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Regeneration of the Built Environment from a Circular Economy Perspective

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Camilla Lenzi · Alessandra Zanelli
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ISSN 2198-7300
Research for Development
ISBN 978-3-030-33255-6
<https://doi.org/10.1007/978-3-030-33256-3>

ISSN 2198-7319 (electronic)
ISBN 978-3-030-33256-3 (eBook)

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This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

The chapters included in this book give a kaleidoscopic selection of conceptual, empirical, methodological, technical, case studies and research projects, which implement the concepts of circular economy to the regeneration of the built environment. This means enhancing the understanding of sustainability to a broader paradigm, developing a number of practices concerning energy, raw materials, waste, health and society. In particular, a set of theoretical and methodological contributions introduce the theme of the socio-economic development of territories, while the three following sections deal with the challenge of closing the loops of the construction sector—on the one hand, focusing at the larger scale of urban regeneration and, on the other hand, deepening new ways of activating sustainable and resilient paths at the level of the building materials' production, and eventually foreseeing novel policies, tools and organizational models of the building performances' improvement through the reusing, recycling, up-cycling and remanufacturing strategies, applied to the built environment.

This book belongs to a series, which aims at emphasising the impact of the multidisciplinary approach practised by ABC Department (Architecture, Built Environment and Construction Engineering) scientists to face timely challenges in the industry of the built environment. This book presents a structured vision of the many possible approaches—within the field of architecture and civil engineering—to the development of researches dealing with the processes of planning, design, construction, management and transformation of the built environment. Each book contains a selection of essays reporting researches and projects, developed during the last six years within the ABC Department of Politecnico di Milano, concerning a cutting-edge field in the international scenario of the construction sector. Following the concept that innovation happens as different researches stimulate each other, skills and integrate disciplines are brought together within the department, generating a diversity of theoretical and applied studies.

The papers have been selected on the basis of their capability to describe the outputs and the potentialities of carried out researches, giving at the same time a report on the reality and on the perspectives for the future. The cooperation of ABC Department scientists with different institutional and governmental bodies (e.g.

UNESCO, UIA, EACEA, EC-JRC, ESPON, DG REGIO) as well as their participation to sectoral boards and committees (e.g. ISO, CEN, UNI, Network Android-Disaster Resilient, IEA, Stati Generali della Green Economy, Green Public Procurement, Associazione Rete Italiana LCA, Lombardy Energy Cleantech Cluster) and their dialogues with institutions (e.g. national ministries, regional government, local administrations) led and motivated the selection of the essays.

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Introduction

The regeneration of the built environment represents a prominent research field for all scholars and professionals interested in the creation, evolution and transformation of the urban environment and the relationships between urban, peri-urban and rural spaces. In spite of its well-established and long tradition, this field of enquiry has not yet become depleted but rather is receiving renewed attention and has become compelling in the scientific community for the co-occurrence of multiple trends and phenomena. First, recent times are characterised by an impressive rate of urbanisation, and projections forecast increased urbanisation for the future, especially in less developed and developing countries. Second, the increasing constraints on the widespread availability of economic, social and environmental resources push towards the ideation, prototyping and application of new solutions as to accommodate this quest for urbanisation. Third, the need to continue to take care of, adapt and maintain the heritage of historic cities, especially in advanced countries, and in the light of these constraints, require the experimentation of new approaches to the requalification and renewal, both material and functional, as well as new methodologies of intervention, more error-friendly and based on the reversibility of the current actions, in order to guarantee future generations the possibility of revising the approaches in view of more advanced tools and procedures.

This volume then aims to take on this challenge and proposes a reflection on the strategic importance and advantages of adopting multidisciplinary and multi-scalar approaches of enquiry and intervention on the built environment which are based on the principles of sustainability and on circular economy strategies. In fact, the regeneration of the built environment can represent an important cornerstone in the transition from a linear to a circular economy model through multiple actions that can take place at different scales, i.e. the recycling and reuse of building artefacts, products and components, the improvement of the quality and functionality of existing buildings, the valorisation of cultural heritage, the re-infrastructure and implementation of sustainable transport systems and the efficient use of local economic resources.

In order to address the abovementioned overarching research challenge, this volume identifies specific challenges according to a macro-to-micro unit of analysis

ranging from the city itself as an aggregated unit of analysis, to the district/building, from sustainable innovative products and processes to be developed and deployed in the construction sector to multi-scalar strategies to improve building performances.

