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Data Challenge. Re-thinking the library as a learning space to intersect youth, culture and gender diversity

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The COVID-19 pandemic has had a major impact on public spaces, which has become an urban variable that changes people's mindset and perception about their use, fruition, affection, and considerations. The Data Challenge project research identifies a common thread between gender-related data, public spaces of libraries and the approach of younger generations to cultural facilities. Service design methodologies can support change in the public sector and foster democratic processes in the co-creation of knowledge. The research uses two main pillars: design research and practices to innovate existing services for young people and "Citizens as scientists" processes to analyse quantitative and qualitative data. The methodology implemented is a replicable tool for Citizen Science projects based on horizontal and vertical research actions to identify existing data and communicate complex social phenomena related to young people, culture and gender diversity. The research activities aimed to build skills in young generations in the field of professional orientation, such as understanding inclusivity and gender equality, through collaborative and laboratory activities in school spaces and out-of-school spaces. Challenges investigate relationships and perceptions between young people and culture, experiment with data analysis and visualisation, and create product/service prototypes.

Keywords: libraries; data visualizations; learning space; community-led knowledge

1 Introduction

Over the last four years, the upheavals we have witnessed caused by the COVID-19 pandemic produced a major impact and significant social repercussions in many areas concerning the city and urban life.

One of the most surprising impacts is certainly related to public space, which has always been considered an invariant of the city's layout: a square, a street, a museum, a station, with their own main functions and rules of operation. Throughout the aftermaths of several crises, not only the pandemic but also the climate crisis or the current geopolitical conflicts, it is evident that public space is an urban variable that changes people's mindset and perception about their use, fruition, affection, and considerations. And this transformation is never-ending because it is continuously influenced by

individual status and by the restrictions/conditions of that historical moment. Even the name by which public space is defined is changing with increasingly catchy terms: urban ecosystem (Tuhkanen et al., 2022), proximity infrastructure (Bosco et al., 2021), community space, etc.

1.1 Design cultures and the spatial dimension

For scholars and practitioners involved in design cultures, the strong potential of overcoming the spatial dimension of public places to become nodes of new services, technologies, human-centred products, and human-nonhuman relations seems clear. This continuous process of updating public spaces is supported by policies and practices that, experimented in the pandemic period and in a prototypal form, are becoming established with different declinations within cities. The space's connotation becomes multiple and more focused on citizens' needs, which can be mapped through sensors and technological devices, and consequently transformed into specific and situated projects or become spontaneous practices of change. Just to mention a few initiatives, both connected to indoor and outdoor spaces: museums and historical buildings turned into climate shelters in the city of Barcelona (Cartalis, 2020); the libraries in Vilnius where boys and girls with specific needs can participate in listening groups; the Alzheimer's garden in Parma; the transformation of Piazza Rossini in Bologna after the prototype phase which culminated in the development of a method for all temporary transformations, such as the school squares in the city; urban parks that become service ecosystems; the St. Kields project in Copenhagen where through the Storm Surge Plan in 2017 (Gianfrate & Longo, 2017), "storm gardens", "water boulevards", "water plazas" and re-naturated surfaces created an integrated system of green streets and small pocket parks as retention zones and water basins.

To complement these structured initiatives, we can also list spontaneous or temporary projects linked to specific events. One of these examples refers to the debate with city authorities promoted by Fridays For Future Movement in Milan in 2019 at Triennale di Milano Museum, where the Exhibition "Broken Nature, Design Takes from Human Survival" was ongoing: the space dedicated to the exhibit becomes a place for intergenerational discussion, thanks to the reflection stimulated by the showcased artefacts. Another case study is Piazza Lucio Dalla in Bologna, which picks up the legacy of a participatory project from more than 10 years earlier to become a multi-season open-air third place (Oldeburg, 1989) for different ethnic groups inhabiting the neighbourhood. By deepening the processes and dynamics related to these case histories, it is possible to notice the emergence of a win-win condition: the public space is nurtured by the presence of people, increasing safety perception and risks reductions, and at the same time, there is an activation of dynamics of education, indirect communication and awareness-raising beyond the citizens involved and indirectly on the whole communities. The awareness-raising action acknowledges people's human and urban conditions and offers tools for new conceptualisations in response to uncertainty, exception and necessary transformation.

