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Toward sustainable urban health: defining hospital outdoor spaces for community well-being

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Abstract. The challenges that Bologna is facing belonging to the 100-carbon neutral city list are largely related to the quality of its urban fabric. The site hosting the IRCCS Azienda Ospedaliero - Universitaria di Bologna Policlinico di Sant'Orsola represents one of the largest green areas of the city. The renovation plan the hospital has launched represents an opportunity to contribute to the city's sustainability goals and to enhance the value of the hospital's outdoor spaces for users. The hospital experiences over 20,000 accesses per day, with a significant proportion of these being for work or medical visits; the informal use of outdoor spaces often leads to tensions among users with diverse needs, discouraging access and depriving individuals of potential benefits that could be derived from spending time outdoors. Reflecting the management's commitment towards two of the UN Sustainable Development Goals: Good Health and Well-being (SDG 3) and Sustainable Cities and Communities (SDG 11), the hospital created a design team with the cooperation of the University of Bologna to research the technical and functional requirements for adapting outdoor spaces to meet the needs of users. The research is based on a human-centred design approach while the methods are grounded in Service Design practices.

Keywords. service design, human-centred design, hospital outdoor spaces, urban health, urban regeneration, community well-being

1. Introduction

In 2022 the city of Bologna was officially selected to be included in the list of 100 European cities aiming to become smart cities and carbon neutral by 2030, representing the frontrunners for experimentation and innovation in enabling all European cities to achieve the same goals by 2050 [1]. With this aim, the 100 cities are funded 360 million euros by the Horizon Europe fund to create, with the support of a dedicated Mission Platform run by NetZeroCities, clean mobility, energy efficiency, and green urban planning projects, individually or in networks [2]. In light of these



developments and the pressing issues related to climate change, the administration approved on 30 September 2019 the declaration of climate and ecological emergency [3], through which Bologna commits to: provide information on climate and environmental data through the Environmental Report and the digital space Chiara.eco; develop a course of action to reduce and neutralise climate-changing gas emissions and increase resilience to climate change; activate citizens through a citizen's climate assembly focused on the development of measures to be implemented to hinder the climate crisis; and draw up a climate pact with the metropolitan city and the Emilia-Romagna Region for an evolution of the regulatory framework [4, 5, 6].

All these actions contribute to the broader framework of the 2030 Agenda for Sustainable Development, adopted by all members of the United Nations in 2015. The Agenda, with its 17 sustainable development goals (SDGs), aims, by 2030, to address environmental protection, health, economic prosperity, and other challenges, providing a framework for sustainable development and guiding policies and programs at global, national, and regional levels [7], following the definition presented by Brundtland in 1987 [8]. The concept of sustainability is thus seen more broadly and holistically, which holds intertwined environmental, social, and economic sustainability, the three pillars through which sustainable development can be achieved [9] (these can be joined, in specific cases, by other key elements such as culture [10]). The implementation of the SDGs enables the generation of long-term effects on the perceived well-being of the population, which in turn produces objective, measurable well-being [11].

Within this general framework, the whole city's urban environment is involved in several initiatives which will progressively support the transition towards carbon neutrality while reshaping entire portions of the urban fabric. Among them a unique and dynamic situation is represented by the main city hospital, IRCCS Azienda Ospedaliero - Universitaria di Bologna Policlinico di Sant'Orsola (AOU-BO), which is hosted in a large area close to the historic city centre where more than 30 buildings and pavilions are allocated in the second largest city green space. In response to its functions and the considerable number of users it serves, the site is experiencing an unprecedented level of transformation supported by a recently approved development plan and massive funding for updating both the hospital facilities and the equipment. This remarkable transformative process is driven by innovation, encompassing not only the physical built environment but also the processes and organisational aspects; it is guided by a forward-thinking vision, playing a pivotal role at the regional, city and community levels. Two of the projects carried out by the hospital are most aligned with the sustainability goals previously outlined. The first project, entitled "The Hospital of Tomorrow", is an action-research initiative undertaken in collaboration with the World Health Organization (WHO). Its objective is to define and test novel working and design methodologies that are more collaborative and therefore less hierarchical. In this project, various multidisciplinary working groups (involving management, technical, administrative, and healthcare figures) have been successfully tested to examine topics of interest for the hospital's plans and to formulate, in a participatory manner, recommendations on effective and innovative ways to deal with them in the short and long term [12].