Starting from the most aggregated level of analysis, the first specific challenge addressed in this volume refers to the possible strategies to relaunch socio-economic development in urban environments through regenerative processes. The key concern, then, is how the regeneration of the built environment can promote not only economic growth processes but also the efficient use of local economic, social and environmental resources, from a circular economy perspective and consistently with sustainability principles.

The second specific challenge relates to the regeneration of urban spaces from a resilient and circular perspective. The key concern in this case is how regeneration of the built environment can be achieved through the reuse and requalification of existing buildings by developing efficient, structurally adequate, resilient, adaptive, flexible and convertible building systems; through the requalification of abandoned and peri-urban areas by planning construction and demolition, by managing and/or reusing building waste, by promoting sustainable buildings, by limiting land use, by activating virtuous and innovative circular processes between primary and secondary materials; and through the requalification of the urban fabric in minor centres by promoting the history and identity of rural villages and peri-urban areas as to favour their conservation and resilience with respect to risk factors such as earthquakes.

The third specific challenge is associated with the development and the deployment of innovative products and processes in the construction sector in the effort to move towards sustainable and circular principles. The key concern then refers to the ideation of new components, products, systems and processes starting from the reuse of existing products and materials that can lead to changes in the construction sector filière as well as to the use of innovative materials aimed at promoting the development of structural requalification technologies and techniques based on the use of materials that have been recycled or can be easily recyclable/convertible, according to a circular economy perspective.

The fourth and last specific challenge is linked to the development of multi-scalar (i.e. from the building to the city) approaches for enhancing the performances of the existing building stock, as well as of the new buildings. This concerns multi-scalar strategies as to mitigate climate change effects by limiting local metabolism, by improving energy efficiency practice, by integrating locally available resources, by diffusing smart buildings, systems and grids as well as by implementing actions to improve the existing buildings and public spaces with the aim of reducing risk factors for individual and collective health, of promoting built environment quality from both a social and environmental perspective along all phases from the project, to construction, from use to maintenance and dismantling.

Addressing these complex fields of research requires the availability and the integration of multiple disciplines that span from engineering to architecture and regional and urban economics and studies. Such multidisciplinary, in fact, enables to disentangle and to unpack the multidimensional nature of all processes impacting

on built environment regeneration. The ABC Department of Politecnico di Milano, with its multidisciplinary faculty composition, is well-equipped to address all these research subjects and has launched over time a series of national and international research projects that explore and analyse in depth how these challenges can be addressed. Additionally, the international openness of the studies conducted at ABC enables a comparison with the most advanced research—basic, applied, technological and project-based—conducted abroad.

In particular, this volume offers a rich and kaleidoscopic selection of the most prominent conceptual, empirical, methodological, technical, case study and project-based researches conducted by the members of ABC and that are the outcome of national and international research projects carried in collaboration with other universities and research centres, also on behalf of institutional and governmental bodies (e.g. UNESCO, UIA, EACEA, EC-JRC, ESPON, DG REGIO); of participation to sectoral boards and committees (e.g. ISO, CEN, UNI, Network Android-Disaster Resilient, IEA, Stati Generali della Green Economy, Green Public Procurement, Associazione Rete Italiana LCA, Lombardy Energy Cleantech Cluster); of dialogues with institutions (e.g. national ministries, regional government, local administrations).

The design of this volume follows the challenge logic sketched above. Accordingly, the volume is organised in four main sections, each addressing one of the four specific challenges listed above and opening with an introduction written by the volume editors. Given the multidisciplinary nature of this volume, the allocation of each contribution in a specific section is not watertight but, in our view, the proposed structure of the volume serves as a useful structure of central themes in the research field on the regeneration of the built environment from a circular economy perspective.