1.2 The intersectional approach

The space could be interpreted through the experience that both humans and non-human beings have in that environment, which is strongly impacted by the characteristics of the context and the individual's condition. This new perspective shifts the focus from the design of space, as an expression of its predetermined material and functional components, to an intersectional approach, in which

public space adapts to the characteristics and conditions of those who frequent it, offering elements of personalisation and different degrees of autonomy.

There is an animated debate among scholars and policymakers investigating and operating at the city level about the new role of public spaces and facilities in the 15-minute city, the 30-minute city, the smart city, the educating city, the gender city, etc. Each of these definitions (and related policies) generates diverse and challenging fields whose impact on people and citizens, in a broader sense, should be analysed in terms of enabling/limiting wellbeing by the context. Space, places, functions design should focus on the capacity to increase knowledge and action to generate greater inclusion, new information and data flows, new stakeholders, and to animate reflection on possible futures. In the general research framework about public spaces, this paper presents the results of Data Challenge: a two-year research project about libraries and their social turn from places of collection to places of connection (Golten, 2019). The project insists on the existing narrow relationship between the use of the space library and their role in the field of active cultural participation, which could improve citizens' quality of life as defined by previous studies (Fancourt & Finn, 2019).

Considering the European context, many examples of libraries that are improving their services could be individuated, becoming, in some cases, Community Centers (as in the case of Marvila, Lisbon, or the skills service at the Curve in Slough, the LAHSA Homeless Services of Los Angeles) or improving their spaces and technological infrastructures in order to offer to their users extend experiences. Another topic which is addressed in the Data Challenge project is related to the high amount of data that is included and described in a library in relation to collections, archives and to users' habits or to relations with local associations and entities, such as events and initiatives organised within the libraries' premises. This amount of data and information may contribute to making visible the role of public libraries as meeting places and cultural arenas and reflecting their responsibility as active communicators of knowledge and culture. On the other hand, there is a lack of clearly defined frameworks in data-collection processes for public libraries at the European level (Deppe & Schmock-Bath, 2021), and there is a problem related to a drastic reduction of young people's participation in the use of library services, in particular with regard of people starting from 15 years old[1]. This reduction is significant compared to other data related to a tendency of increasing early school leavers or a lack of psychological well-being in young people. Giving evidence to a) library-related knowledge through new forms of data visualisation and to b) the need for new tools to bring Z Generation2 closer to the Library as a common good, represent the two main drivers of the research conducted and whose results will be presented in the following paragraphs. As explained later, these incipits have found a possible point of contact in experimental actions arising from the realisation of specific research actions developed by the Advanced Design Unit of the University of Bologna.

The topic of the "collective learning system", which the research unit investigates, led to a reflection on new forms of innovation in the educational system through design. The recent editions of the FutureDesignEd Symposium in 2017[3] and 2020 highlighted a fundamental issue of the current

[1] https://www.istat.it/it/files//2022/04/BES_2021.pdf
[2] https://www.gwi.com/reports/generation-z-eu5
[3] https://events.unibo.it/futuredesigned-2017

educational research frames: to start by considering attitudes, skills, methodologies, and values that students can acquire through a process of learning through freedom and responsibility (Bosco & Gasparotto, 2021). Moreover, the concept of innovation in education by design is always becoming more strategic by considering alternative training realities based on approaches and tools from the design cultures (Celaschi, Formia & Vulpinari 2021).

1.3 A responsible process of design

The principles of responsible innovation (Bailey et al., 2016), combined with the ability of design cultures and practices to connect and activate cross-sectoral and inclusive relationships, have led to extending traditional educational horizons and looking at new forms of collaboration between universities, cities, territories, and public administrations. The research team therefore experimented with new design processes to conduct synergic educational actions between high school students, university students, university and high school professors, while creating collaborations with local authorities, businesses, and organisations. These processes were developed in the two editions of the 'POT/Design' project (2018-2020), funded by the Italian Ministry of Education (MUR) as part of the Orientation and Tutoring Plans (POT). Thanks to shared objectives among design courses among Italian universities, during these experiences secondary-school students have experienced a path capable of guiding them towards a more informed choice about their future. The chosen format is didactic-exploratory workshops for developing digital skills and recognising vocations (Formia et al. 2020). This background has been capitalised in defining a more complex initiative, such as the "Data Challenge – Youth and Culture"[4,5], a joint action between the Municipality of Bologna and the Advanced Design Unit of the University of Bologna. The project aims to investigate and raise awareness of gender diversity in the relationship between libraries in the urban context of Bologna and students from 16 to 25 years old. The experiments in Data Challenge aim to adapt design thinking approaches and practices with different target groups (young students and their teaching staff, university students, library operators, etc.). Moreover, the project investigates the adoption of a data-driven methodology to reduce the data gaps about gender and municipal services and facilities in the city of Bologna.