Within the second project, "Ospedale nel Parco" (hospital in the park), the AOU-BO has drafted a 2021-2035 development plan with the following objectives: optimising internal and external care pathways; expanding the healthcare offer; promoting care innovation and integration with the University of Bologna; implementing and innovating the reception system; improving accessibility; and seeking the sustainability of any transformative action. At the operational level, these objectives should be achieved through a series of actions designed to modify the building and plant structure,

integrate healthcare services and outpatient functions, reorganise internal logistics, and improve and innovate the entire settlement, functional, and healthcare configuration of AOU-BO. This will be achieved by respecting the historical, cultural, and social identity of the entire reference community and the City of Bologna [13]. The designation of the plan indicates the value that this transformative action places on the outdoor and green spaces of the AOU-BO as an element capable of enhancing the time spent by patients and users. This also aims to enhance the relationship between the hospital and the city, while increasing the permeability of the entire hospital space within the surrounding urban fabric.

AOU-BO (figure 1) is comprised of 31 pavilions and covers approximately 0.22 km² (the total surface area of the Municipality of Bologna is 141 km² [14]), and it is visited by approximately 20,000 people each day, including staff, students, university teachers, patients, visitors, and suppliers. In light of these numbers, it can be considered a district of the city, taking up all the sustainability challenges outlined above and attempting to identify solutions that will enhance the well-being of all citizens and users.



Figure 1. Infrared satellite image (2018) of the polyclinic area, Geoportale Regione Emilia-Romagna. In blue scale artificial/built elements, in red scale vegetation/green elements. (Orthophoto 30cm/Execution CGR ©2018 - ALL RIGHTS RESERVED).

2. Scope

To respond to the Good Health and Well-being (SDG 3) and Sustainable Cities and Communities (SDG 11) goals defined in the United Nations 2030 Agenda, AOU-BO has set the scope of regenerating its outdoor areas to provide spaces that are highly liveable and usable according to the needs and desires of the users, aiming to improve their well-being, and, therefore, generating indirectly a benefit for the entire city. The interconnection between outdoor and green spaces with healthcare facilities is becoming increasingly significant as a means of expanding the comprehension

of holistic well-being in healthcare structures. This diverges from the paradigm of facilities designated exclusively for care, intending to dismantle the psychological barrier that has been generated with the rest of the city's urban fabric [15, 16]. The objective of this research is to identify the technical and functional requirements for transforming outdoor spaces into shared spaces for multiple users, defining priorities and solutions that are tailored to their expectations. According to the stated innovative and systemic approach, the purpose is to define an organic and consistent set of possible use configurations for outdoor spaces based on a direct analysis involving the user's experience and the related perception to exploit the green area potential while ensuring quality time, well-being, and a community-driven environment. This will be achieved under the principles of environmental, social, and economic sustainability, which are essential for the construction of resilient spaces that are best equipped to adapt to the constant social, climatic, and health challenges they may face, thereby aiming to enhance users' holistic well-being.

AOU-BO established a long-term collaboration with the Advanced Design Services and Sustainable Technologies unit operating at the University of Bologna, Department of Architecture, to examine the different contextual elements and relevant users, by adopting a human-centred perspective to empower them to ideate, value, and prototype potential solutions.

The objective of this research is to evaluate the capability of a user-centred methodology, specifically Service Design, in defining and optimising the possible uses and functions of space in a complex context, based on the diverse needs of the users. The research emphasises a deep understanding of user requirements and interactions within these spaces, intending to demonstrate how Service Design can effectively address and enhance user experience and satisfaction in complex environments through the regeneration of spaces. The proposed approach provides a range of tools that can be employed across the various project phases, from research to implementation. The methodology employs a systematic, creative, iterative, and collaborative approach to identifying user and context problems and proposing innovative solutions. This approach emphasises the importance of actively considering the users' needs and experiences [17, 18, 19, 20].

3. Methods

The project is developed as part of the Wayfinding and Service Design working group activities, embedded in the broader frame of "The Hospital of Tomorrow" project [12]. In agreement with the members of the group, with the General Management office, and with the hospital representatives in charge of following the regeneration project, the objectives were outlined, as well as a complete timetable of all phases and design actions to be carried out. The objectives were to conceive and define possible scenarios and practices for the use of outdoor areas, following user needs and within the limits defined by the AOU-BO, using a user-centred approach like Service Design. It was agreed that periodic and continuous reporting meetings and activities would be held on a fortnightly basis with the working group to co-design and co-produce, and on a two-monthly basis with the General Management office, intending to update the management on the progress of the project. The meetings were also convened to ensure that the development line was aligned with the general principles and goals of AOU-BO and did not impinge upon or conflict with other ongoing projects being pursued by the hospital.

