Communicating Air Quality Data: a Co-creation Approach

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ABSTRACT

This article explores how solutions to pressing global challenges, such as leading cities towards climate neutrality, can be made possible and reinforced by engaging all concerned actors through sound participatory methodologies. The initiative InformAria − run in the city of Milan in 2023 − explored co-creation as a collaborative approach to innovation, in which actors from the quadruple helix (researchers, policy makers, industry, and civil society) worked together towards the co-production of technological tools to support residents and city users in making informed decisions related to air quality in the city, e.g., choosing the best days for outdoor sports activities.

Activities and reflections outlined in the paper have been developed within the MOSAIC project, a research action funded by the European Commission in the framework of Horizon 2020.

KEYWORDS: air quality, EU missions, information tools, quadruple helix, Milan.

INTRODUCTION

The European Context and the MOSAIC project

This paper describes a co-creation experimentation run in Milan within MOSAIC, a research project funded by the European Commission under the Horizon 2020 Framework Programme. MOSAIC ended in December 2023, and its main aim was to study, test, and evaluate the effectiveness of co-creation (Robinson et al., 2021) to address broad global challenges, such as the Grand Societal Challenges of the European Union or the Sustainable Development Goals of the United Nations (SDGs). These significant issues are at the heart of the agenda of the European Commission, which has introduced five key Missions in its current Framework Programme for research and innovation funding, Horizon Europe,

in which the engagement of citizens can bring key added value (Mazzucato, 2018).

MOSAIC developed and piloted its approach in two of the 112 European cities supported by the Mission Climate-Neutral and Smart Cities Mission (European Commission, 2022) to achieve climate neutrality by 2030: Milan and Gothenburg. We report here the Italian experimentation, focusing on practical aspects and lessons learned in order to contribute to building capacity around co-creation in Mission-like frameworks and pave the way for replication.

The Local Context. The InformAria Co-creation Process in Milan

Located in the Po Valley, Milan has been facing poor air quality for decades, and air pollution has become a sensitive issue for the citizens and a key challenge for the City. For this reason, the Municipality of Milan developed the Air and Climate Plan (Piano Aria Clima - PAC), a strategy aimed at improving air quality and paving the way towards a climate-neutral city, including the objective to increase citizens' awareness of environmental issues.

Access to air quality data and information is a prerequisite for greater ownership by all local actors in building a collective response to air pollution. From this reflection, Bassetti Foundation, together with the Municipality of Milan, decided to focus the MOSAIC pilot in Milan on the co-design and co-creation of technological tools to support residents and city users of Milan in making informed decisions related to air quality in the city (e.g., choosing the best days for outdoor sports activities).

In line with this challenge, the Milan pilot of MOSAIC was called **InformAria**. The co-creation process was run between October 2022 and October 2023. It was coordinated and implemented

by Bassetti Foundation, a Milan-based civil society organisation, in collaboration with the Directorate Green and Environment of the Milan Municipality and AMAT (Azienda Mobilità, Ambiente e Territorio), a municipally owned company responsible for the air quality monitoring.

METHODS

The approach

Co-creation is an open and participatory approach to the innovation process, which entails the involvement of various societal actors to develop concrete solutions (products or services) through a structured and facilitated process (Manzoli et al. 2024; Arnaldi et al. 2023; Robinson et al., 2021). The co-creation experimented through MOSAIC envisaged the participation of stakeholders from all components of the 'quadruple helix': researchers, the private sector, policy makers, and citizens/civil society (Schütz et al., 2019).

MOSAIC developed its methodology building on Responsible Research and Innovation, an approach aimed at opening research and innovation to the broader society (von Schomberg, 2013). The research put particular attention to issues such as inclusiveness and accountability by trying to involve civil society as much as possible (in particular, those who do not usually participate in this type of process) and by initiating a reflection on the need to recognize and reward the contributions of participants.

The Process and the Participants

Participants in the co-creation process were selected through an open call, which the Municipality of Milan launched in collaboration with Bassetti Foundation. The call was published in February 2023 on the platform "Milano Cambia Aria", the official webpage developed by the city administration to inform citizens about the initiatives run by the Municipality to foster the green transition.

The process was organized in 4 main stages (Fig. 1).