Sara Cattaneo
Camilla Lenzi
Alessandra Zanelli

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Camilla Lenzi has been an Associate Professor of Regional and Urban Economics at Politecnico di Milano since 2015. She holds a PhD in Economics from the University of Pavia and a Master of Science in Industry and Innovation Analysis from SPRU – University of Sussex, UK. From 2005 to 2008, she was a postdoctoral fellow in the Department of Economics of Bocconi University and CESPRI (now I-CRIOS). Her main research interests are in the fields of regional and innovation studies, urban economics, highly skilled worker mobility, and

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Socio-Economic Development and Regeneration of Territories

Sara Cattaneo, Camilla Lenzi and Alessandra Zanelli

Introduction

This section of the volume focuses on the first challenge identified in the Introduction, in particular, on the possibility to relaunch the socio-economic regeneration and development of territories as to achieve sustainability and circularity goals (and not simply competitiveness ones). From this perspective, then, the regeneration of the built environment requires the capacity to gauge economic growth processes and the efficient (and circular) use of scarce local resources, where scarce resources include not simply economic ones, but also environmental ones.

Accordingly, the analysis of territorial regeneration requires a multidisciplinary perspective and the integration of different scientific competences including competences in spatial economic analysis, urban studies, evaluation studies, sustainable technological project design and development.

This section of the volume, thus, proposes a selection of contributions that covers all these different disciplinary fields. The contributions collected in this section are organized according to the perspective adopted, namely a comparative analysis at the aggregated urban scale across cities vs an in-depth analysis of single cities and areas within cities.

The first group of papers sets the analysis at the aggregated urban scale by adopting a comparative perspective on European cities. In particular, Camagni et al. provide a historical outlook on the evolution of economic thought concerning the development of cities and their performance with particular reference to the European context. Next, Capello et al. investigate the role of culture, cultural heritage and creativity as territorial assets and their impact on the socio-economic development of cities. Lenzi and Perucca complement these perspectives by examining the impact of urbanization, city size and city development on residents' well-being in European cities and for different types of cities. Lastly, Fratesi and Perucca propose an analysis of the role of different territorial endowments, i.e. territorial capital, for the resilience of European territories to the economic crisis

and the effectiveness of local development policies in different contexts characterized by different territorial capital endowments.

The second group of papers sets as well the analysis at the urban scale while focusing on single areas/neighbourhoods within cities. Within this group, two subgroups can be identified depending on the specific dimension emphasized in the analysis. The former focuses on the analysis of territorial transformation in specific areas of a city while the latter concentrates on the technological project dimension of such transformations.

In the first subgroup, Merlini offers a conceptual reflection on the relationship between territorial regeneration and demolition. She proposes a new interpretation of this link that departs from the view of demolition as reparation or precondition for a valourization project. Instead, she proposes a view on demolition as a project tool for the reconfiguration and transformation of the built environment. Sdino et al. propose an overview of the state of the art of evaluation methods for the economic assessment of urban transformations complemented by the analysis of a peri-urban transformation in Italy.

In the second subgroup, Mussinelli et al. discuss public spaces valourization, urban landscape requalification, adaptive regeneration of degraded areas and advance a new approach to project development with the aim of targeting sustainability and resilience to climate change. Next, Mussinelli et al. reflect on the relevance of integrated and multidisciplinary approaches for peri-urban landscape project development, for architectural heritage valourization and for agriculture socio-economic value in the management of places. Lastly, Pavesi et al. propose a case study analysis on the possible drivers and strategies to improve real estate management, resources and processes and their valourization according to a social and circular economy perspective.

Reusing Built Heritage. Design for the Sharing Economy



Roberto Bolici, Giusi Leali and Silvia Mirandola

Abstract In the last years, the construction sector has seen a greater number of building interventions on existing assets rather than the realization of new buildings. The enhancement of urban property assets can become an opportunity both for efficient and effective building management and for the offer of innovative public and private services on the territory. With this approach, based on sustainable urban regeneration, the enhancement could be intended in many different ways such as recovery, maintenance, and reuse of abandoned or underutilized buildings. This phenomenon, present in general in building assets as a whole, is more evident in the management of the public ones. The reuse of these buildings acts as an answer to a change in the needs of the community regarding welfare, culture, and work, generating a new economic, social, and environmental value. In relation to their innovative features, the new functions related to the real dimensions of sharing are emerging, and with them a new approach to the project. The increase in these new kinds of sharing and the insufficient knowledge about design and management of the relative “box” have allowed for the development of the study entitled “Enhancement of abandoned or underutilized assets. Design for coworking.” The main goal of the study was to define, within the logic of environmental technology design, the key points of this framework. This was possible thanks to the collection of data which was useful to increase the knowledge regarding the design of these places within abandoned or underutilized buildings and their management.