As with other Design practices, the Service Design action can be subdivided into project phases, which can be rapidly represented by the double diamond model (figure 2) [21], which clearly outlines the envisaged tasks and related expected. Regardless of the tools and design practice employed, the model offers a representation of the four main macro-phases of a design action, which

alternate between divergent and convergent thinking phases. The model is then integrated with the specific information and project tasks [21, 22]:

- The *'problem space'* (represented on the left side of figure 2) encompasses the following stages:
 - *Discover* (first divergence): starting from a problem, the context is analysed, qualitative and quantitative data are sought, user and stakeholder needs are understood;
 - *Define* (first convergence): analysing the information identified to map processes, define problems, and decide where to intervene and with what priority;
- In contrast, the *'solution space'* (represented on the right side) consists of:
 - *Develop* (second divergence): exploring possible solutions to the questions posed before and developing models to prototype various solutions;
 - *Deliver* (second convergence): establishing the best solutions by outlining the service components and implementation processes.

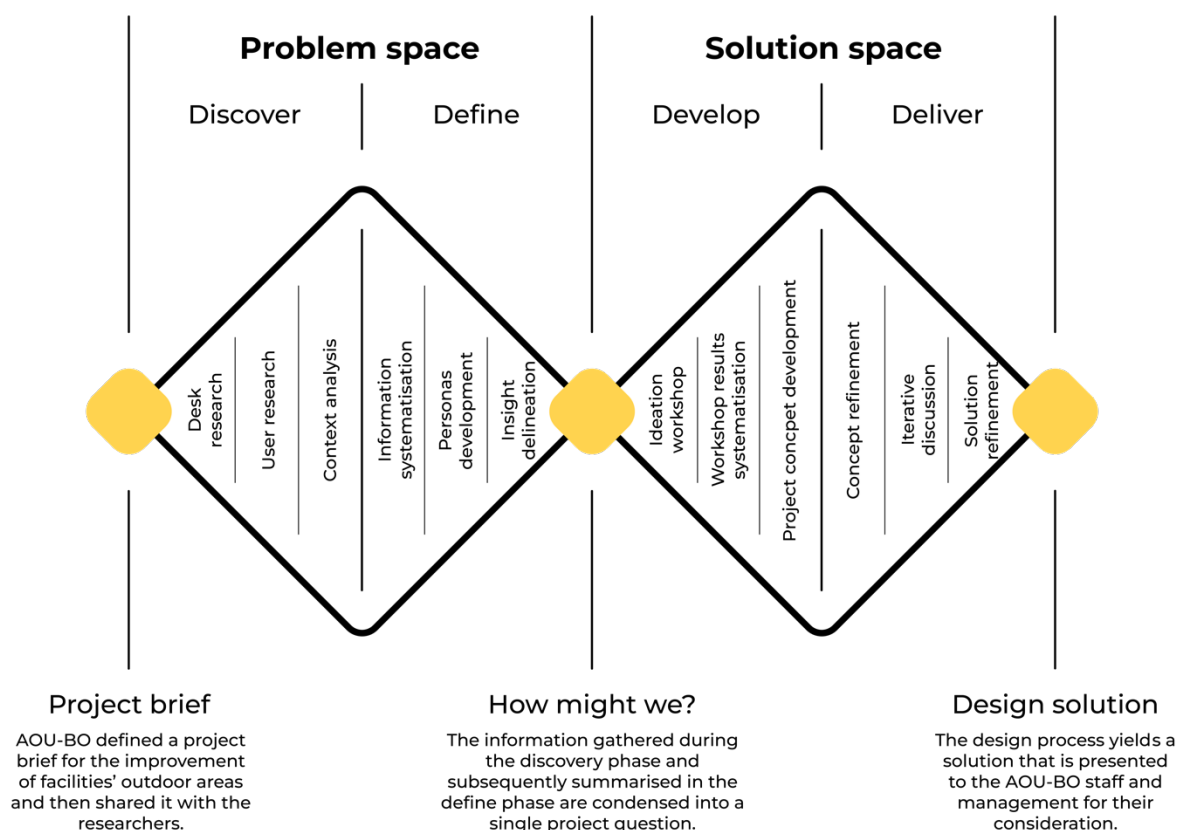


Figure 2. Here represented the distribution of the activities and tools employed during the project phases, divided according to the Double Diamond phases. There are three central bridges, the brief given by the AOU-BO, the "How might we?" formulated downstream of the research phase and the final solution returned to the General Management office.