2 The Data Challenge methodology

Data Challenge designs a combined methodology to face the complexity of the activities proposed, and it is based on two main pillars:

1. The actuation of design research and practices around the topic of "design with and for the city". With the aim of innovating an existing service for the benefit of a specific target, i.e. young people, it activates forms of co-design for possible solutions with those directly concerned. Within the Data Challenge project, educational paths have been activated with the students enrolled in the Industrial Product Design Course at the University of Bologna. These initiatives had a dual purpose; a) prototyping products and services that can have a

[4] PON Metro REACT EU - L'intelligenza artificiale e le nuove tecnologie per la trasformazione delle biblioteche Bo.6.6.1b - "Progetto Data Challenge giovani e cultura". CUP: F31B21004110006-CIG: Z6A3A861F6

[5] https://sites.google.com/view/data-challenge/about?authuser=0)

positive impact in terms of the use of libraries by young people, based on their direct feedback; b) increasing youth knowledge in design cultures. In this sense, the spaces and services of a city become both a design subject and an expedient for the training of young designers.

2. The activation of "Citizens as scientists" processes. In order to understand existing services through the analysis and processing of data, it is necessary to analyse both quantitative data, coming from existing databases and providing a description of library services, and qualitative data, related to young people's perceptions of the use of services. Accordingly, the educational paths activated with high-school students included field observation activities carried out directly by young people to identify gaps or strengths in Bologna's libraries. The programme, Percorsi per le Competenze Trasversali e per l'Orientamento - PCTO (Transversal Skills and Orientation Pathways), was promoted under the Italian Law 145 of 2018 to gather qualitative information and to provide skills enhancement, both in terms of design research and data literacy. This exchange between the academic sector and the public (on the one hand, academia provides skills to the citizens, and on the other, citizens provide data and information to academia) has to be considered as the experimentation of a replicable tool for Citizen Science projects, which is configured as an experience that should bring benefits (in terms of information and skills) to both parties involved (ECSA, 2015).

To achieve effective and measurable results (in qualitative and quantitative terms), Data Challenge methods are based on:

- horizontal research actions, i.e., transversal throughout the project, aimed at identifying existing data with respect to the topics of interest and their analysis and processing. The aim of these actions is to individuate gaps in existing data; to visualize these data and finally communicate complex social phenomena related to the relationship between young people, culture and gender diversity in the context of libraries;
- vertical research actions, i.e., actions that have been activated for defined periods within the project, aimed at enhancing digital skills in the target audience and at building greater awareness of the proximity of public services, particularly libraries.

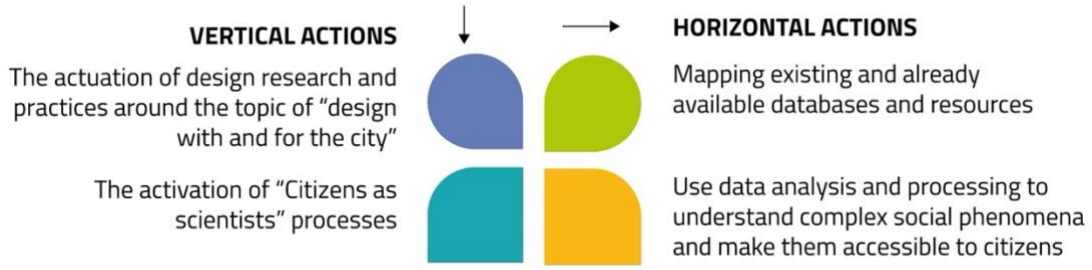

Figure 1. Representation of Data Challenge methods

The project "Data Challenge, Youth and Culture" has been developed following a design-driven research-action methodology based on readings and data extractions from existing databases of the Municipality of Bologna and the University Libraries system; in order to stimulate proximity to urban knowledge infrastructures, data literacy, peer collaboration and design processes, the research team carried out gender and inclusiveness-oriented data-interrogation and experimentations with target groups of young people in transition to adulthood. The implemented activities allowed the validation

of multilevel training models related to gender equality issues, “data” skills and the topic of STEAM (Science, Technology, Engineering, Mathematics + Arts) in a creative and design-driven way.

