expertise in technology relevant to the context

As previously indicated, the project focuses on the development of four distinct learning environments in three main disciplinary contexts. The primary step was to analyze the various styles of teaching in schools in order to find macro-areas of intervention on space (i.e., the disciplines of design and architecture require a more similar distribution and type of instrumentation than engineering). To gather as much information as possible, the research team analyzed numerous learning behaviours implemented in several fields with the assistance of teaching professionals.

The second step was the acquisition of the state of the art of the research, also through the evaluation of case studies of contemporary campus projects; the definition of requirements for the design of innovative teaching activities, with reference to the most advanced learning tools; the development of specific guidelines for use and dissemination within educational environments; the implementation of strategic partnerships with the educational sector and industry for relevant social intervention.

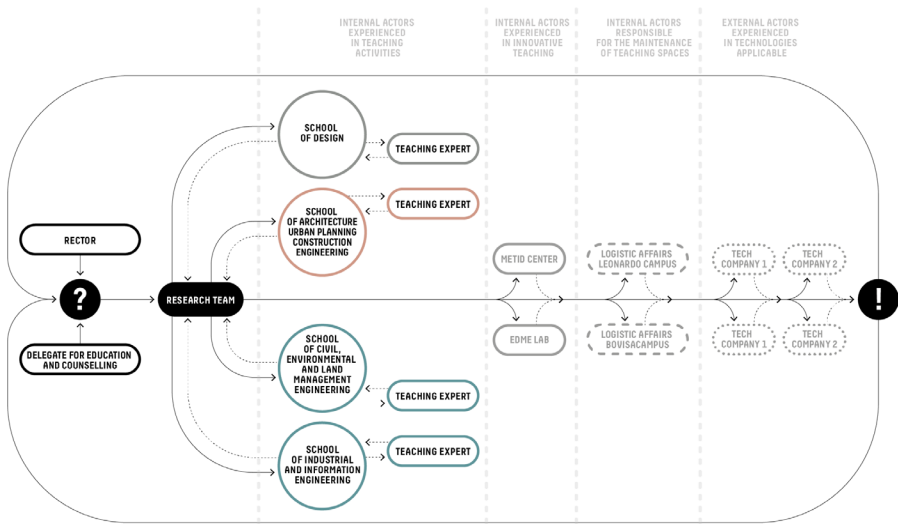


Fig. 5 – Map of the actors involved in the research process

A next step was to meet the centres already present in Politecnico di Milano spaces that are working with didactic interaction developed by employing technological innovations, which: the METID centre, which has set up a room specially designed to test the use of technology in innovative teaching; and the interdepartmental laboratory EDME (Environmental Design and Multisensory Experience), which provides a physical space to develop and undergo digital, multimedia and multi-sensory worlds.

Through these two experiments, it was possible to deal with new learning technologies such as large-scale digital smartboards and analogue smartboards capable of sharing written information in the cloud, or immersive digital theatres where the user can create a teaching experience inside a specially created virtual set that transforms a room's walls into touch and interactive surfaces.

After gathering information to better analyze the context, the logistical offices in charge of maintenance were involved in deciding on the sorts of intervention appropriate to the spaces in terms of proportion, light and sound management, position in relation to access flows, and connection spaces. Meanwhile, technological equipment was

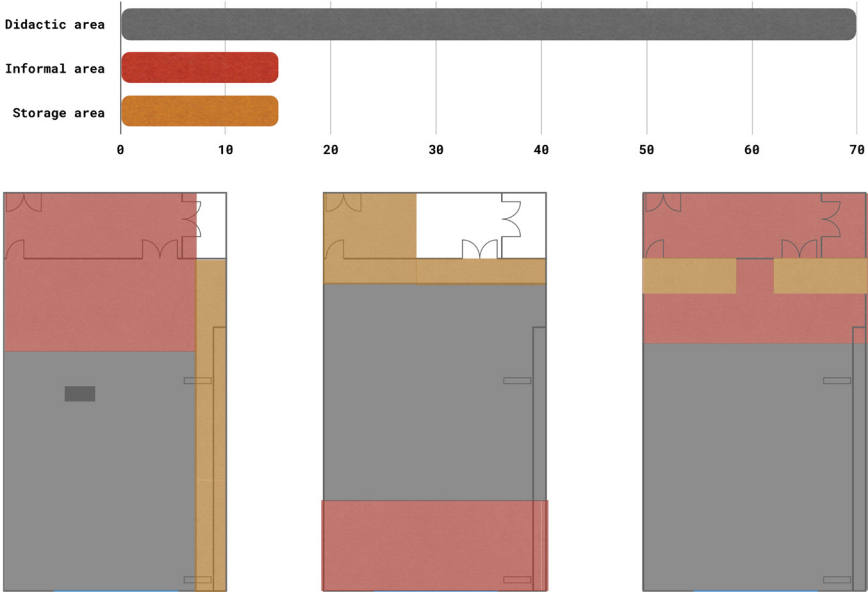


Fig. 6 – Configuration element and sample of application

investigated to enhance active learning behaviours and allow instructional activities dedicated to smart information interchange and online dialogues between students and remote lecturers. The approach concluded with a dedicated meeting to relate the research conducted to recalibrate the interventions and reformulate research and design suggestions for future activities.

## Grammar of Directions (GoD)

Starting with the prior considerations, a common language has been defined to organize all the elements identified. A grammar of directions (GoD) has been created to define a common basis for the emerging disciplines' spaces as well as to validate the forms of intervention required to raise the space to an innovative and flexible state. A system has been adopted to interweave the different spatial components with the possible degrees of intervention to allow the development of a basal matrix that may be updated with possible optimization interventions for the different disciplines' peculiar activities. The intended environment must be flexible enough to support various forms of teaching and, as a result, be ready to change itself as needed.

| <b>GRAMMAR RULES</b>      | <b>BUILDING</b>  | <b>FURNITURE</b>   | <b>TECHNOLOGY</b>   |
|---------------------------|--|--|---|
| <b>BASE LEVEL</b>         | <ul style="list-style-type: none"> <li>• ACCESSIBILITY</li> <li>• LIGHTING</li> <li>• DARKENING</li> <li>• ACOUSTICS</li> <li>• ENVIRONMENTAL COMFORT</li> </ul> | <ul style="list-style-type: none"> <li>• FURNITURE ACCORDING TO THE NORM</li> <li>• SOCKETS</li> </ul>   | <ul style="list-style-type: none"> <li>• WIFI</li> <li>• PROJECTION</li> <li>• SOUND SYSTEM</li> <li>• WIRING</li> </ul>  |
| <b>INTERMEDIATE LEVEL</b> | <ul style="list-style-type: none"> <li>• FLOATING FLOOR</li> <li>• ELECTRICAL SYSTEM</li> <li>• SOUND-ABSORBING PANELS</li> </ul>                                | <ul style="list-style-type: none"> <li>• MODULAR FURNITURE</li> <li>• WRITABLE WALLS</li> <li>• MOVABLE SOCKETS</li> </ul>                     | <ul style="list-style-type: none"> <li>• VIDEO SYSTEM</li> <li>• ADJUSTABLE SOUND SYSTEM</li> <li>• MULTI PROJECTION</li> <li>• SMART BOARD</li> <li>• CLOUD + WI-FI</li> </ul> |
| <b>ADVANCED LEVEL</b>     | <ul style="list-style-type: none"> <li>• FLEXIBLE STORAGE SPACE</li> <li>• WALLS EQUIPPED FOR DISPLAY</li> <li>• MOVABLE WALLS</li> </ul>                        | <ul style="list-style-type: none"> <li>• TRANSFORMABLE FURNITURE</li> <li>• FOLDING FURNITURE</li> <li>• INDUCTION/WIRELESS SOCKETS</li> </ul> | <ul style="list-style-type: none"> <li>• IMMERSIVE CLASSROOM</li> <li>• DISTANCE COMMUNICATION TECHNOLOGY</li> <li>• CAMCORDERS</li> <li>• VIDEO MAPPING PROJECTON</li> </ul>   |

Fig. 7 – Grammar of Directions scheme

To identify the forms of intervention required, three sets of physical and virtual features and components with significantly different impacts were identified:

- **Building:** The framework of the space is made up of systems and surfaces that will better support any activity that will take place in the classroom.
- **Furniture:** Flexible furnishing components that allow for fast changes of the layout based on teaching needs.
- **Technology:** Anything related to the virtual appearance and digital devices used to enhance the teaching experience.

The three groups comprise all the supporting components required for an effective teaching path. However, since the space must accommodate different kinds of activities in addition to the conventional ones, changes must be made through implementation and installation of resources. Three intervention phases have been identified to raise the physical space of the teaching from a basic conformation to a more sophisticated level:

- **Base:** the starting point that incorporates all the elements required to ensure fundamental support for the delivery of a traditional lesson, such as moments of exchange between professor and students (lectures, feedback sessions, seminars), as well as peer-to-peer activities to be performed in groups. The furniture must be chosen in accordance with the regulations, and the system must allow for soundproofing, classroom darkening, and a digital apparatus adequate for providing the simple execution of audio/visual material as well as a high-performance wi-fi connection.
- **Intermediate:** all the changes made to the class are performative, offering a greater degree of flexibility to allow a quick reconfiguration of the classroom. The furniture, which is moveable, modular, and writeable, is supported by a more flexible technology baggage, which includes smart boards, cloud platforms, and multi projections.
- **Advanced:** to diversify a single space depending on the special needs of each course, an even greater degree of optimization and improvement is required. To enable the execution of some extra activities, it is necessary to consider a flexible storage system to store the furniture in order to entirely free up the environment, as well as a system of moveable walls to expand the space.

The furniture must be comfortable but foldable in order to be quickly moved and stowed, while the digital equipment must allow for a high level of immersion through the installation of multi-cameras capable of changing the perception of the classroom and enhancing the learning experience. The use of this grammar, which arises from the basic needs related to the behaviours found in the learning spaces, is useful for planning a laboratory environment that can be implemented gradually. Understanding the common needs and the individual requirements helps to establish a hierarchy of interventions to be planned immediately to prevent the space becoming unable to support the teaching of the present and the future.

## **Relationship between classrooms – the elements**

The research allowed for the creation of schemes that favour the choice of elements according to the educational experience chosen, implementing the experience and the action to be carried out with the characteristics useful for this result. Through the diagrams, the relationship between space and technology is described in more detail, analyzing the types of activities and actors using the space.

To demonstrate how this diagram may be used to generate new scenarios, three options for space arrangement will be provided, and each follows the previous phases of the guidelines.

A – Virtual frontal didactic: a frontal type that permits 360-degree use, with two opposing projected walls that allow you to keep a position that stimulates cooperation in periods of active learning and sharing with colleagues. Frontal instruction is also virtual in this instance, and due to the established supports, it is possible to attend a session held at the same time in a class abroad. It is also feasible to see how the informal area outside the classroom encourages the use of space for actions and user engagement.

B – Classroom activities: In this scenario, the furnishings stimulate interaction and allow for fast reconfiguration of the classroom to facilitate cooperation. Moving dividers in the support storage area allow for the preparation of tools for group work in open space. The surrounding walls can all be used for sketching and/or collaborating.



C – Collaboration activities: A part of the classroom has been created to allow full participation in the work review activity, even from a distance. A camera is put above the table to display the material that has been laid out, while a second camera can show the faces of the individuals around the table. The interlocutors may be seen from a distance on the other wall.