This framework enables various tools under the umbrella of the Service Design method involving many characteristics from other disciplines such as ethnography, sociology, design thinking, and

marketing [17]. The combination of these fields enables Service Design to offer innovative solutions that respond to users' needs while also considering the impacts and sustainability of its results [23].

3.1 Discover

The brief shared with the management and the actors involved was initially transformed into a research question to have a clearer vision of the actions to be taken in this first phase. Subsequently, desk research was conducted on scientific literature, best practices, and context analyses. This enabled the mapping of the elements present and the reference stakeholders. Due to the complexity of the system, a parallel field research program was conducted through semi-structured interviews with users to investigate their needs and desires qualitatively. Additionally, surveys were distributed to frequent visitors of AOU-BO to assess the same elements sought through the interviews but from a quantitative point of view. Finally, a non-participant structured observation activity was conducted.

The survey comprised both open-ended questions [24], and closed-ended questions such as Likert scales [25]. Subsequently, the closed-ended questions were subjected to quantitative analysis, while the open-ended responses were analysed and grouped into clusters to facilitate a more detailed understanding of the users' needs.

Given the complex configuration of AOU-BO, which occupies a vast area of high structural complexity, the observation activity was preceded by the subdivision of the total area into several spaces on which to carry out the observation activity. The identified spaces were then analysed through a non-participant iterative observation methodology. The results of the observations were then collated in a unified analysis sheet, allowing for a comparison of the analyses conducted at different times by different researchers. This will permit the comparison of even the observation results that may be conducted subsequent to the implementation of the solutions [26, 27].

3.2 Define

The findings of the research phase were subsequently analysed, organised, and integrated into a synthesis, which highlighted the insights of the research phase and served as a foundation for the design one. Concerning the key stakeholders, the user research phase was followed by the creation of user personas. In the field of Service Design, user personas are archetypes that represent the essential characteristics that a certain group of users have in common, these express the attitude, behaviour, and way of thinking of the main users [17]. Systematising the various results obtained, it was possible to define a second question, namely "How might we?", which proved to be a useful tool for directing the design phase. This question allows insights to be reframed as opportunity areas and problems identified during user research to be innovatively addressed, thus making the information identified actionable [17].

3.3 Develop

The insights, the user personas and the "How might we?" formed the information base on which a multidisciplinary group of internal and external individuals attending AOU-BO (i.e. potential users of the outdoor areas) collaborated during a brainstorming workshop to develop innovative solutions in response to the theme under analysis. Through the utilisation of brainstorming techniques, coupled with the formation of smaller working groups, participants were able to express their perspectives on the subject matter and the findings of the research, thereby facilitating the generation of effective ideas that would optimally satisfy the needs of all users.

After the workshop, a second phase was initiated in which the ideas were presented to the working group and hospital technicians for review and discussion. This process allowed for the identification of critical issues and the generation of a unique project concept capable of responding to both the evidence that emerged during the research phase and the stimuli and visions that arose during the workshop phase.

3.4 Deliver

The concept was subjected iteratively to further elaboration, resulting in the definition of a concrete and applicable project idea. As the project developed, it was presented to key stakeholders, including AOU-BO staff and the same individuals who had been consulted at the outset of the project. The insights gained from these discussions informed the refinement of the solution, which was then used to develop an implementation framework to be presented to the AOU-BO General Management office.

4. Application

The timeline agreed between the research team and AOU-BO staff, due to corrections and adjustments during the project phases, resulted in the following timeframe:

- *Discover*: January 2024 – March 2024 (3 months);
- *Define*: April 2024 – May 2024 (2 months);
- *Develop*: June 2024 – July 2024 (2 months);
- *Deliver*: August 2024 – October 2024 (3 months).

This timeframe is closely linked to the project in question, its activation path, and the complexity of the context, whose thorough understanding requires time. Additionally, the need to liaise with various departments of AOU-BO for the development of specific activities, such as surveys, interviews, or workshops, led to the allocation of adequate time slots to manage these relationships and information loops.

The brief issued by AOU-BO required the identification of solutions capable of improving the quality of time spent in the facilities' outdoor areas concerning changing needs and user profiles, defining possible scenarios and usage practices.