3 Data Challenge, Youth and Culture: implementation and results

The action research activities can be divided into 2 macro-project lines:

1. Context-specific co-design workshops with and for high schools which involve teachers, university students and high school students.
2. Context-specific co-design Intensive workshops with product/service design students to design products/services for neighbourhood library contexts.

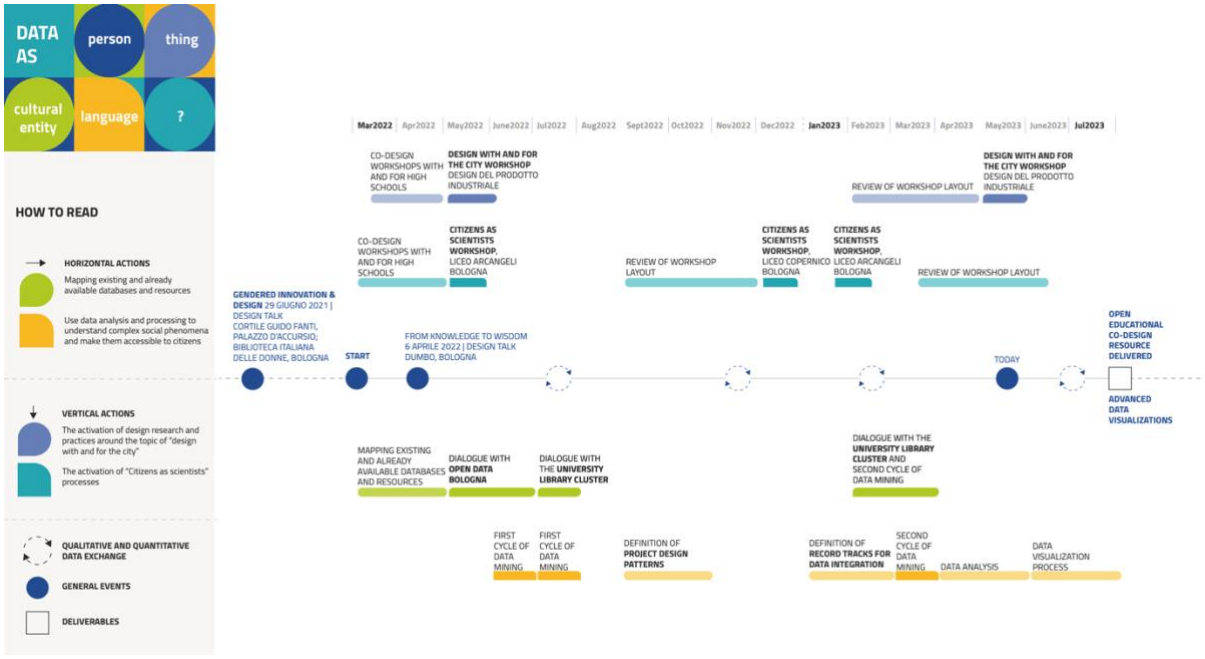

Figure 2. Timeline of Data Challenge activities

The project concluded three experimental workshops, from May 2022 to February 2023, with high-school students involved in three secondary school classes in a course called 'Osservo/Partecipo' (Observe/Participate). The designed format consists of workshops organised with and for high schools, implemented and facilitated by researchers and first-level university students, building partnerships between universities and high schools in PCTO paths. The activities carried out have adopted methods and techniques typical of the Design approach, aimed at building skills useful for the future studies and/or work activities of the students involved, in an orientation perspective. The experimentation aims to build future scenarios to co-design the "Library of the Future" guidelines, interpreted through a perspective of gender equality and inclusiveness. The topic was approached by considering gender as a factor interconnected with other social categories, such as ethnicity and class. This led to the term intersectionality (Crenshaw, 1989).

Among the specific objectives of the work packages, it is certainly to introduce the high school students to some methodologies of investigation and research (desk research, field research) through collaborative and laboratory activities in school spaces (also including school Libraries) and out-of-school spaces. The plurality of locations aimed at enhancing teamwork and exchange with a

constructive comparison with the experience of students from the University; moreover, the goal was to provide high school students with useful tools to orient them to future educational paths and choices through exercises based on "learning-by-doing" approach, in order to convey a methodology of active and creative thinking in problem-solving, typical of design processes.

We can identify three key challenges characterising the proposed education model, which respond to developing specific skills.

The first one, named "Understanding inclusivity and gender equality" aims to reflect on the topic of inclusivity in an open manner, to be understood as the foundation underpinning a process of research and investigation, in which students are involved in a guided brainstorming activity and desk research of articles and case studies to co-design a paper summarising the outcomes.