Keywords Coworking · Urban regeneration · Sharing economy

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© The Author(s) 2020

S. Della Torre et al. (eds.), *Regeneration of the Built Environment from a Circular Economy Perspective*, Research for Development, https://doi.org/10.1007/978-3-030-33256-3_29

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1 Introduction

The Europe 2020 Strategy of the European Union has assigned a fundamental role to cohesion policies in the socioeconomic development of the territory. The implementation of these policies requires the enhancement of a more efficient and competitive economy that is more attentive to environmental issues, including in terms of building recovery and land consumption (sustainable growth); support for employment, especially youth employment, to foster social and territorial cohesion (inclusive growth), and finally, the development of a knowledge and innovation economy (smart growth).

Strategies necessary for achieving these objectives are the optimal use of resources and financial opportunities in key economic sectors and the structuring of an integrated and coordinated approach to interventions. The synergic activation of these elements offers new opportunities for businesses and the community, boosts local development, strengthens coordination between community, national, and sectoral policies and broadly facilitates the process of territorial cohesion also through the 'activation of a partnership between local and regional actors, social partners and civil society'.

Within the scenario envisaged by the European Union, the issue of social inclusion, as a way of favoring a better and full integration of the individual within the social and economic context in which they live, is brought back, in addition to the sphere of welfare, to labor policies. For the community, employment is an indispensable prerogative for accessibility to the services and opportunities created by economic growth, in fact, through processes of inclusion and reduction of social hardship, it becomes both a recipient of interventions or services and an active agent of economic development, social life, and the well-being of a territory.

The international economic crisis characterizing the last decade has brought to the forefront the problem of unemployment, especially youth unemployment. A possible way of looking into this issue is the activation of multilateral and innovative collaborations, involving public administration, social parties, educational institutions, communities, and young people (International Labor Office 2012), for the construction of projects that facilitate youth entrepreneurship, which represents an opportunity for local businesses that can draw innovative elements from this, starting from the skills of young professionals and incorporating them into their companies.

The sustainable growth promoted by the European Union is also implemented through rational use of resources and finds in the theme of urban regeneration and therefore the reuse of real estate a wide context of experimentation.

The theme of urban regeneration in a sustainable way represents a priority aspect in the development policies of cities as it offers, on the one hand, the opportunity to trigger architectural, environmental, energy, and social redevelopment processes of urban centers, starting from the reuse of already existing real estate assets. On the other hand, there can be important social and economic consequences from the transformation of degraded urban areas into real catalysts for creativity and

innovation. The recovery and strategic management of the abandoned heritage can significantly influence the entire “urban context due to its location in central and valuable areas and to the possible historical and artistic value, thus constituting a precious resource, not only in immediate monetary terms, but also as an element of requalification and growth for large portions of the urban fabric which could increase their value and become attractive for investment” (Baiani and Cangelli 2012).

In this scenario, the enhancement of the underutilized or disused public heritage, implemented through the reuse of that which is built, in addition to being an opportunity in economic terms and rationalization of the expenditure of local administrations, represents an opportunity to experiment regeneration interventions in urban centers. By investing in aspects such as technological innovation and environmental design, this real estate asset is the cornerstone on which to structure a broader strategy to rethink the entire city through the definition of a new network of spaces within consolidated urban fabrics and of alternative functions to those now acquired over time (Ottone et al. 2012).

By this logic, the local administrations are defining new destinations of use for the high quantity of underused or abandoned buildings to give them new value (Manzo 2007) and to respond to the changing needs of the collectivity in terms of welfare, culture, and work. With respect to the panel of possible new destinations, and in line with European labor policies, the functions connected to the performance of “collaborative” work activities linked to a sharing economy emerge due to their innovative nature. The collaborative economy does not propose “merely a new consumption model, but also an alternative way to move (carsharing), to lend (crowdfunding), to work (coworking), to learn, to travel, to be together, to eat and therefore to live” (Maineri 2013).

The “containers” of the collaborative economy therefore provide, on the one hand, a response to the need of public administration to assign a new functions and to make assets that are disposed of or underutilized their own. On the other hand, they offer emerging professionals the opportunity to use their skills in innovative work spaces that allow them to “incubate” their ideas by putting them in a system with those of others and then being able to propose them in a more competitive way to the “outside.” The positive effects, following the activation of these containers for the collaborative economy, are also to be sought in the “talent gardens” provided to local companies, capable of encouraging the innovation in socioeconomic terms of the territory.