4.1 Discover limits, needs and desires of users and context

From the brief, the following research question was derived: "*What is the optimal use of the outdoor areas, respecting all constraints, to improve the quality of time spent by users?*"

The scientific literature on the subject demonstrates that a meticulous design of the physical environment in a hospital context can yield positive outcomes for both patients and staff. These outcomes include a reduction in stress, an enhancement of the efficiency of care, and an improvement in the quality of services offered [28, 29, 30]. The design and development of outdoor areas capable of hosting a variety of activities and experiences [31], which are tailored to the specific needs of users, can result in the aforementioned effects, enhancing the well-being of individuals who spend time in these areas, particularly in crisis situations such as those presented by the Covid-19 pandemic [29]. The existing literature indicates a clear need for spaces that facilitate movement and exercise, offering a choice between social interaction and solitude. These spaces should provide direct and indirect contact with nature, as well as other positive distractions for users from clinical and medical elements. Furthermore, these spaces challenge the negative image of hospitals as

medical fortresses, instead portraying a message of openness to the city. Such spaces can support, enhance and promote positive effects on well-being [30].

The search for best practices led to the emergence of a focus on healing gardens, both in Italy and in Europe. These are green spaces specifically designed to promote and improve people's health and well-being through contact with nature. The benefits of such spaces can be obtained through a passive experience. Examples of this include the "Giardino dei sensi" (Sensory Garden) of the Meyer Hospital in Florence [33], the "Giardino degli abbracci" (Hug Garden) of the San Carlo Borromeo Hospital in Milan [34], and the NHS Forest project of the English National Health Service, which aims to increase the use of green spaces in English public health facilities [35]. Other types of solutions oriented towards a multi-functionality of spaces are less frequent and limited. One example is the Victorian Comprehensive Cancer Centre [36], which is mainly concerned with the terracing of its building. Another is the "Secret Garden" of the Sheffield Children's Hospital [37], which led to the regeneration of an inner courtyard.

The stakeholder mapping, co-produced together with the multidisciplinary working group, revealed that there were three main users of the external areas of AOU-BO: students; patients and their caregivers; and healthcare, administrative and logistics staff.

It was therefore resolved to develop, in collaboration with the hospital working group, a survey in digital format (on the AOU-BO website). The survey was disseminated through a combination of leafleting (a flyer with a QR code) in high-traffic areas frequented by key users. The survey resulted in 770 responses, almost all of which came from employees (out of the total number of responses: healthcare personnel 66.97%; administrative personnel 22.71%). It is interesting to note that those who use these areas (69.16%), use them for short breaks (65.49%) or to eat meals (39.18%), while those who do not use them (30.84%) are not interested in them (32.22%), does not find them stimulating (30.96%), cannot find a suitable space for its needs (15.48%) or generally do not have time to use them (14.22%). Both groups, however, would positively value the inclusion in these areas also of services or activities that are not purely health-related (68.90%). It became evident that there are problems related to internal mobility (orientation, traffic, and pollution), the lack of equipped and/or covered spaces, poor safety, and the absence of extra-hospital activities capable of attracting users to the spaces.

Similar themes emerged during the semi-structured qualitative interviews, which lasted approximately 45 minutes. Interviews were conducted with six users of the outdoor areas (two students, one resident, and three employees) who were identified through both the survey and the field research. In their responses, the participants highlighted the lack of equipped spaces for various activities, including eating meals, studying or working, and recreation. They also identified a lack of specific recreational activities and problems caused by the mixing of users with often conflicting needs in the same space. The students in particular drew attention to the issue related to food, denouncing the absence of spaces dedicated to them for the consumption of food as well as the difficulty in finding it.

In parallel with the user research activity, the context analysis enabled the mapping of potential spaces for the project's activation (figure 3).

A comprehensive examination of the context led to the identification of 19 potential areas for focused attention. Observation was conducted in these areas, with repeated observation sessions every two hours on the same day (five moments in total, two in the morning, one during the lunch break, and two in the afternoon). It was observed that the extensive informal use made of the spaces is closely linked to the neighbouring activities. However, despite this, it is impossible to define a

unique type of user for each space. The observation served to corroborate the hypotheses developed during the user research phase, with the identification of the consumption of meals (not strictly linked to the conventional lunch break times) and short breaks (of both staff and the university population) as the primary activities.