The second challenge, "Investigating to know", aims to investigate the relationships and perceptions between young people and culture by directly experiencing the context of libraries, starting with the school library. The students involved were guided in constructing an interview with an expert subject (librarian) and using some observation techniques typical of service design, such as Shadowing and Service Safari.

The third challenge, “Analysing and visualising”, aims to experiment with a basic data analysis and visualisation process, both qualitative and quantitative, through the open tool DataBasic.io, a suite of easy-to-use web tools for beginners that introduce concepts of working with data and favour data literacy.

The end of the work phase involves the delivery of an output of the research carried out by the young student-scientists in the form of a poster or a journal article containing graphs and visualisations of the data analysis process. The process for creating the output followed design fictioning techniques (Dunne & Ruby, 2013). In particular, students wrote the article imagining the newspaper output of 2030, reasoning in a long-term perspective about the future library's characteristics.

Figure 3. Graphical outputs realised by Arcangeli High School students during the first PCTO course. These elaborations are the results of a process of data collection and analysis carried out by the students involved.

The second pilot of intensive workshops addressed students (about 50 per workshop) of the Industrial Design Course at the University of Bologna. The design process focused on creating product/service prototypes to improve the relationship between young people and culture in Bologna's municipal libraries. The research team selected the investigation areas in collaboration with the Libraries Sector of the Municipality of Bologna, i.e., one library per district. The intensive workshop occurred in the "Communication and project prototyping workshop". The workshop had a total duration of a month and was developed in 3 macro steps:

1. For the first meeting, an open design talk was organised to introduce the complex issues that will be addressed by the data, culture, gender, to the participating students. The talk took place in the Biblioteca Salaborsa library, which has a central role in the municipality of Bologna, involving experts in the field6.
2. The second phase focused on qualitative and quantitative data collection on the topic of the library's role as a proximity service, through tools such as online surveys, interviews, Service Safari, and Shadowing.
3. The third workshop phase enabled the students to create prototypes of products/services that were presented to the Municipality, to cultural operators and to librarians working in the 5 municipal libraries involved during the presentation event on 1° June from 10:30 to 12:30 in Sala Borsa Lab - Roberto Ruffilli7.

The topics addressed by the students in their projects were multiple and useful in starting a dialogue on key issues such as a) the need for greater transparency and accessibility of public places, both digital and physical, b) the need to expand and implement the services offered and their comprehension of the library and public spaces in general, especially for young people, and lastly c) a reflection on the central role of the indoor and outdoor physical space of cultural neighbourhood places.

Figure 4. One of the outputs realised by Industrial Product Design students. The image shows renderings of a product design project elaborated for the Louis Borges Library

[6](https://corsi.unibo.it/laurea/DesignProdottoIndustriale/bacheca/design-talk-le-biblioteche-di-bologna-spazio-servizio-risorsa)

[7] (https://www.bibliotechebologna.it/biblioteche/salaborsalab).