2 Collaborative Economy Platforms. Analysis and Study of a Growing Phenomenon

The growing increase in collaborative work¹ and the lack of knowledge in planning and management aspects have stimulated the development of the study entitled “Valorisation of abandoned or underutilized real estate assets. Design for coworking²” (Bolici et al. 2015). The study, starting from the recognition of a wide and detailed reading of the national panorama of the sharing economy spaces and in particular of those for coworking, allowed us to extend and put systematic design and management indications in order to structure a design concept—with a management that is declinable in relation to the peculiarities of the different contexts (Fig. 1).

Currently in Italy, there is a constant increase in places where it is possible to work together, collaborating and creating a community that uses the same environment: these spaces can be identified with those for coworking, talent gardens, and Fab labs. The term coworking does not only define a physical space but refers to a real style of work-oriented toward sharing an environment, which, however, leaves users with the possibility of developing independent activities. In the talent gardens, in addition to sharing spaces and services, new ideas are formulated for the development of economic activities capable of evolving into start-ups and projects. Finally, the philosophy at the heart of Fab labs is the sharing of ideas and the promotion of sustainable technological development in order to bring innovation and technological knowledge to the territory in which the laboratory operates.

To present a cross section of the containers for a collaborative economy present at national level, the study involved a desk analysis of the dedicated platforms and of the sector literature and of questionnaires given to the space managers; the survey embraced 422 case studies, collected in a database.

84% of the spaces analyzed were coworking, demonstrating that within the national territory, this platform is the one that best responds to market demands, anticipating lower start-up costs compared to the infrastructure of spaces that must support a Fab lab and not requesting specific managerial skills, which typical of a talent garden. The geographical distribution has shown that 65% of the collaborative economy has developed in the northern part of the national territory; specifically for coworking spaces, a high concentration was recorded in the Lombardy region (over 30% of the total), particularly in the Milan area and in its hinterland.

Given the importance in quantitative terms of coworking spaces, the research has looked closer into this new working reality from the point of view of inclusion in the local settlement system, of the location within a given architectural typology, of the type of building intervention, of the surface, of user capacity, of the functions present within the containers, and of the management models. The analysis showed that the placement of the spaces in relation to the context sees a greater presence in

¹As noted by the “1st Annual Global Coworking Survey” conducted by Deskmag.

²The research project was commissioned to the UdR TEMA of the Mantua Research Laboratory of the Politecnico di Milano—Mantova Campus by PromoImpresa Borsa-Merci—Mantova Chamber of Commerce.