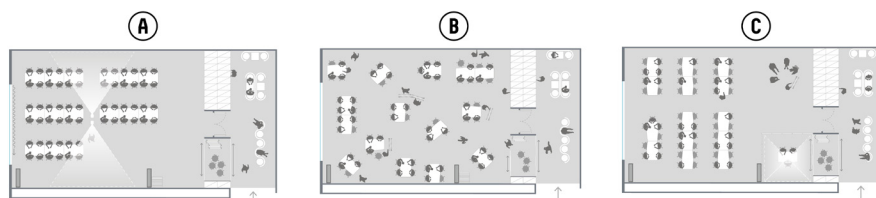


Fig. 8 – Drawings showing three possibilities of configuration of the space

This method of intervention was chosen to generate and accentuate the types of interactions that might occur between learners and their teachers in hybrid and connected environments. The informal configuration of space, as well as its status as a link place between the spheres of learning and leisure, encourages interaction between users with radically different roles, democratizing the student-teacher relationship. The space can be utilized to carry out all the revision or explanation activities that exist in the teacher-student relationship but struggle to materialize in a defined place.

The innovative classrooms realized and visible in the picture (Fig. 9) held the necessary flexibility requirements to allow the application of active pedagogies. Variations have been made in the type and position of the elements, in relation to the subject area in which they are ‘dropped’ while maintaining a sufficient degree of transversality to allow all users to use them profitably. In all cases, great emphasis was



Fig. 9 – Politecnico’s innovative classroom

placed on aspects such as visual and acoustic comfort, ease in the classroom setting, and the provision of surfaces for collaborative learning.

## **Student-student relationship in informal spaces – interdisciplinary content**

The informal environment is typically utilized by students for both studying and destressing, in addition to offering an excellent location for dialogue between lecturer and student(s). University campus connection areas are rapidly developing as venues for continuous contact among students who find themselves in groups to conduct both academic and informal activities. Interactions between user groups might benefit people by fostering the interchange of theoretical knowledge and methodological skills. These informal spaces comprise a wide range of non-conventional venues (such as cafeterias or student residences) where information is transferred via the study and cooperation of students based on cooperative learning (Neuman, 2013).

If outfitted with a variety of furniture and technology, the informal and connecting spaces may be turned into true multidisciplinary places where students can engage in an assortment of activities. The informal area must, in reality, provide suitable furnishings for the different activities to be carried out: seats, armchairs, pods, electrical plugs, tables, whiteboards, and others must be flexible and practical, allowing for quick reconfiguration of the space.



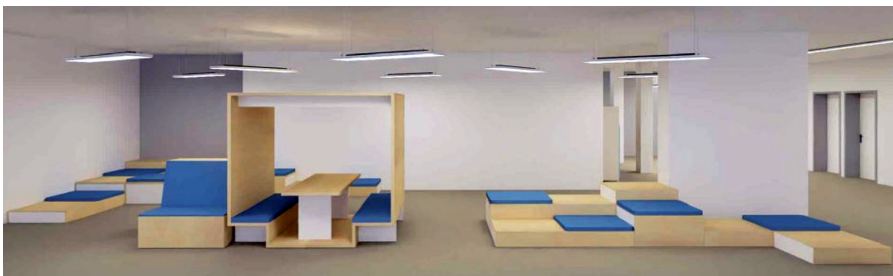
*Fig. 10 – Contemporary presence of the didactic and informal area*



*Fig. 11 – Scenario of different activities in the same location*

The process of designing informal spaces began with mapping out potential areas of intervention on the Politecnico campuses in Milan, which allowed for the identification of three major categories of in-between spaces close to classrooms that were only used as transit areas: dead-end corridors, linear corridors, and squares.

The following phase was to develop a list of modular solutions that might suit the users' various needs: solitary study, group work, and social interchange. In terms of seating, three macro-categories have been identified: tiered seats, pods, and benches. After that, a grid was built to connect spaces, functions, and solutions in order to provide three design concepts for the Leonardo, La Masa, and Durando campuses (Fig. 12). The Leonardo area is designed as a dead-end hallway where the tiered seating arrangement was installed. Because it



*Fig. 12 – The elements that define the space on the Durando Campus*

is not a tunnel, it was feasible to design a space with cabled steps that could, if required, become an appendix of the classroom, confronting a flexible display system for displaying the students' projects (Fig. 13).



*Fig. 13 – Before and after the installation of the informal space on the Leonardo Campus*

A modular system was evaluated and its adaptation to varied contexts was authorized in the La Masa and Durando Campus concept. In the first scenario, along a linear corridor with a central spine where plant cabinets alternate with underutilized regions where the various modules have been put, provides a common area with steps and places for group work (Figs. 14, 15). Individual study pods are positioned on the opposite wall of the central spine.

Instead, on the Durando campus, a plaza was chosen, which has been turned into an articulated landscape of the various module types owing to the placement of the modules. The idea was enhanced with wall features such as analogue blackboards and monitors that students may connect to their devices in order to showcase their work. All of the areas include electrical and data outlets, as well as wi-fi, to facilitate cooperation, even with students from different campuses or abroad on exchange, as in the case of Erasmus programmes.

Because of the coordinated image research in connection with the innovative classrooms project, the materials employed have a formal aesthetic value, making the spaces instantly recognized, even if they are distributed throughout the many campuses. Students recognize the environment as a location for informal learning, resulting in distinctive

visual meanings. In Leonardo's platform, wood is coated with linoleum and blended with light blue-grey pieces that are the same colours as the classrooms, forming a sound-absorbing feature to improve the acoustics and comfort of the spaces.

The lights are renewed to offer diffuse lighting using the same language – the linear one – but scaled down to fit the space in which it is placed. The pods, on the other hand, have their own illumination to ensure an adequate level of illumination.

Particular attention is paid to the acoustic aspect in the spaces of La Masa and Durando, which are located in core portions of the campus, with comfort ensured by the installation of sound-absorbing slats or hanging panels.

The pieces that comprise the learning corridors may be utilized freely, providing for greater flexibility and an increased impression of informal space.

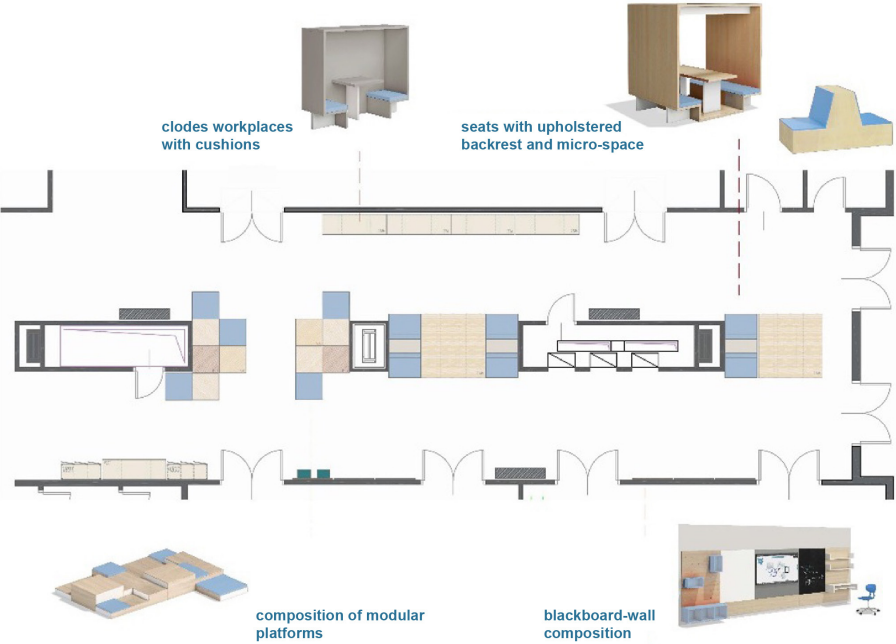


Fig. 14 – The layout of the abacus elements inserted in the La Masa Campus



*Fig. 15 – Before and after installing the informal space in the La Masa Campus*



*Fig. 16 – The informal learning space in the Durando Campus*

## **Conclusions**

The experimentation currently underway at the Politecnico di Milano aims to be the first step in validating the various levels of integration between space and technology, analogical and digital tools, didactics in presence, and virtual collaboration, analyzing the possible interactions, interpenetration, and overlap between different methods and tools for teaching in order to achieve a consolidated and regulated omnichannel approach.

The new classrooms and learning corridors are a prototype that will be evaluated during the coming academic years in order to more deeply and better understand the potentialities of the numerous solutions that may be implemented. These solutions, depending on



the type of teaching and learning activities used in the educational journey, will provide a more flexible and inventive approach to didactics. Monitoring the behaviours and uses of the many players engaged will allow us to determine which solutions may be better adopted in the future, indicating which type to implement in order to respond to changing needs.

The results collected thus far demonstrate how it is feasible to envision an evolution of the teaching environment in which analogical and digital, physical and intangible features contribute to the improvement of interactions between the many players participating in the teaching process.

The concept of education is being expanded as an act that can occur anywhere and at any time (Oblinger & Oblinger, 2005), and new learning dynamics lead to the definition of spaces intended for formal learning, such as classrooms or laboratories, for a planned didactic conveyed through the traditional teacher's lesson. Informal spaces, on the other hand, include a broad spectrum of locations where information is exchanged via the study and collaboration of students or researchers.

These locations are positioned in “the space between”, or in places with a high degree of architectural flexibility, allowing the discovery of new environments dedicated to group study and acting as a filter between the many roles on campus.

The anticipated outcomes seek to reimagine the spatial model that may support the learning environment within this continuous mechanism of interaction between people and place, in order to develop new forms of engagement, cooperation, and multidisciplinary for the campus's future growth.

The development of group project-based education highlights the need for diffuse, hybrid, and adaptive settings that promote active and collaborative learning. Traditional classrooms are no longer sufficient to meet current teaching approaches. As a result, university campuses should not be considered as a series of instructional structures or units, but rather as an integrated synthesis of environments that may all contribute to educational value. They should be defined as a full network of interconnected learning environments in which learning takes place across a range of pedagogies, places, and technology rather than in isolation.

Additionally, the most time is spent studying, and learning occurs in informal areas outside of the classroom, where new kinds of cooperation might emerge.

The hybridization with other service functions targeted at enhancing and promoting the use of informal spaces, such as break places, books and materials sharing, and so on, will be examined in the holistic vision of future applications. Canteens, cafeterias, and green spaces, for example, appear to be more adapted to welcome the changes brought about by new learning needs and the new technology devices used by the next generation of students. Only in this manner will it be feasible to establish inviting areas not only within a certain building but throughout the campus.

## References

- Bennett, S.E. (2007), “First Questions for Designing Higher Education Learning Spaces”, *The Journal of Academic Librarianship*, 33(1), 14-26.
- Bickford, D.J., & Wright, D.J. (2006), “Community: The Hidden Context for Learning”, in D.G. Oblinger (Ed.), *Learning Spaces*, Educause.
- Bonwell, C.C., & Eison, J.A. (1991), “Active Learning: Creating Excitement in the Classroom”, *ASHE-ERIC Higher Education Reports*.
- Chatterton, P. (2000), “The Cultural Role of Universities in the Community: Revisiting the University – Community Debate”, *Environment and Planning A*, 32(1), 165-181.
- Chatti, M.A., Jarke, M., Agustiarwan, M.R., & Specht, M. (2010), “Toward a Personal Learning Environment Framework”, *International Journal of Virtual and Personal Learning Environments*, 1(4), 66-85.
- Christensen, C.M., Horn, M.S., & Staker, H. (2013), “Is K-12 Blended Learning Disruptive? An Introduction to the Theory of Hybrids”, *Clayton Christensen Institute for Disruptive Innovation*.
- Collina, L., Gerosa, G., Manciaracina, A., Mazzarello, M., & Vergani, F. (2019a), “Designing innovative learning experiences. an experimental project to support education facilities”, in *INTED2019 Proceedings*, 1, 6620-6629.
- Conole, G., & Dyke, M. (2004), “What are the affordances of information and communication technologies?”, *Research in Learning Technology*, 12(2).
- Cox, A. (2018), “Space and embodiment in informal learning”, *Higher Education*, 75(6), 1077-1090.