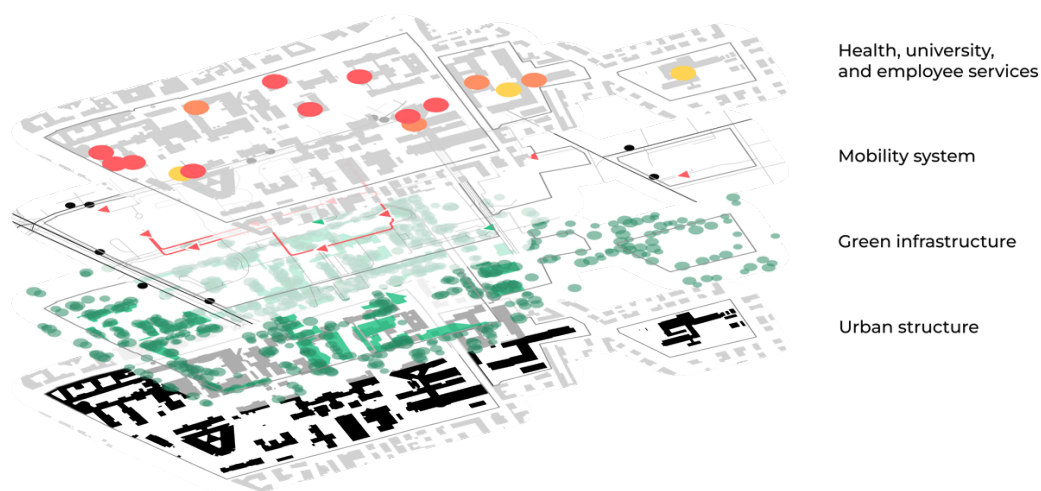


Figure 3. The multilayer map displays how the complex interaction of separate information packages has been processed to detect critical issues and physical points to address the choices and preferences on outdoor space use and configuration.

4.2 Define the main focus of the action

Keeping in mind the three principal users (i.e., students, patients/carers, and staff), four transversal elements of interest were identified during the research phase. The first of these relates to the possibility of spending time outdoors, and therefore the need for equipped, well-maintained, and clean spaces. These are identified as the enabling elements for all the other needs that emerge, since in their absence it would not be possible to use the outdoor areas. The second element pertains to the necessity of providing services that can attract a diverse range of users over an extended period. These services must be capable of responding to the specific needs of the user categories while simultaneously increasing passive control of the space to enhance its safety. The third element concerns the characterisation of the space and the communication of the services offered. This is done to improve the orientation of all users and to disseminate information about the activities that are carried out. The fourth element considers the users' need for quiet spaces and the management and definition of their relationship with internal mobility. Two vertical themes were identified as being of concern to all key users: the facilitation of food consumption, including the implementation of accessory services to the consumption of meals in outdoor areas; and the provision of services complementary to the main users' activities, responding to the needs of individual user categories with a view to coexistence.

The synthesis and systematisation of these points allowed us to define the "How might we?" question that served as the foundation for the design phase: "*How might we facilitate users to make use of services complementary to their activities, creating an ecosystem of services capable of*

responding to the needs of the individual categories, taking into account the needs related to food and recreational aspects." The objective was to facilitate the utilisation of complementary services and to define AOU-BO as a well-being space capable of offering a multitude of possibilities and activities in its outdoor areas, with a particular emphasis on the themes of food and recreation, maintaining a holistic well-being perspective.

4.3 Develop possible outdoor scenarios

The material developed was used to inform a multidisciplinary brainstorming workshop, which lasted approximately three hours. The workshop involved 10 participants, including potential users (healthcare personnel, administrative staff, and students) and hospital technicians, identified to provide support in the development of feasible solutions. The participants were divided into three sub-groups. The initial phase of the workshop was dedicated to the identification of a common framework of critical issues and problems. Each component was then asked to develop seven ideas through individual brainstorming. The various ideas developed were then subjected to a voting process, systematisation, and reworking within the sub-groups. This enabled the participants to emerge from the workshop with three ideas that covered three well-defined phases: activating the spaces, experiencing the spaces, and getting to know the services. The objective is to provide a sense of identity for the places by creating spaces that can accommodate a variety of functions and offer services designed to foster a sense of welcome and holistic well-being. Furthermore, it is recommended that the services offered by AOU-BO should be clearly communicated through a multi-channel logic.

Following a series of discussions held with the AOU-BO working group and technical staff, it was possible to extract the key concepts of the ideas developed during the co-design session and rework them to define a design concept capable of bringing together all the elements addressed up to that point: "*Improving the quality of time spent in the external areas of the hospital facilities by the various categories of users through the activation of mono/polyfunctional islands: places designed to meet the multiple needs of the users who experience these areas through the functional orientations that characterise them.*"(figure 4).

4.4 Deliver a concrete solution to the problem

A second discussion with the actors questioned at the outset of the process enabled a more precise definition of the concept developed, delineating the various functions that the space can assume. The continuous dialogue with the hospital contact persons also permitted the delineation of the implementation path that the developed solution could take. To offer the management a greater degree of flexibility, concerning the scale of commitment and the complexity of implementation, the solution was divided into three scaled implementation scenarios. These scenarios outline the basic functions that the solution must possess and the various upgrades that it may require.