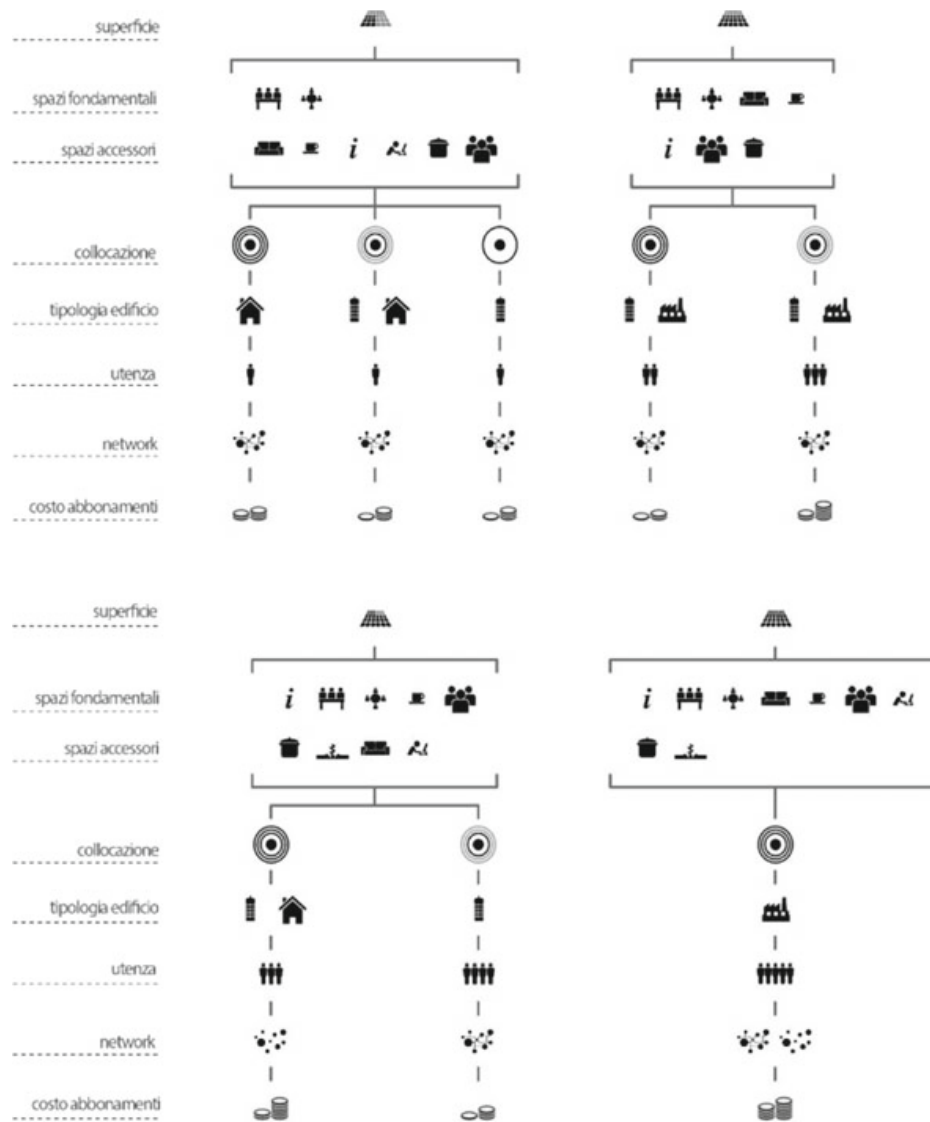


Fig. 1 Comparative matrix

the urban center (71%), followed by the peripheral areas (25%), while it is minimal in isolated contexts (4%). As for buildings, the tendency to recover buildings (90%) was recorded rather than the construction of new buildings; this observation supports the principle of sustainability at the core of the collaborative economy, which sees the redevelopment of what already exists as an opportunity to make these spaces active once more and reduce land consumption. As the coworking spaces are generally located in existing recovered structures, it was also interesting to note that around four-fifths of them refer to residential and commercial buildings with a slight prevalence of residential buildings, while only a small part is located inside industrial buildings.

The analysis showed that 72% of the containers have an area of less than 250 m², particularly between 50 and 100 m². Given the small surfaces, most of them can

accommodate a small number of people (from 1 to 10); this size, while not contributing on the one hand to generating significant economies of scale, on the other hand, it does favor the creation of communities.

The essential functional spaces within the various containers surveyed have been traced back to four major categories: work spaces (meeting room, open space offices, study room, conference room), service spaces (reception entrance, kitchen), spaces for additional services (library, laboratory), and recreational spaces (refreshment area, relaxation area, outdoor space). Starting from the analysis of the existing realities, a hierarchy of these functions has been articulated based on their diffusion, which has allowed us to determine as open spaces of a coworking environment open space offices (easily adaptable and flexible spaces) that allow the users to work inside a large environment that stimulates collaboration, as opposed to a traditional office, and meeting rooms (necessary to hold meetings without disturbing other coworkers). Given the prevailing informal nature of these platforms, the relaxation areas and the refreshment areas (spaces equipped to encourage dialog between coworkers) are fundamental for the creation of an environment that favors socialization and sharing. Complementary to these spaces are the study rooms and private offices, or spaces intended exclusively for certain users, and the congress rooms structured to host presentations and events. In a smaller number of cases, the presence of a room equipped as a kitchen and spaces for library and laboratories was detected; in this case, it is a hybrid coworking platform, with features more common to the Fab labs.

With respect to the theme of space management, it was found that the manner is exclusively private, more than a quarter of the platforms analyzed adhere to a network and in only 10% of the cases analyzed, in order to make use of the spaces, a membership is required. Particularly, joining a network allows for the community of a coworking environment to increase exponentially by creating an ecosystem of relationships in which proposals are activated and contaminations develop in the entrepreneurial and professional sphere, particularly at the level of freelancers and small work teams. The advantages of belonging to a network are generally the use of a brand, having basic advice available for management and presence on the media and on social media, increasing the visibility and knowledge of the structure toward possible coworkers present in the territory.