- Enache, I.C. (2011), Marketing higher education using the 7 PS framework, *Bulletin of the Transilvania University of Brasov. Series V : Economic Sciences*, 1, 23-30.
- Gibson, J.J. (1977), "The theory of Affordances", in R. Shaw & J. Bransford (Eds.), *Perceiving, acting, and knowing. Toward an ecological psychology* (pp. 67-82), Lawrence Erlbaum Associates, Hillsdale, NJ.
- Groff, J. (2014), "Technology-rich innovative learning environments", *OECD Working Paper*. Retrieved from [www.oecd.org/education/ceri/Technology-Rich%20Innovative%20Learning%20Environments%20by%20Jennifer%20Groff.pdf](http://www.oecd.org/education/ceri/Technology-Rich%20Innovative%20Learning%20Environments%20by%20Jennifer%20Groff.pdf).
- Haselberger, D., Oberhumer, P., Perez, E., Cinque, M., & Capasso, F. (2012), *Mediating Soft Skills at Higher Education Institutions – Guidelines for the design of learning situations supporting soft skills achievement, Version 1.0, Education and Culture DG Lifelong Learning Programme, European Union, EU Lifelong Learning Programme; ModEs*. Retrieved December 23, 2018, from [www.euca.eu/en/prs/modes-handbook.aspx](http://www.euca.eu/en/prs/modes-handbook.aspx).
- Hunter, J., & Cox, A. (2014), "Learning over tea! Studying in informal learning spaces", *New Library World*, 115(1/2), 34-50.
- Ivy, J.W. (2008), "A new higher education marketing mix: the 7Ps for MBA marketing", *International Journal of Educational Management*, 22(4), 288-299.
- Jamieson, P. (2003), "Designing more effective on-campus teaching and learning spaces: a role for academic developers", *International Journal for Academic Development*, 8(1-2), 119-133.
- Lippman, P.C., (2013), "Designing collaborative spaces for schools: Part 3", *The Journal*. Retrieved from <http://thejournal.com/articles/2013/02/13/designing-collaborative-spaces-for-schools.aspx>.
- Maglioni, M., & Biscaro, F. (2014), *La classe capovolta. Innovare la didattica con il flipped classroom*, Erickson, Trento, Italia.
- Manciaracina, A.G. (2019), "Relation among pedagogy, space, technology and users. An implementation of Radcliffe' s PST framework", in *Proceedings of EDULEARN19 Conference* (pp. 3067-3073).
- Milrad, M., Wong, L.-H., Sharples, M., Hwang, G.-J., Looi, C.-K., Ogata, H. (2013), "Seamless Learning: An International Perspective on Next Generation Technology Enhanced Learning", Book chapter in Z.L. Berge & L.Y. Muilenburg (Eds.), *Handbook of Mobile Learning*, Routledge, New York, pp. 95-108.
- Morieson, L., Murray, G.M., Wilson, R., Clarke, B., & Lukas, K. (2018), "Belonging in Space: Informal Learning Spaces and the Student Experience", *Journal of Learning Spaces*, 7(2), 1-11, <https://files.eric.ed.gov/fulltext/EJ1200615.pdf>.

- Morrell, M. (2012), *Campus of the future*. Arup Foresight. Retrieved December 20, 2018, from [www.driversofchange.com/projects/campus-of-the-future-2018/](http://www.driversofchange.com/projects/campus-of-the-future-2018/).
- Neuman, D.J. (2013), "Building type basics for college and university facilities" (vol. 22), John Wiley & Sons.
- Norman, D. (1988), *The Psychology of Everyday Things. Technology and Culture*, Basic Books, New York.
- Oblinger, D. (2005), "Leading the transition from classrooms to learning spaces", *Educause quarterly*, 28(1), 14-18.
- Oblinger, D.G., & Oblinger, J.L. (Eds.). (2005), *Educating the Net Generation*, Educause.
- Oldenburg, R., & Brissett, D. (1982), "The third place", *Qualitative Sociology*, 5(4), 265-284.
- Radcliffe, D., Wilson, H., Powell, D., & Tibbetts, B. (2008), "Designing next generation places of learning: Collaboration at the pedagogy-space-technology nexus", *The University of Queensland*, 1–20. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.215.788&rep=rep1&type=pdf>.
- Radcliffe, D., Wilson, H., Powell, D., & Tibbetts, B. (Eds.). (2009), "Learning spaces in higher education: positive outcomes by design", in *Proceedings of the Next Generation Learning Spaces 2008 Colloquium University of Queensland, Brisbane*, The Contributors, St Lucia QLD.
- Ridder-Symoens, H., De Ridder-Symoens, H., & Rüegg, W. (1992), *A History of the University in Europe: Volume 1, Universities in the Middle Ages*, Cambridge University Press.
- Sharples, M., Adams, A., Ferguson, R., Gaved, M., McAndrew, P., Rienties, B., Weller, M., & Whitelock, D. (2014), *Innovating Pedagogy 2014: Exploring new forms of teaching, learning and assessment, to guide educators and policy makers*, The Open University.
- Schön, D.A. (1995), "Knowing-In-Action: The New Scholarship Requires a New Epistemology", *Change: The Magazine of Higher Learning*, 27(6), 27-34.
- Warger, T., Dobbin, G. (2009), "Learning Environments: Where Space, Technology, and Culture Converge", *Educ. Learn. Initiat. Pap.*, n. October, pp. 1-14.
- Stroup, W.M., & Petrosino, A.J. (2003), "An analysis of horizontal and vertical device design for school- related teaching and learning", *Education, Communication & Information*, 3(3), 327-345.
- Wheeler, S. (2009), "Learning Space Mashups: Combining Web 2.0 Tools to Create Collaborative and Reflective Learning Spaces", *Future Internet*, 1(1), 3-13.

Zanolin, G. (2017), “Orientarsi nel tempo e nello spazio: la geografia localizzativa dalle conoscenze alla competenza”, in G. Zanolin, R. De Lucia, T. Gilardi (Eds.), *Geo-didattiche per il futuro. la geografia alla prova delle competenze*, pp 85-94, FrancoAngeli.

## 5. XL: Metadesign for the Relocation of Università degli Studi di Milano (the Milan State University)

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### Abstract

Spaces can become iconic places of belonging for the communities that inhabit them, in which hopes, ambitions, and future scenarios are embedded. However, they can also embody individuals' and future communities' fears and resistance when faced with significant change.

This chapter focuses on the synergy of different entities (physical, intangible, and human interactions) that have emerged from the decision to move the Università degli Studi di Milano's science faculties to a new location – the 2015 Expo Area. This unexpected change presented the challenge of imagining spaces and facilities appropriate for current and future interdisciplinary cooperation in research, teaching, and learning practices. What happens when the successful planning of a physical space is intrinsically related to the consent of its inhabitants?

As the chief consultant, Politecnico di Milano was interested in researching high-level project criteria, expectations, and needs of a cohesive and successful organization of the various entities and activities. The aim was to balance the future settlement's spatial dimension, based on quantitative analysis, and the appropriate mood, through inclusive co-design processes. The result was to work on a meta-design level. The approach generated a "space of discussion" for future campus inhabitants as a strategy where participants had the freedom to distance themselves from current constraints and start imagining future scenarios with a whole new mindset.



## Introduction

Spaces play a crucial role in shaping the sense of belonging for the communities that inhabit them. They can inspire new hopes, ambitions, and future scenarios but they also embody fears and resistance towards significant change.

The relocation of the science faculties of the Università degli Studi di Milano (abbreviated to *UniMi*) to the 2015 Expo Area is an example of how a significant change can challenge individuals and communities to imagine new spaces and facilities appropriate for present and future interdisciplinary cooperation in research, teaching, and learning practices.

The headquarters of the science faculties are in *Città Studi*, a district in the northeast of Milan, close to the city centre. It developed through a stratification process over a century ago, but it currently presents several problems. These include high levels of degradation of its buildings and equipment; strong fragmentation of university structures; non-rational organization of research departments; widespread duplication of research infrastructures; inefficiencies in the exploitation of space due to a policy of development of departmental systems based on contingent needs; and lack of synergies typical of a university campus. In addition, the low flexibility of the existing structures does not encourage future development and expansion in conjunction with the university's objectives.

Ten years ago, the Rector of *UniMI* recognized that meeting the challenge of international competition required a new and radically innovative design.

However, the opportunity to start a process to improve the campus spaces was challenging due to the need for a physical apparatus to meet the requirements for an innovative revision of the environments. The lack of spaces necessitated the university's architectural reorganization looking to other urban sites that could meet this need. The project stemmed from the need to follow a current European trend to have more interdisciplinary and intersectoral spaces, and to aspire to more sustainable and efficient infrastructure solutions. A comparison with the current university site's space allocation also revealed a significant deviation of the net and gross surfaces, which should be optimized in a new campus into new and innovative spaces for study, research, and work.

The university's design solution to this challenge was, at the time right after *Expo Milan 2015*, to build a new campus on the Expo site. This is an area located in the northwest of Milan, more suitable for constructing a campus from scratch and ready to promote effective operation and possible expansion of the university in the near future. The decision to move to *Area Expo* was therefore able to meet the following requirements, such as: the availability of infrastructure for attractive and competitive study and research environments; a strategic location for transport; the possibility of creating an entire campus with sports facilities, residences, and services; and to develop synergistic relationships with the surrounding area and institutions, and with international companies.

The general plan for the site conversion of *Expo 2015*, operated by *Arexpo SpA*, was to establish a Science, Knowledge, and Innovation Park; the goal was to achieve an integrated strategic renovation of the area, which could also exactly fit *UniMi*'s goals. This innovation was a valuable opportunity for radically regenerating spaces and their relationships, and innovative approaches in science and education (Camocini *et al.*, 2017). Moreover, as both private and public scientific and technical research institutions were invited to design a vibrant and potentially stimulating environment for collaborative studies and cross-cutting connections, there was huge potential for new collaborations to be forged.

Hence, the real challenge was: how to combine the ambition of creating a successful planning of a physical campus space with the consent of its inhabitants?

## **Scope of the work**

The fundamental purpose of the new campus project was to provide the necessary physical spaces and digital services to facilitate cutting-edge technological innovation and exploration. In addition, the project aimed to promote interaction within and beyond the campus boundaries. Therefore, its name, *Science for Citizens*, underlines the university's pivotal role in enhancing the welfare and health of society (Chatterton, 2000) through the continuous dissemination of research

findings, and it suggests the concept of a borderless and open campus integrated into the city. A Scientific Cooperation Agreement was signed at the beginning of 2017 between *UniMi* and the *Politecnico di Milano* appointing a multidisciplinary team of *Politecnico di Milano* (from design and technological architecture)<sup>1</sup>, as the chief consultant, with a specific interest in researching high-level project criteria expectations and the requirements for a cohesive and successful organization of the campus's various activities.

The research objectives of *UniMi* were:

- To identify the elements and characteristics of physical space and services that can enhance interactions between users.
- To find tools for direct user involvement to gather insights into the conditions that foster new interactions or reinforce existing ones, and to support individuals and future communities in overcoming fears and resistance when facing such significant changes.
- To be in tune with contemporary and future innovation trajectories regarding spaces, services, and organizations of new university campuses and science parks.
- To maximize the use of surfaces as a limited and valuable resource, in contrast to phenomena of “academic private space acquisition” in forms such as single offices.