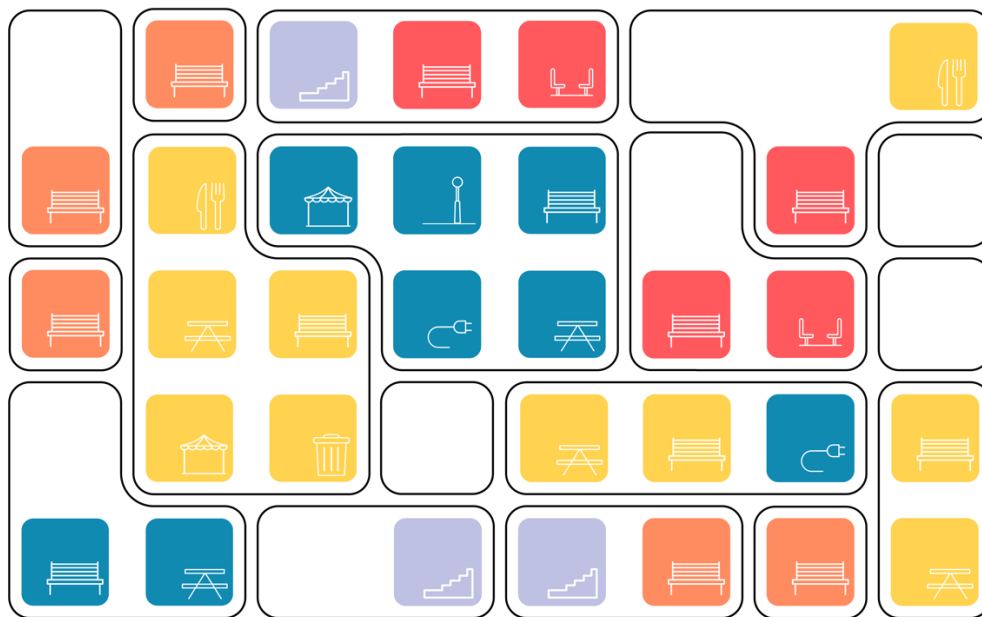


Figure 4. The diagram reflects the concept of mono/polyfunctional islands proposed for organizing outdoor spaces: each island (box), can differ in size and shape, but recurrent and well-defined elements can be included to generate a set fitting the users' needs following the outcome of the co-design workshops.

5. Results

The proposed design solution, which was refined during the delivery phase, represents a demanding framework through which to characterise the external areas of AOU-BO to meet the multiple needs of the users. This framework facilitates the implementation of the concept of an ecosystem of services and possibilities, which emerged repeatedly during the design process. The research and subsequent comparisons with the stakeholders have made it possible to designate the functions that these spaces must fulfil. These are as follows:

- *Dining areas;*
- *Study/work areas;*
- *Socially oriented areas;*
- *Areas for non-hospital activities;*
- *Areas for short breaks.*

Spaces, or islands, have to respond to one (monofunctional island) or several (multifunctional island) of these categories through the insertion of elements capable of enabling these functions. This solution is then scaled to three implementation scenarios: scenario A envisages the co-presence of all functions at an advanced level, with permanent components capable of guaranteeing continuous, non-seasonal use of the spaces; scenario B, at a lower level, considerably decreases complexity by eliminating the services that can be established and the related enabling elements; the simplest scenario, C, does not guarantee continuous use of the AOU-BO external areas (due to weather or climate issues), maintaining the essential elements capable of responding to users' key needs. The subdivision has been developed with a focus on the implementation activities, allowing the General

Management staff to begin with the simplest solution and incorporate additional elements as needed. A summary of the configurations presented can be found in Table 1.

Table 1. Summary of possible configurations

Functions	Elements								
	Seats	Tables	Food provision	Charging points	Light points	Coverages	Social dedicated structures	Activity dedicated structures	Accessory elements
Dining areas	A, B, C	A, B, C	A			A, B			A, B, C
Study/work areas	A, B, C	A, B, C		A	A	A, B			
Socially oriented areas	A, B, C						A, B, C		
Areas for non-hospital activities								A	
Areas for short breaks	A, B, C								

6. Discussion

The development of the solution through a shared and participatory process with all the various stakeholders allowed the creation of an inclusive and result-oriented design environment. This approach enabled a wide range of perspectives, knowledge, and needs to be captured, thus creating the ideal conditions to identify an answer that fully reflected the challenges and opportunities that emerged during the design process. The significance of active stakeholder involvement became evident in the final outcome, as the proposed solution was more readily accepted and supported by all parties involved. Furthermore, it fostered greater transparency in the decision-making process, thereby creating a climate of trust and collaboration between all stakeholders within the hospital.