The subscription costs that a user incurs per year to use the spaces are on average between €1000 and 3000; the peaks noted refer to platforms that do not adhere to the network, since adherence to networks generally leads to price control.

To obtain a cross section of the analyzed realities and to provide a methodological direction for the design of coworking spaces, a comparative matrix has been elaborated which has systemized the information concerning the functions with the surfaces, the location, the types of buildings hosting these activities, the number of users that can be hosted, network membership, and, finally, the annual cost of subscriptions. The reading of the matrix, consisting of four sections defined according to the extension of the surfaces of the collaborative platforms and their geographical location, has revealed that the spaces with reduced dimensions (0–250 m²) find a preferential position in central areas, peripheral areas, and in isolated contexts, within

residential and commercial building types. Since the platforms are small, they consequently have a reduced capacity and rely on existing networks to develop their business. The subscription cost is lower for spaces located in the suburbs or isolated areas. The spaces with medium-small surfaces (250–500 m²) find a counterpart only in the center and on the outskirts where they are located within commercial and industrial buildings. Also in this case, joining a network is a characterizing element. Access to spaces has a higher cost in peripheral structures than in central ones. The realities that have medium-large surfaces (500–1000 m²) are located in central and peripheral contexts, mainly occupying buildings for commercial and residential use and increasing the number of users that can be hosted. In this category, joining networks is not widespread. There is a noticeable difference in the cost of subscription between central and peripheral facilities. Platforms with large surfaces (more than 1000 m²) are generally located in central areas within disused industrial buildings and provide a high number of workstations. The cost of subscriptions is medium-high and, as in the previous class, network membership is not a characterizing element. Finally, reading the information in a transversal manner, a number of elements characterizing the entire system emerge, such as the direct relationship between the increase in number of functions and the increase in surface area and between users and surface area, the preferential location in urban centers, the commercial building as prevalent building typology, the frequency of adhesion to a network, the proportion between the cost of the subscriptions proposed to the coworkers and the dimensions of the surfaces, and therefore of the functions offered, and the greater cost for access to platforms located in historical centers.

3 Proposal for the Definition of a Project-Management Concept

The analysis of the spaces present in the analyzed collaborative platforms made it possible to define the reciprocal relationships between the functions present in a coworking environment. The study of the relationships between the spaces has allowed us to conduct a synoptic reading of the different elements that structure the containers for a collaborative economy, and to define a concept of articulation of spaces, paths, and use of services over time (temporary, Fig. 2, medium, Fig. 3, and long, Fig. 4, term).

The spaces destined to be used by users on a temporary basis (e.g., daily use) are located near the entrance and are inserted along a path that allows users to reach only certain functions within the coworking system (open space office, refreshment area, services, conference room, and meeting room). Users who use spaces in a more structured way, but that are limited in time (e.g., weekly–monthly use), can benefit from additional services according to a growing level of accessibility to spaces (flexible open-space work area, kitchen, relaxation area), to the external space, to the library, and to the laboratory. Finally, users who use the space with greater