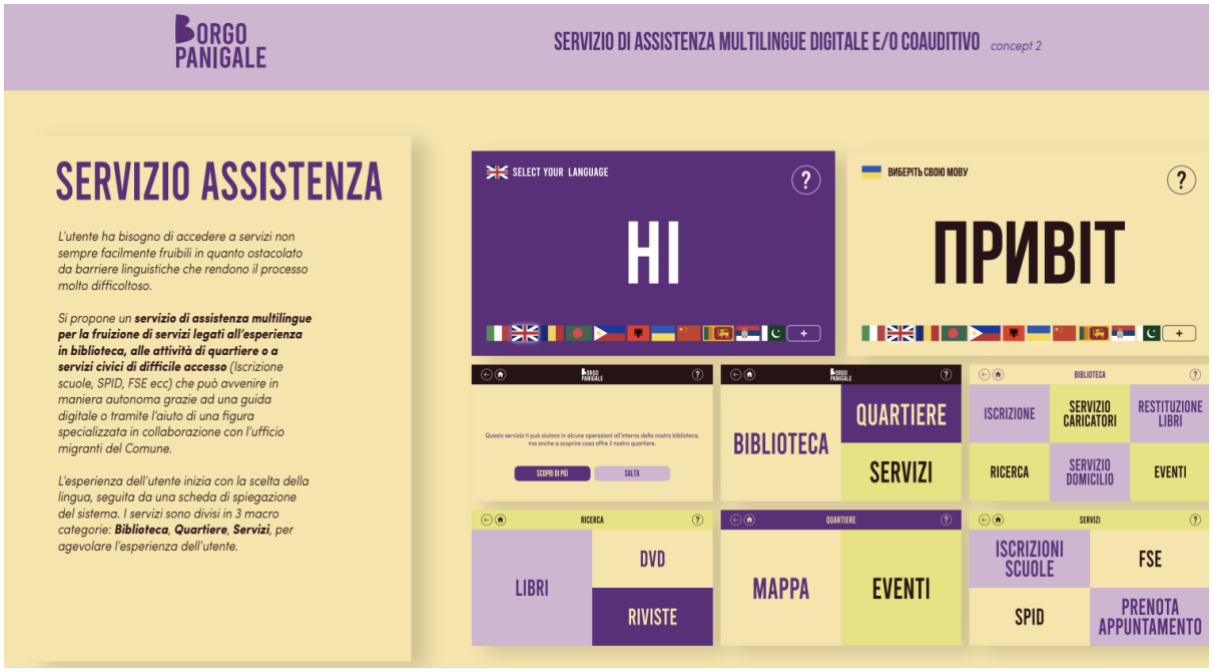

Figure 5. Homepage of the digital touchpoint prototype of the project realised by Industrial Product Design students for the Borgo Panigale Library.

Figure 6. Graphical outputs created by Industrial Product Design students. These are part of the prototype of a service prototype aimed at enhancing the cultural use of the Scandellara Library.

4 Conclusions

The Data Challenge project is characterised in an original way by the interplay between three main areas of research and action: the world of gender-related data and the adoption of design techniques to increase the data literacy and reduce the data gaps, the public spaces of libraries and their

interpretation as a common good through the provision of people-centred services and the approach of the younger generations to cultural facilities through direct actions of exploration and intervention. This iterative process fed on the various components investigated, aiming to integrate the results achieved and make the Data Challenge phases more effective. The possibility, for example, of activating two cycles of experimentation both with high schools and through the workshop with university students made it possible to refine the tools and phases of the applied methodology, with a twofold purpose:

- to make the field experiments more adherent to the needs of the students, and strongly situated in the process of incremental knowledge of languages, cultural models to improve the self-awareness and the recognition of social stereotypes and provoking their overcoming, specific characteristics of each library involved. Furthermore, mapping the perceptions and expectations of the younger generations in relation to libraries was a discussion material of great interest for the city's Library Sector, which is working on overcoming the attendance gap in the 15-23 age group. Building future scenarios is the object of the co-design phase to create shared guidelines for the 'library of the future', read a perspective of gender equality and inclusiveness.
- to design new relationships between the libraries and librarians involved, the young designers and researchers of the Advanced Design Unit research group for the shared generation of diverse types of enabling services and products to increase the inclusiveness and accessibility of culture and its institutions. But also to design new relationships between data from different sources, to let emerge original interplay between qualitative and perception-related data and the gender-driven analysis of libraries database.

Figure 7. Impacts of the Data Challenge activities on different actors

Service design methodologies can support change in the public sector, stimulating the adoption of new levels of reading space and a better understanding of the rich potential of services that Libraries as places of proximity can offer to citizens to generate community-led knowledge, in addition to a

community-based knowledge (Jull et al., 2017). This inclusive approach fosters democratic processes in the co-creation of knowledge. by creating opportunities to challenge assumptions through digital tools and collaborative, participatory methods to re-define what is defined as knowledge from a citizen science perspective.

The local matrix inputs from this program have also influenced the data research work that has been carried out transversally during the two years of activity, producing an advancement of knowledge on how to use the rich potential of data held by the library sphere and on forms of visualisation capable of making this content accessible and interoperable with other information related to:

- the city, in the form of available open data about various aspects capable of describing a urban area, such as the transport system, vulnerability maps, the relationship with the school ecosystem, etc.;
- young people's needs, in the form of qualitative data gained through the educational experiences, that created a depiction of involved young people's perceptions about the context of libraries and their relationship with culture.

This new knowledge becomes generative, enabling a re-thinking of public space that is also fluid in terms of timing and temporariness of functions (Bonfiglioli, 1990). The communication flows to and from the public space of multilevel and multichannel data libraries (Celaschi, 2020) promoted by Data Challenge prioritised openness and collective efforts to bridge the gap between data availability and its actual use and reuse.

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