The proposed solution facilitates the creation of multifunctional spaces that can mitigate the issue of user intermingling by delineating specific functionalities and preventing the overlap of activities that might be in conflict. The proposed placemaking activity represents a pivotal step in the activation of spaces and the fostering of active user participation. This approach is not limited to the creation of physical environments; it also encompasses the creation of contexts that are able to foster a sense of belonging and involvement on the part of the community. These spaces are designed to serve as an enabling framework that can accommodate future services and activities. The project may be regarded as the inaugural phase of an ongoing programme of improvement and regeneration of the external areas of AOU-BO. In the absence of this foundation, the implementation of future, more pragmatic projects would be considerably more challenging.

However, it is necessary to adopt a step-by-step approach for the development of these elements, including a prototyping phase to enable a careful evaluation of the effectiveness of the proposal. It is essential to verify whether the identified functions are indeed adequate and whether the proposed elements enable and direct their uses effectively and satisfactorily. Currently, in close collaboration with AOU-BO, preparatory activities are underway for the prototyping of a food provision area and the design of the related spaces. This process will be followed by a series of monitoring and follow-up activities aimed at assessing the impact and results, ensuring a more tailored development of the project over time.

However, while the prototyping phase was progressing also some barriers were raised. The introduction of an additional food provision area (dynamically located within the hospital site)

resulted in the expansion of the current food offer by the single supplier within the pavilions, which was not within the contractual boundaries of the original agreement. This required several weeks of discussion to delineate a shared pathway for implementation in a complex legislative framework. Additionally, the preparation of the location setting of the pilot is not managed internally but it is assigned to a local architecture firm, requiring further time to complete the process.

The design and implementation of the proposed solution provide a tangible example of how an approach linked to Service Design practices and oriented towards participation can lead to significant and sustainable results. Through active stakeholders' involvement and continuous evaluation of the impact and results achieved, it is possible to create spaces that fully meet the needs and expectations of the community. Furthermore, the design project for outdoor spaces (including furniture and spatial design) is not managed internally but is instead assigned to a local architectural firm, which requires additional time for completion.

Nevertheless, remarkable efforts are required to facilitate the widespread acceptance of less structured and more horizontal process-oriented design methodologies. The divergent phases involved in the design process have frequently proven disorienting for the AOU-BO working group, entailing the need to improve the focus on the methodological aspect during the work. Additionally, the current structure, with its silo-like approach, is not always familiar with collaborative techniques addressed to encourage modal change. To address this issue, the multidisciplinary working teams established by "The Hospital of Tomorrow" project offered significant support.

7. Conclusion

The healthcare context is characterised by a series of criticalities, including its complexity, the stringent regulations that govern it, the strong hierarchisation of internal relationships, and, consequently, the difficulty in bringing innovation and change. The design method provided by the practice of Service Design has made it possible to curb some of these critical elements and has succeeded in enhancing collaboration to foster optimised solutions.

The objective of this research is to conduct a comprehensive evaluation of the efficacy of a user-centred methodology, specifically Service Design, in identifying and optimising the potential uses and functions of spaces within complex contexts, tailored to the diverse needs of users. The research has demonstrated how Service Design can significantly enhance user comprehension, enabling a dialogue between users and directional staff. Although further prototyping and testing phases are required to refine these solutions, initial findings suggest that integrating user-centred practices can provide substantial benefits, overcoming challenges related to the inherent rigidity and complexity of the context. A user-centred methodology was employed to develop a detailed functional framework for the external areas, to identify and accommodate their various uses. This approach not only facilitates more effective and user-friendly space utilisation but also fosters greater collaboration and innovation among stakeholders.

It is, however, important to note that the design path represented in tools such as the Double Diamond is not entirely consistent with reality, which is often more complex and requires the iterative repetition of the various design phases in a non-linear process. More accurate representations of this concept can be found in the work of Marc Stickdorn and Damien Newman, in their design squiggles [38]. The proposed solution addresses the utilisation of outdoor spaces in hospital contexts and the identification of their optimal utilisation according to the needs of AOU-BO users, intending to promote the well-being of the entire community and thus aligning with the United Nations 2030 Agenda's goals 3 and 11 [7]. Given the customisation of the solution according

to the specific context, it is therefore highly site-specific and difficult to apply to other situations. In contrast, the method applied is highly replicable, outlining each time the best solution according to the characteristic elements of the context.

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