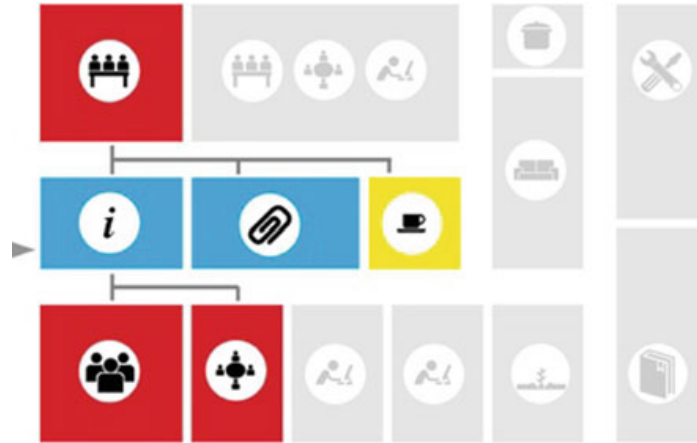


Fig. 2 Route and function diagram—temporary use

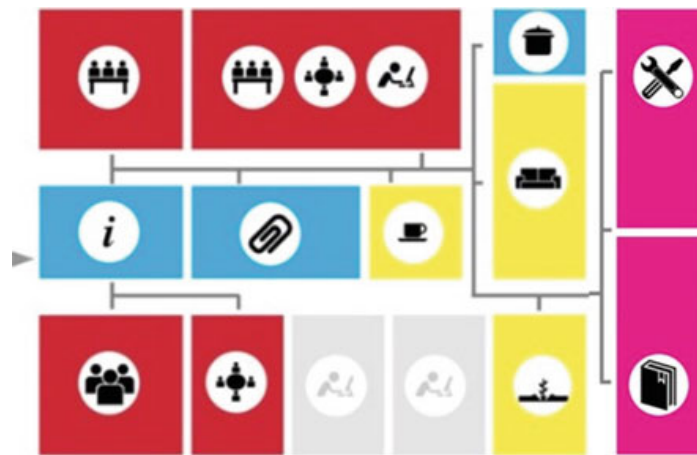


Fig. 3 Route and function diagram—use in the medium term

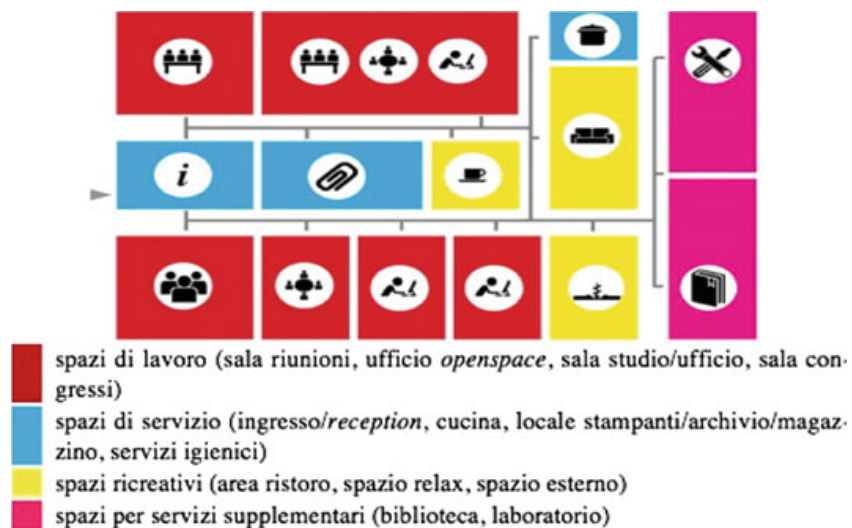


Fig. 4 Route and function diagram—long-term use

continuity over time (e.g., six months a year) have the opportunity to occupy the premises characterized by a greater level of privacy (offices).

The 24-h coworking spaces can be managed in different ways depending on the services offered by the platform. A basic operation is foreseen with daytime opening times from 7 am to 8 pm with the possibility of evening openings on certain occasions (exhibitions, events, meetings, etc.). A second management mode allows for the use of the spaces 24 h a day to allow access to workstations and to different services even at night.

The study saw the predisposition of a pre-dimensioning matrix that linked both the minimum reference surfaces with the maximum number of users that can be hosted and the percentage weight of a function in relation to the total surface. The reading of the matrix has revealed a number of observations regarding the surfaces: the extension of the work environments has a constant percentage weight in the different spatial solutions, while the surface of the service spaces decreases in proportion to the increase in the offer of activities. As the extension of coworking increases, the percentage of area used for recreational areas remains constant. Finally, the surfaces dedicated to paths are contained given the prevalent open-space aspect and the need to share the structure's spaces.

As described in the introductory passages, the refunctionalization interventions can constitute an effective response to the many questions of change expressed by the community, and although they are yet to represent a single narrative capable of communicating adequately with administrators, they prove to be a privileged field for the experimentation of models of public-private management of real estate assets and integration between economic activities and cultural and socioeconomic functions (Bacchella et al. 2015). The question of reuse becomes an architectural issue since the identification of the new functions cannot be separated from an evaluation of the architectural, typological, and technological characteristics of the building and the peculiarities that characterize the territorial area of reference. The presence of these endogenous and exogenous factors triggers specific problems: for buildings characterized by cultural values, a conflict is generated between the instances of conservation and transformation due to the inclusion of new activities. At the same time, new settled activities can produce positive effects on the surrounding area if they are able to trigger widespread recovery processes of underused areas or can have negative effects if not effectively managed (De Medici and Pinto 2012).

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