The goal was also two-fold:

- To generate a “discussion space” for future campus inhabitants, enabling participants to distance themselves from current constraints and start imagining future scenarios with a new mindset. By establishing this “discussion space”, individuals were encouraged to think creatively and ‘outside the box’, without feeling constrained by pre-existing conditions or limitations. The hope was that this approach could lead to a more innovative and forward-thinking plan for the future campus space (Camocini *et al.*, 2018).
- To define, based on desk research and co-design sessions, quantitative and qualitative parameters related to spaces and activities and their interactions (Collina, 2005). This outcome was relevant in

1. The team of *Politecnico di Milano* consisted of Luisa Collina (scientific lead), Barbara Camocini and Laura Daglio (scientific coordinators), Martina Mazzarello (operational coordinator) and Francesco Vergani (collaborator).

supporting implementation of contemporary international standards as well as of the existing structure's state, highlighting the campus's central functions and analyzing the complexity of activities and logistics that characterize different scientific disciplines: biology, food science, pharmacology, chemistry, geology, physics, mathematics and computer science.

This two-fold goal became part of the information package distributed to architectural firms and developers participating in the international competition for a master plan and an architectural proposal so that flexible analysis and groundbreaking typological and technical solutions could occur.

## ***Approaches and methods***

At the outset, the need was recognized to identify tools to facilitate communication between community members, collect quantitative and qualitative data, and interpret them correctly.

The *Politecnico di Milano* team decided to adopt the approaches of meta-design and participatory design, and to develop a comprehensive field research plan utilizing tools and methodologies from spatial and service design, and from architectural technology.

The first perspective was oriented towards understanding the situation: co-design sessions, workshops, and field interviews were employed to engage with the campus community and gain insight into their daily habits and routines. These sessions helped highlight the campus's critical issues and allowed the team to gather valuable feedback from the community.

In addition to these participatory tools, the team also utilized space analysis tools to gain a deeper understanding of the physical requirements of the campus environment. This allowed them to identify areas of improvement and develop targeted solutions to address the issues.

The second perspective was oriented to research innovative and futuristic models, supported by a concentrated desk research activity, benchmarking, and interviews with experts in the field at the interna-

tional level. The reason for using this method was related to the risk of this work's result being a simple re-proposal of a similar, although partly rationalized, model of the existing campus.

The team also leveraged specific tools and collaborative methods to develop scientific research and adapt to a broader disciplinary area between spaces and services. This interdisciplinary approach allowed them to identify and understand the complex interactions within the campus community, and to develop innovative solutions for a future way of working, studying, and living.

To improve communication and collect data accurately, the existing campus structure and central functions were analyzed for various scientific disciplines: biology, food science, pharmacology, chemistry, geology, physics, mathematics, and computer science. The existing complex building structure's spatial discontinuity and dispersed urban fabric had resulted in a sectoral approach to research, reducing innovation opportunities and technology advancement. To overcome these challenges, a novel, futuristic model was researched, with an interactive discussion model created to encourage imaginative and creative ideas for the future. The approach aimed to eliminate constraints and limitations and generate a forward-thinking plan for the campus space.

### ***Four phases to tackle the challenge***

The elaboration of the new campus project's generative principles at the former Expo Area of Milan has been articulated in successive research phases, starting in February 2017, and including different types of future campus inhabitants and stakeholders in each stage. A path developed according to sequential logic, starting from the territorial macro-scale. It then continued by defining the characters of the different functional categories of the campus and their connections, leading to the identification of requirements at the scale of the building and introducing guidelines concerning structural, technological, and plant design aspects. On the other hand, the research activity's specific task was combining top-down and bottom-up strategies, intending to investigate and improve a shared concept of a contemporary campus, where space is a complex social construction that is not merely built,

but produced and made productive through social practices (Lefebvre, 1991). This aim targeted academic staff and students, allowing them to identify needs and practical requirements to define the settlement's new organization.

The phases and related activities can be summarized in detail as follows.

**Phase 1.** The first phase of the research action combined quantitative and qualitative approaches to define spatial and services' requirements.

This involved collecting and verifying quantitative data to identify spatial and service requirements for the new *UniMi* campus at the former Expo site. Surveys were distributed to department heads to gather information on spaces, mobility habits, number of users, etc., and both interviews with international designers and bibliographical research were conducted. The proposals were presented and discussed in public sessions with the Academic Senate, departments, students, and administrative staff representatives. The primary outcome of this phase was the development of parameters related to spaces, activities, and their interactions.

In addition, on a broader scale, a systemic approach was taken to define the categories of campus spaces, their functions, and the hierarchy of importance between them. The information related to all the areas present in the future campus has been schematized into four different categories:

- *general characteristics of the settlement*: useful information for the definition of the overall morphology of the campus, energy-environmental requirements, location, information to quantify staff and users;
- *core functions*: requirements and necessary functions directly related to the project of the new campus and direct competence of the State University of Milan;
- *binding ancillary functions*: requirements not directly essential to fulfil the campus's mission but of significant support to the project's functionality and sustainability. These functions, fundamental for the activities of a campus, can be managed externally through solutions that have an agreement with the campus;
- *non-binding ancillary functions*: requirements to complete the primary infrastructure (campus), the development of which depends

on the interest generated. They enrich the settlement’s urban quality by foreseeing the risk of desertification in the non-use time bands.

This categorization has been useful for organizing requirements based on importance. But it also ensured the premises would include both spaces and services in the meta-design definition of the campus. A graphic diagram was created to represent the different degrees of proximity of the three categories of functions (core, binding ancillary, and non-binding ancillary) within the Science for Citizens project (the future campus), the surrounding areas of the Arexpo site, and the external urban fabric. The diagram includes quantitative data concerning spaces and users.

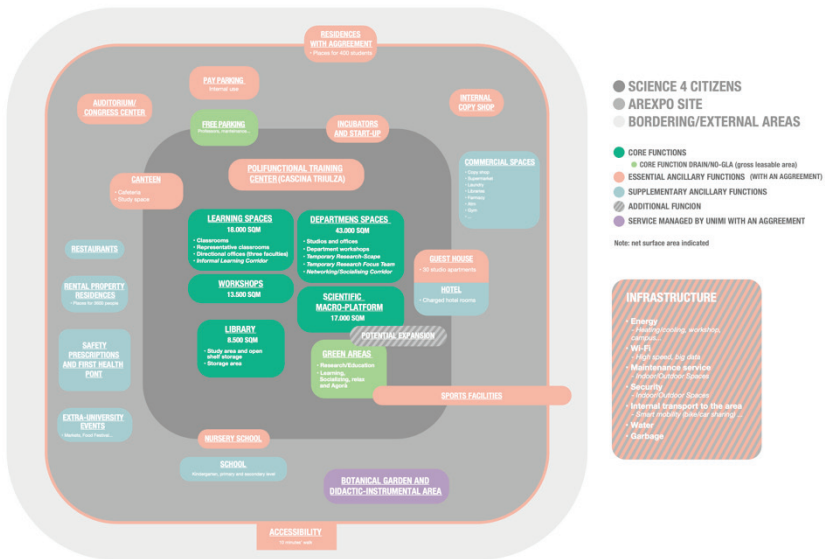


Fig. 1 – The functional scheme as outcome of the collaborative activity

The diagram has been helpful in communicating *UniMi*’s ambition of considering the campus as a model of a contemporary integrated campus, i.e., as a system of spaces and functions that solicits and consolidates relations with the urban context, facilitates spatial integration and incorporates the influence that innovative contemporary educational models exert on the design of spaces (Trapani *et al.*, 2018).



The idea behind the general project of the *Science, Knowledge and Innovation Park* shares the same vision as that of *UniMi* in guaranteeing the new theme park a porous and continuously connected system; as an urban campus where environments, activities, and people are integrated into a vibrant mutual cooperation system to replicate an urban dynamic.

In the first phase of the research, a meta-design document was created and published in April 2017 containing the information gathered during the activities. It identified the spatial and services requirements for the new campus, along with the necessary core and ancillary services (binding or non-binding) for its operation within the Masterplan of the ex-Expo 2015 area, which was then named *MIND – Milan Innovation District*<sup>2</sup>. Further meetings were held to obtain more detailed information about the spatial needs to be integrated into the project, which defined the second phase of the research.

**Phase 2.** The second phase involved collecting and organizing requirements for intra- and inter-departmental research spaces and surveying teaching spaces. Through meetings and analysis of departmental research space, an initial quantification of departmental and shared research spaces was developed. The focus then shifted to a more detailed analysis of the campus's core functions, particularly research facilities. The research aimed to have a better understanding of the practices and specialized equipment needed for laboratories in various disciplines. This step of the process required a specific, focused, participatory methodology for multiple reasons:

- the complexity of the activities, flows of people and logistics related to diverse scientific disciplines such as biology, food science, pharmacology, chemistry, geology, physics, mathematics and information technology;
- the current setting of the faculties, separated in different, and often historic, buildings where the upgrading of technologies and equipment was achieved, albeit temporarily and unsuitably; moreover, the scattered organization of the facilities required a thorough rationalization to reduce disused and misused space, to minimize distribution and ancillary spaces;

2. [www.mindmilano.it](http://www.mindmilano.it).

- the same space separation between faculties and researchers generated a sectoral way of conceiving research and education activities, frequently leading to self-referential, insular attitudes, possibly restricting innovation and research advancements.

Hence, the intended role was to activate and facilitate interactions and relationships among the researchers and academic staff who occupy and experience the spaces, exploring and applying new collaborative design models. Therefore, academic staff were directly involved in the design process, questioning well-established models and behaviours, raising doubts about deeply ingrained habits, and conversely drafting the advantages of sharing spaces, working and meeting rooms and corridors, to foster multidisciplinary interactions. In consecutive meetings, representatives from different departments were gathered in focus groups according to existing or potential connections between disciplines. They were asked to envisage their new desired department facility organization. The general aim was to have them work on and rationalize the characteristics of the different laboratories and ancillary-related spaces and the relationships (level of adjacency or separation).

To transform users into architects and designers as *experts of their experiences* (Visser *et al.*, 2005), specific collaborative tools and techniques were tested to guide them in this new role. From the diverse range of tools and techniques of participatory design (Sanders *et al.*, 2010), the creative-active card deck tool was chosen, although in an innovative way. During this phase a further methodology became evident and new tools employed to explore and incentivize the sharing of some emerged facilities, that were then explored in the third phase of the project.

**Phase 3.** The third phase involved defining a model for a macro-platform of highly advanced shared infrastructures for research a fundamental pillar of the future settlement. This model has been created in collaboration with working groups from different areas. During the previous research phase, it became clear that some spaces and equipment were used at a supra-departmental level. The macro-platform of shared infrastructures for research was further defined to understand these facilities and their relationship with research depart-

ments. The idea was to create a standalone building that could be used by different departments, providing an opportunity for researchers, faculty, and students to meet and share research.

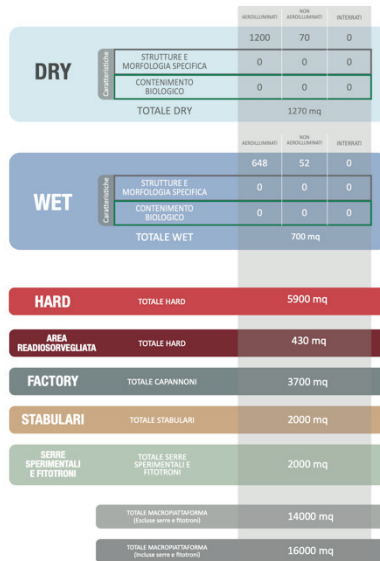


Fig. 2 – Diagram illustrating the categories and repartitions

To manage this campus model, design criteria had to be established that would go beyond the sectoral vision of spaces divided by discipline type. The departmental and shared laboratories' research spaces were initially quantified, which allowed for different equipment thresholds to be identified, including hard, wet, and dry laboratories, factories, animal facilities, experimental greenhouses, and phytotrons. Also included in this structure were shared research infrastructures necessary for research activities at the campus level with logistical characterization.

The deepening of the qualitative and quantitative requirements of the macro-platform of shared infrastructures for research was necessary to rationalize all the spaces planned for the future campus. This phase of research has been essential for the development of the feasibility project of the new campus as activities will be concentrated in

these types of facilities that require particularly advanced technology requirements.

Within this phase, the macro-platform's methodology was developed by analyzing the spaces' requirements outlined in a further meta-design document. The co-design tables helped to define the specificities of hard laboratories and rationalize the categories of research laboratories. Working groups and contact persons were assigned to develop the scientific project and articulate activities and spaces for the future campus. Meetings were held with the developers and research services departments to collect qualitative and quantitative data on shared infrastructures for research, and the heads of the disciplinary groups were involved in this process. The information collected was fundamental to the elaboration of the campus feasibility project.

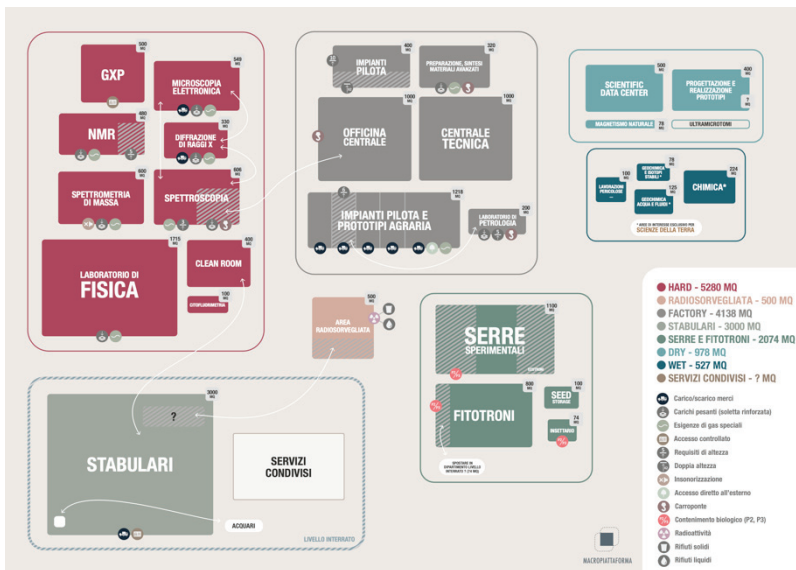


Fig. 3 – Diagram of the result of the activity, representing the macro-platform

The groups proposed sets of laboratories/accessory spaces for the macro-platform, highlighting possible aggregations according to common plant and structural characteristics and integrating activities

(as defined in Fig. 6). The qualitative-quantitative data included the surface area and the list of departments using each type of laboratory.

The most important result was the prefiguration of a complex and articulated qualitative-quantitative system of specific structures recognized by collaboratively researching about spaces and activities. Visual representations of relationships between spaces were useful in simplifying complicated plant requirements for designers and users. The strategy was also helpful in foreseeing the performance needs of scientific activities and the new possibilities of sharing generated by the unique conformation.

**Phase 4.** In the fourth phase, the research team played a crucial role in comparing the requirements outlined in the *UniMi* Campus documents with the proposed Technical Economic Feasibility Project edited by Boston Consulting Group. The team leveraged desk and field research, as well as critical reading and collaboration with the university's general management, real estate management, and directorate of research services, to identify deficiencies and generate proposals for future implementation to be included in the tender. They also engaged in continuous dialogue with Arexpo S.p.A., the owner of the area and proposer of the Integrated Plan of Intervention.

The outcome of this comparative work was produced and integrated in a final satisfactory meta-design document, as it enabled the development of a project that meets *UniMi's* requirements and the management of some services of the new Scientific Campus of the University.

The four phases outlined and validated the importance of finding the appropriate language and modality to formalize the results of these interactive discussions. In this case study, it was essential to create a document that includes directions and guidance to foster a hybrid space and service model that incentivizes new collaborations on university campuses.

Although the free expression of ideas and opinions is essential, formalizing the results of these discussions is equally important. This helps to provide direction and guidance for the project and ensures that the ideas and opinions are preserved and remembered over time. One

such example is creating a meta-design document, which can serve as a reference point for the developers, the project team of architects, site planners, and stakeholders, outlining the key objectives, strategies, and tactics for achieving the project goals.

### ***Specific designed tools and techniques***

Some tools adopted in the phases mentioned above have been designed or adjusted for specific different purposes. The following section presents a few tools and techniques we used in the outlined steps.

**The card deck tool.** A card deck tool was improvised to provide feedback and helpful information in understanding the relationships between spaces and related services. The tool was used in focus groups to define departmental maps by revising every single working/research space and their potential clustering into families. The printed cards stand for typologies of spaces and their major synthetic quantitative and qualitative characteristics to be filled in as required descriptions. Participants were split into groups based on their department and asked to analyze and complete the information on the maps related to their department's spaces. The responses were pasted on a white sheet of paper to organize the corresponding functions according to their different spatial relationships. The card deck was prepared according to the lists of research infrastructures collected through the initial survey, and it was decided to opt for a thematic skimming that led to the diversification of environments into laboratory spaces, technical/specialized rooms, and subsidiary technical rooms. This classification helped simplify information processing by grouping the various areas in three macro units. The cards of technical/specialized rooms presented only the name of the space. On the front of the green laboratory cards, empty cells were filled in with data regarding the current and future situation on the actual number of laboratories and other technical information helpful in sizing requirements.

Ancillary tools were created to introduce additional descriptions regarding particular needs deemed essential to the campus's meta-design definition. Unique stickers were created to submit further available reports concerning a space's possible underground loca-

tion, the need for particular parking or logistics accessibility, and levels of possible sharing with other similar facilities at the department, faculty, or campus level. An additional sticker was provided to indicate the possibility of moving one's own space into the shared facilities macro-platform, an operational and state-of-the-art centre in terms of size and instrumentation that could be shared among all departments.



*Fig. 4 – Using the card deck tool*

Initially, most of the individual departments' representatives were disoriented by the tool. However, over time they turned out to be proactive and collaborative, mainly because of the valuable mental organization skills the game managed to promote. The playfully expedient cards activated relationships between different departments, leading to the independent collaboration of personal realities to optimize resources through a more cooperative future. The willingness to undertake a co-design process has served to help participants understand the entire system of relations of a possible foundation for the future campus, both for issues purely related to the calculation of surfaces and the activation of multidisciplinary connections between the various departments.



**Development of departmental maps.** A parallel in-depth study was conducted to gather quantitative data on various spaces' technical plants, dimensions, and structural needs. Thirteen maps, supervised by Politecnico di Milano and completed by individual departments, were compared and verified through meetings to identify possible connections with other scientific departments at *UniMi*. The mapping tool facilitated multidisciplinary collaboration, triggering discussions on new research possibilities and shared projects.

Using the meta-design approach, the representatives of the thirteen departments created a visual system that outlined the degrees of relationships between departments and identified areas available for sharing laboratory and adjacent spaces. The final result was a set of master datasheets containing necessary logistical information for future campus construction. Acting closely with future space users enabled a better understanding of the spatial conformations and formal requirements of environments that were complicated from a logistical point of view. The result was a greater community awareness of the value of its resources and the possibility of creating flexible collaboration dynamics through different degrees of sharing.

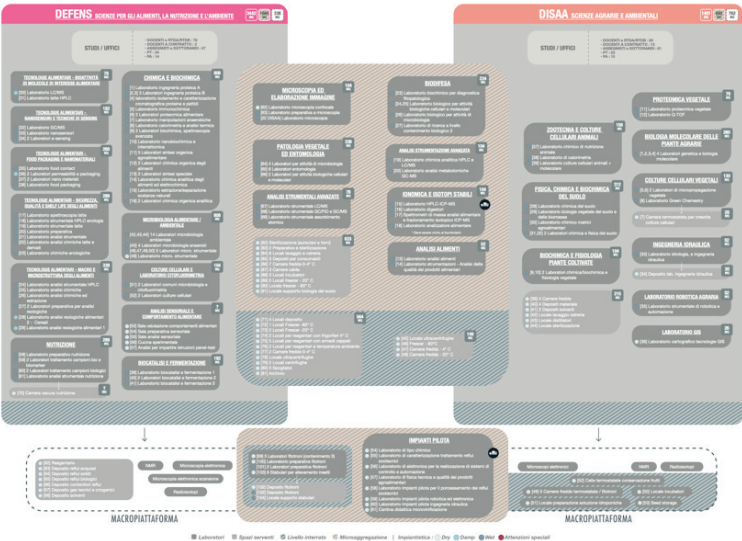


Fig. 5 – The departmental maps

Overall, the study involved the creation of thirteen maps, multidisciplinary collaboration, and the use of a meta-design approach to identify shared spaces and logistical information. Fig. 5 shows an example of two departments sharing some spaces in the middle and defining laboratories to be included in the macro-platform of shared infrastructures. The result was a clear vision of issues of absolute importance for the effective spatial design of the campus.

**Students' diaries.** Great importance was also given to a particular category of users: the students. During two meetings, student representatives were informed about the research team's role as intermediaries between the Politecnico research group and enrolled students. The students were asked to fill in diaries, and a password-protected Pinterest board was set up to collect pictures and narratives of worldwide learning spaces suggested by Erasmus colleagues. In the second meeting, students discussed and interpreted the diary notes, reporting issues such as a lack of adequate study spaces, mobility concerns, and a need for social and informal gathering places. The feedback aimed to improve the campus system and enhance the students' university experience.

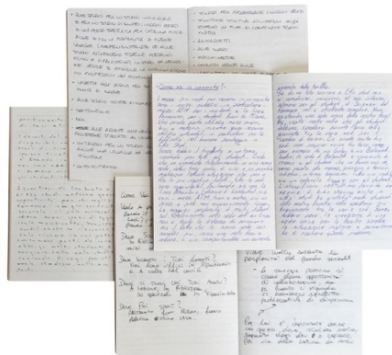


Fig. 4 – Diaries

## Conclusion

The relocation of the science faculties of the Università degli Studi di Milano to the 2015 Expo Area was a significant opportunity for the creation of new spaces and facilities to support interdisciplinary cooperation in research, teaching, and learning practices. At the same time however, this considerable change originated fears and conflicts in the community.

It can be very challenging to balance the desire to create a successful and efficient physical (spaces and equipment) and digital (services) campus with the need to obtain the consent of its inhabitants.

This complex and comprehensive research activity has highlighted how design can play a significant role within complex real estate developments even in the early stages of the process. In this case, the combined competencies in space and service design applied through a participatory and meta-design approach have contributed enormously to designing a well-defined and shared brief for developers and architectural firms, even in a highly complex and conflicting situation.

*UniMi* doesn't have design and architecture disciplines inside its community. The necessity to involve Politecnico di Milano as the main external consultant has offered the possibility to play a neutral role within the broad debate of the *UniMi* community, building a relationship of trust with the different stakeholders, which included the Rector, General Director and their administrative and technical staff, the students, the heads of the departments and their units, the developer, etc.

The double role of experts in advanced innovative environments and services (such as university campuses) and neutral design facilitators of structured, open debates and codesign activities has brought about a successful, integrated approach.

This role has led to a set of activities intended to enlarge and strengthen the competencies of the community in the field of university campus design, new working, research, and education environments and services, and other collateral themes, bringing the community in contact with contemporary trends and advanced international case studies.

This transfer of knowledge to the community has permitted facilitators to get well-structured information and more advanced and reasoned feedback instead of just preconceived oppositional positions. To achieve this, it has been essential to involve the community in the planning

process from the beginning and to listen to their feedback and concerns throughout the process.

In more detail, the four different phases confirmed that when people are offered information transparently and are given the freedom and the means to express their ideas and opinions in a conducive environment, they tend to do so with great enthusiasm and interest. This is because it allows them to feel heard and valued and encourages them to be creative and imaginative in their thinking. This, in turn, leads to a greater sense of ownership and commitment to the project or initiative they are involved in.

Adopting a hybrid service/spatial design approach has contributed to enhancing user interactions and overcoming the current physical separation between faculties and researchers that have created disciplinary silos in the past.

The meta-design iterative method of data collection, review, comparison, and visualization supported the research team in managing complexity and engaging participants from a broad spectrum of categories, resulting in a cohesive and successful organization of the various entities and activities.

The necessity to design new tools and to customize already given ones has, in this case, confirmed the role of designers as *bricoleurs*, able not just to do but also to conceive the best process and the suitable instruments for doing.

These findings and confirmations conclude that the adopted approach offers a useful example of how successful planning of innovative spaces and services intrinsically relates to a well-defined, inspiring brief designed by experts and codesigned by its inhabitants. Advanced shared visions are essential for creating spaces and services that inspire new hopes, ambitions, and better ways of living.

## References

- Camocini, B. *et al.* (2017), “‘Science for Citizens Campus’. New Methods for Research and Learning Environments”, *ICERI*, IATED Academy, pp. 5629-5637.
- Camocini, B., Collina, L., Daglio, L., Mazzarello, M. and Trapani, P. (2018), “Service design methods and tools as support to the participatory definition of the meta-design brief of a contemporary integrated campus”,

- in *ServDes. 2018 Service Design Proof of Concept Proceedings of the ServDes. 2018 Conference* (pp. 726-735), Linköping University Electronic Press.
- Chatterton, P. (2000), *The cultural role of universities in the community: revisiting the university – community debate. Environment and planning A*, 32(1), 165-181.
- Collina, L. (2005), *Design e Metaprogetto. Teorie, strumenti, pratiche* (vol. 1, pp. 1-299), Edizioni Poli. Design.
- Lefebvre, H. (2014), “The production of space (1991)”, in *The people, place, and space reader* (pp. 323-327), Routledge.
- Sanders, E.B.N., Brandt, E., & Binder, T. (2010), “A framework for organizing the tools and techniques of participatory design”, in *Proceedings of the 11th biennial participatory design conference*, November, pp. 195-198.
- Stappers, P.J., van der Lugt, R., & Sanders, E.B.N. (2005), “Contextmapping: Experiences from practice”, *Codesign*, 1, 119-149.
- Trapani, P., Collina, L., Camocini, B., Daglio, L., & Mazzarello, M. (2018), “The Transition to a New University Campus as an Opportunity for the Urban Regeneration of the Former Milan Expo 2015 Areas”, in *Cross-Cultural Design. Applications in Cultural Heritage, Creativity and Social Development: 10th International Conference, CCD 2018*, Held as Part of HCI International 2018, Las Vegas, NV, USA, July 15-20, 2018, Proceedings, Part II 10 (pp. 391-408), Springer International Publishing.

## **6. XS to XL: Interaction design for valorizing heritage across scales. Analyzing constants and variables**

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### **Abstract**

The design discipline and practice have an established tradition in valorizing heritage, recognized as Design for Cultural Heritage at the beginning of the century. Several years later, we take it for given that approaches, methodologies, and tools typical of Design (e.g., co-design, participation, scenarios) can be successfully applied to the cultural field. The discipline of interaction design makes no exception, and the human-centered approach to introducing digital technologies in the cultural realm can be considered today a common practice.

However, it is relevant to review some experiences of heritage enhancement with digital technologies (designed by the Department of Design of Politecnico di Milano) considering the multiple scalarities approach of the book. Five projects are critically analyzed, moving from the micro-scale of an interactive exhibit to the macro one of a city-broad interactive experience. The chapter aims to identify the design-driven approach's constant and variable elements at different intervention scales.

In particular, the chapter will discuss the projects moving from the micro to the macro scale: (i) small interactive exhibits based on embodied interaction, (ii) the development of AR mobile games for a tiny house museum, (iii) the valorization of Design and Architecture archive materials across the city (iv) the implementation of mobile educational games in a city center and finally (v) a city broad, interactive path.

## Introduction

Technology is becoming a life partner in our everyday life, and we are constantly connected digitally to the world. Devices and applications provide the user with new opportunities to access novel content exploitation methods related to culture. Combining powerful computing activities with many embedded tools, technology could provide content to an ever-growing audience, and cultural institutions have not missed the chance to experiment with this opportunity.

Today, content reaches us everywhere. This concept is expressed well by the term *everyware* (Greenfield, 2006). The concept reveals how ICT technology, found increasingly in new contexts and forms, will continue to affect daily life in unforeseeable ways. We, therefore, find ourselves amid the panorama outlined by Mark Weiser, who, over twenty years ago, coined the term: his idea was exact in prefiguring the pervasive and invisible use of hidden technology that is “woven into the fabric of everyday life until it disappears and becomes indistinguishable” (Weiser, 1991).

The days of man-machine interaction seem so distant in comparison to user-device interaction. With new tools, we take a leap forward that is not only technological, it also speculative. This fundamental aspect has revolutionized our notion of interaction and has shaped how users can take advantage of or interact with content and installations. For this reason, how digital systems approach the user is different; interfaces need to be easy and intuitive, as interaction must be natural so that the user can focus on the content. Indeed, over the last decade, research on the link between the physical and the digital worlds has bloomed, giving rise to research fields such as tangible and embodied interaction. Conceptually and symbolically, the human-computer interaction can be traced back to the abacus, which Ishii and Ullmer (Ishii and Ullmer, 1997) argue constitutes the genuine precursor of smart objects as both an input and output device.

In this context, the role of Design and design thinking becomes evident, especially in cultural institutions. Since the beginning of the millennium, scholars have addressed the role design may play in the cultural context (Trocchianesi, 2004; Celaschi, 2006), configuring a specific area of action for the design discipline called Design for Cultural Heritage.



This strand crossed twenty years of design research until the more recent studies regarding design knowledge's role in supporting digital transformation in cultural institutions (Avram, Ciolfi & Maye, 2020; Mason & Vavoula, 2021; Mason, 2022).

A specific role may also be tributed to interaction design, here intended in its broader definition as the art of facilitating interactions between humans mediated by products (Saffer, 2009) or creating a physical and emotional dialogue between a person and a product, system, or service (Kolko, 2011). Indeed, we may list countless projects that employed digital technologies in the cultural context to valorize cultural heritage assets and their legacy.

Despite much written regarding the design-driven approach to introducing digital technologies in the cultural realm and the projects adopting this approach may be considered uncountable, it is relevant to identify constant and variable elements that characterize the design-driven approach at different intervention scales.

Adopting the multiple-scalarities approach of the book, this chapter proposes a reading of design-driven projects involving digital technologies in the cultural realm to highlight how core elements may vary at the variation of the scale of intervention.

We do so by limiting the object of analysis to five projects that have seen the direct involvement of the authors, both singularly and together. This choice finds its rationale in having an in-depth knowledge of the design processes that led to the projects rather than a broad but superficial understanding.

Far from the aim of being comprehensive, we perform here an ex-post reading of our personal experience as researchers, designers, and educators involved in the ideation, testing, and validation of five interaction design projects in the cultural realm.

In particular, the chapter will discuss the projects moving from the micro to the macro scale: (i) small interactive exhibits based on embodied interaction, (ii) the development of AR mobile games for a tiny house museum, (iii) the valorization of Design and Architecture archive materials across the city (iv) the implementation of mobile educational games in a city center and finally (v) a city broad, interactive path. Our interest focuses on analyzing the following aspects: (i) the involved stakeholders and their relation, (ii) the target audience, (iii) and the role of design.

In the following, we briefly describe and contextualize each project and analyze them according to the abovementioned criteria. We then discuss the central insights of the analysis, pointing out those elements that may be considered constant and those peculiar to each project.

## **Micro Scale: designing digital encounters with Leonardo da Vinci**

Moving from the micro-scale, we analyze *Leonardo Plays Leonardo. Milan. Life. Nature.*, an interactive exhibit about Leonardo da Vinci and his Milanese period located in the cloister of Palazzo delle Stelline in Milan. The building is an outstanding site for Leonardo da Vinci as it stands in an area the Sforza family had erected to host courtiers and dignitaries in the vicinity of Sforzesco castle. It is in front of Santa Maria delle Grazie, which hosts the renowned Last Supper, and close to the recently restored vineyard of the Renaissance Master, near Casa degli Atellani.

The main aim of the project was to convey the *genius loci*, the spirit of the place where Leonardo lived and worked, allowing citizens, tourists and city users to perceive the presence of the Master and his legacy and to highlight the great importance the location played in past times. The project proposes a peculiar interpretation of the *genius loci*, transforming Leonardo into the tutelary deity of the place and bringing him back to life thanks to three digital holograms of the Master who welcomes visitors and tells short stories dealing with (i) his Milanese period (ii) his life and (iii) his relationship with nature.

The installation belongs to the domain of embodied interaction, which takes place when the human body itself is used as an interface (Dourish, 2001) and utilizes the presence of visitors and their movements to dialogue with technology, thereby generating engaging experiences potentially meaningful from an emotional point of view.

It comprises three thematic installations hosted in the cloister of Palazzo delle Stelline in Milan's city center. Each installation presents five short videos, telling stories about the years of Leonardo in Milan, his Life, and his relationship with Nature.

When entering the cloister of the building, visitors catch sight, at a distance, of a man dressed in Renaissance-style clothing moving into

and out of the three screens, constantly changing clothes, mood, and activity. Once a visitor approaches one of the screens, the interaction is activated. She can control the system by using her hand: by raising the right hand, she can first select Italian as a language for the subtitles and then ask Leonardo to go on to tell his stories. By presenting her left hand, she can instead choose English subtitles and stop the digital Leonardo (Fig. 1).



*Fig. 1 – Language subtitle selection approaching the sensors with the right (for Italian) or left hand (for English) and Leonardo’s Vineyard video playing*

Physical movements activate the contents through implicit interaction and are also used to make navigation choices through explicit interaction. Once a language is selected, the first video begins to play, chosen randomly by the system from among the five in each installation. A brief introduction displays the piece’s title, then Leonardo appears and talks for about two minutes, addressing the bystanders directly. When a story ends, users can choose to listen to another one – by raising their right hands – or to terminate the interaction – by raising

their left. All five of the videos use the exact mechanics of interaction, and once they have finished, Leonardo kindly bids the user goodbye and begins moving in and out of the screen again.

The project has been developed in strict collaboration with Fondazione Stelline and 5VIE Art+Design, the commissioners, who took care, respectively, of supervising the cultural content and managing finance, being the Department of Design of Politecnico di Milano in charge of managing the project and realizing the interactive exhibits.

The target users for the installation were quite generic since the exhibits were in an open and unsupervised space, close to a hotel, and frequently traversed by citizens and tourists. It must be noted that the project ran in 2015, the year of the Expo in Milan, which brought millions of visitors to the city.

Given the complexity of the project and the leading role assigned to the Department of Design, it is hard specifying the role Design played.

Design, indeed, includes theories and practices that belong to related and contiguous areas that often translate themselves into material or immaterial artifacts; the Design of interactive systems for the enjoyment of cultural heritage often deals with design specialties that are complementary and interrelated as product, interaction, service, and communication design. Furthermore, the designer must ideate and foresee a user experience capable of transferring the cultural content effectively and pleasantly. Envisioning the user experience of a digital encounter means defining a step-by-step script that the user and the system must follow. Like a director, he establishes a sequence of actions and reactions to create digital storytelling, in which the physical interaction activates multimedia content. The project underwent a series of divergent and convergent thinking that helped us identify the best possible solution to every issue we faced during the development through working prototypes.

As designers, we also coordinated the group of professionals involved in the project. Indeed, several other competencies were involved. An art historian and a screenwriter cared for the cultural content, an actor and director personified Leonardo, camera operators took care of the recording, and video experts edited the videos. At the same time, an engineer wrote the code for the interactive

system, and technicians built the exhibits. Finally, a makeup artist and a costume designer oversaw the actor's transformation into Leonardo.

## **Meso Scale: museum-wide interactive games**

The meso scale is here represented by a formal education activity that created thirteen location-based mobile games (LBMGs henceforth) addressed to a younger audience. The study involved a small Milanese house museum, the Bagatti Valsecchi Museum (shortened to BaVa, [museobagattivalsecchi.org](http://museobagattivalsecchi.org)), located in the Milan Fashion District, and BSc students in Design from the School of Design of Politecnico di Milano. The collaboration aimed to exploit the museum's narrative potential, reaching out to visitors under 35, a young audience not fully engaged but very relevant to the museum. It aimed to develop digital solutions to recall the house's life, making visitors perceive the museums' rooms as more than a simple collection of objects on the show. The family, indeed, inhabited the Bagatti Valsecchi House Museum until 1974. After that date, the house was restored to the original condition in which the creative ancestors left it and transformed into a contemporary museum.

Given these ambitious aims, young designers designed, implemented, and tested LBMGs (Fig. 2), exploring how such games could be used within the cultural heritage field and museums (Malegiannaki and Daradoumis, 2017).

Moreover, considering the BaVa desire to reach out to a broader audience, like that of under 35, the activity was carried out by adopting a co-design approach, actively involving end-users and cultural heritage professionals through the different stages of the design process (Ciolfi *et al.*, 2016). Therefore, starting from analyzing the museum's needs, competencies, and experiences, the course became a space where part of the audience (designers under 35) ideated games in constant interaction with the primary stakeholder (museum staff). The intent was to encourage designers to conceive LBMGs as entertaining solutions for visiting the museum based on a wise union of intriguing narratives and challenging mechanics.



Fig 2 – A group of students scanning a QR code to start testing the game *The Crime* (left), and students introducing players to the game *Next, please* (right)

To glimpse the thirteen LBMGs created, we may cite *The fire of eternity – Il fuoco dell’eternità* (Bellosi *et al.*, 2017), which tells of Fausto and Giuseppe, brothers and skilled collectors. In the fictional world, they received a shady merchant who presented the two with a contract in which he promised the eternal immutability of their beloved home in exchange for its custody.

In *The Crime – Il Misfatto* (Banfi *et al.*, 2017), the designers exploit *Cluedo* game mechanics as interviews, mysteries, and riddles to make the tangible and intangible heritage emerge while unfolding an intriguing story. The ghosts of Fausto and Giuseppe Bagatti Valsecchi are invoking someone’s assistance to discover the culprit who replaced an object from their precious collection with a fake.

As already stated, the primary target audience of the initiative was the community *Spechati*, composed of people under 35, created to transform the museum into a living space for culturally relevant social engagement in the evening hours.

This community had the opportunity to playtest a selection of four out of the thirteen LBMGs (*Next, please*; *The fire of eternity*; *The crime*; *Wreck this BaVa*) during a public event specifically addressed to this under-35 community of the museum.



The role of designers – intended in this case as both the design educators and the young designers in training – was here to work in between and with two different stakeholders: on the one side, the museum’s staff that strictly collaborated with the designers to take care of the cultural contents and the under-35 community that was actively engaged as primary recipient and tester of the games.

Beyond the role of bridge between the museum staff and its community, the designers were also in charge of following the entire design process, from understanding the context to delivering working prototypes for iterative tests. The LBMGs were developed following the traditional design process steps as part of a formal higher education activity. In this sense, the young designers acted as professionals, designing the LBMGs in all aspects (e.g., narrative, UX, UI).

## **Macro Scale: engaging education across the city**

The macro-scale involves educational apps developed in the last ten years that have in common the active exploration of the city.

They all exploit experiential and situated learning paradigms (Ulicsak & Wright, 2010), emphasizing factual education to improve soft skills and focusing on the collaborative, social, and situated dimensions.

Informal and playful activities demonstrate the effectivity of situatedness in physical spaces, where digitally overlaid contents hybridize in a meaningful hybrid world (Klopfer, Squire & Jenkins, 2002; Klopfer, 2008), and where social, authentic, open-ended, intrinsically motivating educating experiences may take place (Klopfer, 2008).

### *Looking for Achille Castiglioni*

The first experience here reported promotes Industrial Design intended as a cultural heritage that witnesses industrial production and creative thought, especially in Milan, which counts studios and ateliers, where most Italian design projects were born. Even though they are no longer operating, these locations are still linked to the creative process and convey the atmosphere of the golden age of Italian Design. Design research is essential in investigating archives’ potential in constructing historical narratives, new research paths, and learning tools.



Following an assignment to enhance Giovanni Sacchi's models owned by the Lombardy region and now in the custody of the Triennale di Milano, grew the idea to implement the project, identifying some masterpieces and collecting and digitizing all the helpful material to highlight the design processes of a product (Ceconello & Spallazzo, 2010). Achille Castiglioni Gibigiana Lamp, designed for Flos in 1980, had the most significant quantity of materials: drawings, slides, and intermediate models. Several months working at Fondazione Achille Castiglioni for digitizing items have clarified the enormous potential of all the material preserved there, not only in terms of world-renowned works but also in lesser-known ones.

Moving from the designer's immense legacy, we developed LfAC – Looking for Achille Castiglioni, a smartphone application that presents works in Milan's center (Spallazzo, Ceconello & Lenz, 2011). It guides users in discovering architectures, temporary exhibitions, installations, and other projects that no longer exist in the place they once were in an engaging narrative experience. The multimedia data are linked to a specific point on the map and appear when the user approaches it. The geolocation service guides visitors along a route to points of interest, tracking users' behavior and receiving helpful feedback for project evaluation.

We chose places and their description with the Fondazione Achille Castiglioni curators based on the walking distance from the former Studio Castiglioni. The amount of descriptive material available led to 15 Points of Interest. In the working app, the visitors move freely along a thematic route (architecture, industrial design, interiors) – identified by different colors (Fig. 3). The app activates a short video for each PoI with an audio description of the building or project; images, photos, sketches, and drawings add information. The complete tour takes about one hour plus the time needed to move from one point of interest to another.

This project focuses on an audience of connoisseurs with previous knowledge of Design and architecture who are looking for novel information about the author and eager to be surprised by unknown projects and anecdotes, images, and videos. Therefore, the interpretive audio's language is calibrated for this audience because it is highly informative and includes technical terms. The tale that structures this experience comprises several short stories, all describing a unique attitude towards Design that users can organize according to their individual preferences and location in the city.



Fig. 3 – LfAC – Looking for Achille Castiglioni Mobile app

The main stakeholders for this project were the Fondazione Achille Castiglioni e their visitors, who could experience another way of enjoying the studio’s rich archive. Again, the design here catalyzed the relationship between the cultural assets’ holder – the Fondazione – and its addresses. It also brought the innovation of sharing archival materials out of the studio but in relevant contexts, overcoming the displacement that frequently characterizes assets on display. Our role as researchers and designers was also to help Fondazione’s curators to translate the cultural content, consisting of heterogeneous materials, into a unique and coherent narration.

*Play Design!*

The research project Play Design! aimed at creating and testing location-based, serious mobile games for promoting and spreading the culture of Design, offering entertainment and an informal means of learning by transforming Milan into a playground. The aim is twofold: provide citizens and tourists with information about Design as an

icon of the Made in Italy brand and acquaint the young public with the design field through enjoyable learning activities using two urban mobile games. The recognition of the design traces in the city is an action very close to the discovery of cultural assets spread across the streets.

The first game, *D.Hunt*, is a location-based treasure hunt with users playing the role of detectives/designers who follow the traces left by the famous Zizì monkey (the award-winning toy designed by Bruno Munari) through locations that are exemplary of Milanese Design.

Guided by a smartphone, the player must answer questions correctly as she walks the streets of Milan to discover institutions, showrooms, public sites, and locations that feature highly in the history of Italian and Milanese Design. She thereby engages in a sequence of hints and parts of a storyline, and only after visiting the right place and guessing the clue is she given the following location. During the game, players are accompanied by audio tracks that simulate a radio broadcast with excerpts of design history: a fictional tool that complements the main storyline with the dual purpose of linking up different locations intrinsic to the plot and offering an additional channel for learning. In the game, the Zizì monkey guides users by asking questions and leaving clues along their path, all with amicable, informal language and tone.

D.Learn proposes a different approach: it is a roleplaying game involving four teams, one for each Degree Course offered by the Politecnico di Milano School of Design (product, interior, communication, and fashion design). Each team must collect points and skills by answering questions correctly and locating reward sites to earn the highest score and beat the other groups. In this game, interaction with the mobile device is supported by analogical tools – a map showing the points of interest and a deck of cards with hints – aimed at fostering richer interaction among players and between players and devices in a continuous dialogue between the digital and the physical (Fig. 4).

As in *D.Hunt*, there is always a close relationship between the location of the PoIs and the quiz topics: showrooms, hotels, museums, graphics, and indoor and outdoor urban spaces represent the perfect settings to encourage players to recognize and appreciate examples of modern and contemporary Design in the city of Milan.



Fig. 4 – Play design! D.Learn roleplay game: the playing kit (smartphone, the paper map and a card deck), a detail of the map with the PoI with different colors, and students playing.

The design goal was to create a pleasant user experience to attract and inform high school students interested in design. Both games share a common contemporary graphic language based on bright color variations and a simplified geometric style to engage the young public better and adequately communicate the project's unique identity. Integrating digital content with specifically designed physical tools – a deck of cards and a map with the PoIs – fosters an extroverted attitude, encompassing contextuality and social sharing (Petrelli *et al.*, 2013; Spallazzo & Mariani, 2018).

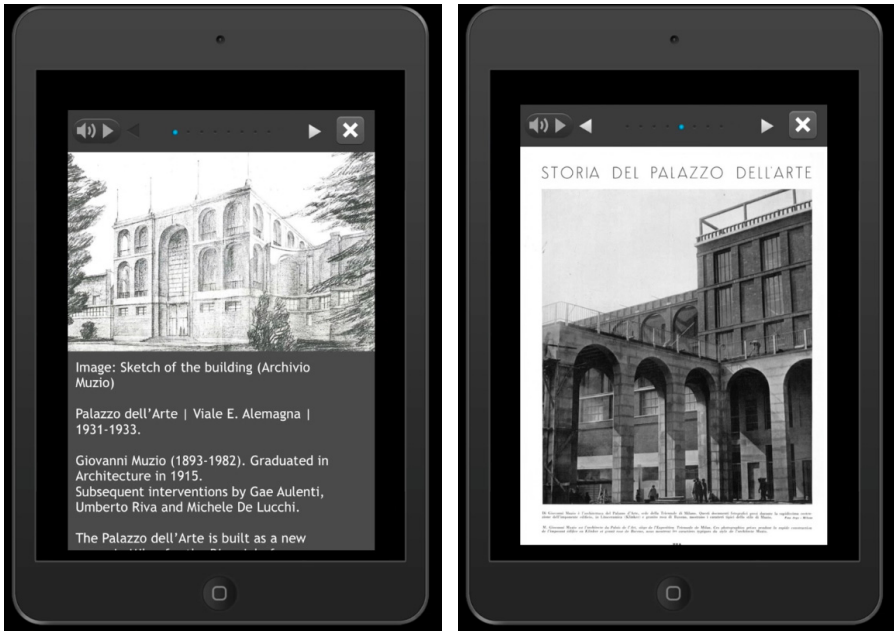
Politecnico di Milano, particularly the School of Design, was the primary stakeholder interested in orienting prospective students, while secondary schools and their students were the primary target audience.

The designer's role in this project goes beyond the catalyst of relationships between two institutions and their students. As for the games designed for Ba.Va, the designers took care of the user experience, creating the entire game (storyline and the fictional world, characters, mechanics, physical props, etc.) and their communication.

## *PolimiWalks*

The last project we briefly describe is PolimiWalks, a mobile app created for the 150th anniversary of the Politecnico di Milano and designed to showcase Milan's architectural heritage through the work of renowned graduates.

PolimiWalks allows tourists and citizens to wander around downtown Milan like modern flaneurs or follow pre-established routes in four neighborhoods. Two hundred and fifty buildings dating between 1863 and 2013 were geo-located, and the user is guided to these PoIs. The buildings are geotagged and divided into four color categories based on chronological period: from 1863 to 1909, 1910 to 1945, 1946 to 1969, and 1970 to 2013. On entering the app, the user can choose to either take a non-guided tour or follow a highlighted route on the map connecting the PoIs for each building; different symbols identify the kind of documentation associated with each location: a brief description, original plans and drawing, period photographs, and Domus Magazine articles if available (Fig. 5).



*Fig. 5 – PolimiWalks running on iOS. An example of content related to Palazzo dell'Arte*



The project stemmed from a collaboration between the Politecnico di Milano, most of Milan's private architecture Archives and Foundations, and Domus magazine and involved an architectural historian in identifying the contents and organizing the routes. It addressed people interested in learning about modern Milanese architecture and experts of the discipline who recognize the value and richness of the material on offer and are interested in further developing their knowledge. So, the target audience was like that of LfAC: connoisseurs, students, and professionals interested in design and architecture.

The designer worked here to create a seamless interaction between the user and the systems, by bringing diverse archive materials together and building a unique narrative, despite being characterized by different PoI dispersed across the city.

## **Constants and variables at different scales**

The projects described in the chapter share several traits: (i) they have a cultural aim; (ii) they are characterized by a technological core even if they are (iii) developed with a design-driven approach. Nevertheless, they differ in scale: from the micro-scale of an interactive installation to the middle-scale of museum-wide experiences to the macro-scale of urban tours and games.

Therefore, it is relevant to understand how the scale impacts the projects' traits, highlighting those constant characteristics, despite the scale and those that are affected by it.

The first element to analyze is the target audience since the scale of the project may eventually impact it. Indeed, it can be assumed that as the scale increases, less control of the audience corresponds. Analyzing the projects discussed in the chapter, it is evident that the scale is not directly impacting the target audience. The most open project for the target audience is Leonardo Plays Leonardo, which works at the micro-scale. While on the contrary, PolimiWalks has a well-defined audience, despite being city-wide.

Nevertheless, it must be noted that, on the contrary, the games at Ba.Va, so middle-scale, were addressed to a particular target – the under-35 community – while a game such as D.Hunt was open and accessible to anyone.

It is oversimplistic to assume that the target audience may be impacted solely by the scale of the project since many elements come into play. Nevertheless, the typology of space is significantly affecting the target audience.

Open-air experiences such as *Leonardo Plays Leonardo*, *LfAC*, *PlayDesign!*, and *PolimiWalks* managed to engage an audience of bystanders intrigued by the installations or what other users were doing. In this sense, the scale is not affecting the audience, but the quality of the space does. In other words, it is a constant feature in terms of scale, even if affected by many other factors.

If the scale does not directly influence the project's target audience, we may recognize a role in stakeholders' involvement.

From our experience developing the projects described here, micro or middle-scale projects will likely produce a firm commitment from a few actors. The relationship between the designers and the other stakeholders – namely the institutions – resembles the relationship between the commissioner and professionals, empowered by co-design and strict collaboration. This is the case for *Leonardo Plays Leonardo*, and the mobile games at *Ba.Va.* since the primary stakeholder is the institution involved. This may also be considered valid for *LfAC*, considering that the city-wide experience has its core at the *Fondazione Achille Castiglioni*. There is a balance between the commissioner's identity, recognizable in its location – cloister, museum, studio – and the designers/creatives.

On the contrary, when the experience lacks its geographical center, the number of stakeholders increases while losing a strict relationship. This is the case with *PlayDesign!* and *PolimiWalks*. *Politecnico* was the primary stakeholder, both commissioner and designer, establishing several relationships with architecture and design studios, and obtaining the patronage of several institutions but none in particular. In this case, the macro-scale entails a widespread geographical distribution of the points of interest, all acquiring the same role and agency.

The relationship between stakeholders may be considered a variable, depending, among other factors, on the scale of the project. In our experience, the micro and meso scale favor strong relationships between a small number of stakeholders. On the contrary, the macro scale of the city supports weaker relationships among many stakeholders.



Looking at the third element of analysis – the role of design – the impression is that more minor scales support a higher control of the experience and, accordingly, a more prominent part of the designer. On the contrary, the wider the scale, the looser the power the designer may have on the end-user experience.

In Leonardo Plays Leonardo designers acted as a mediator, translating the idea and the user journey according to languages coherent with tools and media used to gain a good result in terms of usability and effectiveness. Languages used are different and affect not only interfaces and mechanics of interaction but even the physical appearance of the technical equipment. In other words, the choices made were consistent with the designer’s will, creating “inherently persuasive” design products that embed and embody the arguments of the people who designed them (Redström, 2006) and can influence visitors’ behavior utterly. The same could be said for Ba.Va. games. The students, as designers, iterated the development of prototypes several times to adjust the players’ experience, shaping it based on their goals.

In LfAC and PolimiWalks, the way they were designed implies a high level of agency for the users, letting them choose their pace and path. In this sense, the designer cannot completely control the user experience, mainly what happens between one PoI and the other. The same could be said for the two games of Play Design!: despite the designers’ effort to keep the players engaged, the end-user behavior is unpredictable.

At least from our experience, the scale is therefore impacting the designers’ agency and control over the end-user experience with the interactive system. Despite the interaction always happens between the user and the device – whether it is a smartphone or a bespoke device – a macro scale, city-wide, entails losing control of what happens in between the interactions.

Comparing the film world, we may state that the designer’s role for micro and meso scale could be that of a director who structures – or at least tries to structure – the user experience step by step. At the macro scale, the designer can be likened to a story writer who leaves the actors free to play the part, keeping control of the main story.

## References

- Avram, G., Ciolfi, L., & Maye, L. (2020), "Creating tangible interactions with cultural heritage: lessons learned from a large scale, long term co-design project", *CoDesign*, 16(3), 251-266. Available at: <https://doi.org/10.1080/15710882.2019.1596288>.
- Banfi, G. *et al.* (2017), *The crime*, Politecnico di Milano, Milano.
- Bellosi, A. *et al.* (2017), *The fire of eternity*, Politecnico di Milano, Milano.
- Ceconello, M., & Spallazzo, D. (2010), "Valorisation of the Design Process. Digitisation as a Means of Conservation and Knowledge", in M. Ioannides *et al.* (Eds.), *Euromed2010. Digital Heritage*, Archaeolingua, Budapest, pp. 41-46.
- Celaschi, F. (2006), "Atto culturale e design. Progetto e valorizzazione dei beni culturali", *SDI Design Review* [Preprint], (03).
- Ciolfi, L. *et al.* (2016), "Articulating Co-Design in Museums: Reflections on Two Participatory Processes", in *Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing*, ACM Press, pp. 13-25. Available at: <https://doi.org/10.1145/2818048.2819967>.
- Dourish, P. (2001), *Where the Action Is: The Foundations of Embodied Interaction*, New ed edition, The MIT Press, Cambridge, Mass.
- Greenfield, A. (2006), *Everyware: The Dawning Age of Ubiquitous Computing*, 1st edition, New Riders Publishing, Berkeley, CA.
- Ishii, H., & Ullmer, B. (1997), "Tangible bits: towards seamless interfaces between people, bits and atoms", in *ACM Press*, pp. 234-241. Available at: <https://doi.org/10.1145/258549.258715>.
- Klopfer, E. (2008), *Augmented learning: research and design of mobile educational games*, MIT Press, Cambridge, MA.
- Klopfer, E., Squire, K., & Jenkins, H. (2002), "Environmental Detectives: PDAs as a window into a virtual simulated world", in *IEEE International Workshop on Wireless and Mobile Technologies in Education Proceedings. IEEE International Workshop on Wireless and Mobile Technologies in Education Proceedings*, pp. 95-98. Available at: <https://doi.org/10.1109/WMTE.2002.1039227>.
- Kolko, J. (2011), *Thoughts on Interaction Design*, Second Edition, Morgan Kaufmann, Amsterdam.
- Malegiannaki, I., & Daradoumis, T. (2017), "Analyzing the educational design, use and effect of spatial games for cultural heritage: A literature review", *Computers & Education*, 108, 1-10. Available at: <https://doi.org/10.1016/j.compedu.2017.01.007>.
- Mason, M. (2022), "The Contribution of Design Thinking to Museum Digital Transformation in Post-Pandemic Times", *Multimodal Technologies and Interaction*, 6(9), 79. Available at: <https://doi.org/10.3390/mti6090079>.

- Mason, M., & Vavoula, G. (2021), “Digital Cultural Heritage Design Practice: A Conceptual Framework”, *The Design Journal*, 24(3), 405-424. Available at: <https://doi.org/10.1080/14606925.2021.1889738>.
- Petrelli, D. *et al.* (2013), “Integrating Material and Digital: A New Way for Cultural Heritage”, *Interactions*, 20(4), 58-63. Available at: <https://doi.org/10.1145/2486227.2486239>.
- Redström, J. (2006), “Persuasive Design: Fringes and Foundations”, in W.A. IJsselsteijn *et al.* (Eds.), *Persuasive Technology*, Springer Berlin Heidelberg (Lecture Notes in Computer Science, 3962), pp. 112-122. Available at: [https://doi.org/10.1007/11755494\\_17](https://doi.org/10.1007/11755494_17).
- Saffer, D. (2009), *Designing for Interaction: Creating Innovative Applications and Devices*, 2<sup>a</sup> edizione, New Riders Pub, Berkeley, CA.
- Spallazzo, D., Ceconello, M.A., & Lenz, R. (2011), “Walking, Learning, Enjoying. Mobile Technology on the Trail of Design Masterpieces”, in *The 12th International Symposium on Virtual Reality, Archaeology and Cultural Heritage. Short and project paper proceedings*, Eurographics Association, Ginevra, pp. 61-64. Available at: <http://diglib.org/EG/DL/PE/VAST/VAST11S/061-064.pdf.abstract.pdf>.
- Spallazzo, D., & Mariani, I. (2018), *Location-Based Mobile Games: Design Perspectives*, Springer International Publishing (PoliMI SpringerBriefs), Cham. Available at: [www.springer.com/it/book/9783319752556](http://www.springer.com/it/book/9783319752556) (Accessed: 13 February 2018).
- Trocchianesi, R. (2004), *Il bene culturale oggi. Il contributo del design*, Ed. Poli.Design, Milano.
- Ulicsak, M., & Wright, M. (2010), *Games in education: serious games*, Nesta Futurelab, Bristol.
- Weiser, M. (1991), “The Computer for the 21 st Century”, *Scientific american*, 265(3), 94-105.

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Interior design is less and less reduced to the mere physical component of space and is instead increasingly projected towards an 'environmental system' made up of space, services, communication, and technology, capable of illustrating a multi-scalarity and trans-disciplinarity typical of a project devoted to innovation. This change of focus, from the prevalence of the interior physical component to the dominance of a polyvalent system, has generated a series of changes, including those affecting the project's area, which shows a progressive rise of the informational-cognitive component where the control of the net of human interactions involved becomes extremely important.

The volume collects various design experiences carried out within heterogeneous research groups and talks about experiments in the design of spaces and services on a different dimensional scale and that have impacted different types of users.

Through the recounting of these experiments, the book highlights the close interconnections between the design of spaces, the creation of services, the application of communication systems, and the exploitation of technologies, allowing us to reveal the tensions and interactions that are unleashed depending on the prevalence of one or another design discipline and the scale (from XS to XL) at which they take place.

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