1) The **preparatory** stage (December 2022-February 2023), in which Bassetti Foundation and the Municipality of Milan defined the challenge of the co-creation process and prepared the following steps, as of the extensive mapping of potential participants from the different stakeholder groups, the launch of an open call to recruit participants, and the provision of public communication actions. 57 candidates applied to volunteer as MOSAIC participants; 40 were selected to take part in the process (18 for civil society; 8 for research; 11 for industry; 3 for governance). All admitted candidates met the following criteria: 1) proved connection to the local territory (i.e., being resident in the Municipality of Milan or being city users); 2) maximum 2 people from the same organization; 3) availability in taking part to at least 6 workshops planned along the co-creation process.

2) The **Gathering** (March 2023), which consisted of a 1-day face-to-face workshop aimed at launching the process and involving the participants around the selected challenge. The event followed a structured format, developed by MOSAIC Consortium and tailored to the local context by Bassetti Foundation. After an introductory part on the objectives of InformAria, participants engaged in a collective reflection on the challenges and opportunities related to developing information tools on air quality and its effects on health and came up with initial but concrete ideas to respond to the challenge. Based on a final vote of the proposals displayed, three priority ideas were identified, around which three teams were formed, each of them working on a specific solution for the challenge.

3) The **Co-creation** (March-June 2023) phase, which was conducted in two stages. i) **Ideation**, along which participants explored the challenge and conceived a first proposition of their solution, submitted for evaluation to Bassetti Foundation and the Municipality of Milan after the first month. The evaluation based on seven main criteria: adherence to the objectives of the call, coherence, efficacy, originality, feasibility, scalability, and openness. Two out of three teams reached the threshold and accessed the following stages. Members from the excluded team were asked (on a voluntary basis) to join an Advisory Board, so that they could continue to contribute to shape the solutions, valuing their skills and interest towards the overall co-creation experience. ii) **Projecting**, aimed at generating the technological solutions into more nuanced details. In this phase, participants worked in teams both in person and online and had the chance to share their progress with representatives from the Municipality in a plenary session.

4) The **Delivery** of the final solutions to the Municipality of Milan (June 2023), and the **Follow-up** from the city representatives (September 2023).

InformAria Process

1. Preparatory Phase
- Challenge definition
- Stakeholder mapping

2. The Gathering
- Engaging participants
- Forming teams

Co-creation
Ideation
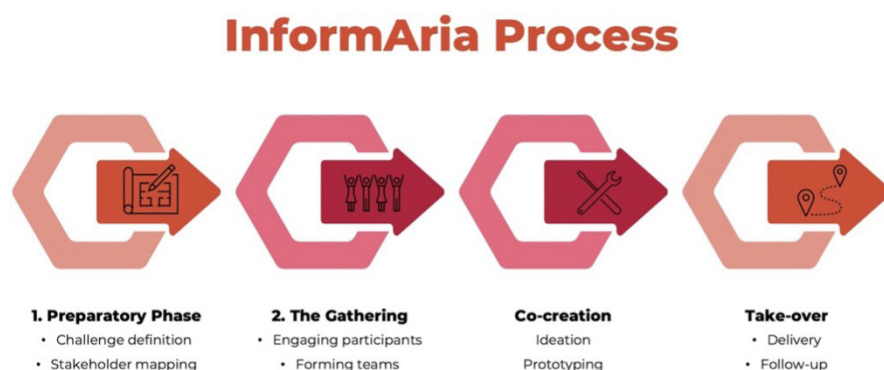Prototyping

Take-over
- Delivery
- Follow-up

Fig. 1 - The Four Phases of the InformAria Process.

RESULTS

Two Technological Solutions Owned by Participants

Two concrete technological outcomes stemmed from InformAria:

1) a geolocation web/ app aimed at informing citizens and city users about their exposure to air pollutants when moving across the city;
2) a system of displays to share information on air quality to citizens and city users using existing infrastructures (e.g., public transport stop, public offices, etc.).

During the preparatory phase of the co-creation journey, the organizers determined that the intellectual property of each co-produced solution would be shared by the participants of the team. Both participants and organizers signed a non-disclosure agreement in order to protect the two solutions and avoid patenting from third parties. For this reason, the authors cannot provide more details about the two solutions in this article.

The solutions were officially presented and delivered to representatives of the Milan Municipality in a final event in June 2023. To foster the take-over from different units within the municipal administration, each team also produced two reports containing a detailed description of the technological solutions. Both solutions were considered valuable by the city administration, who publicly committed to seriously taking into account their implementation in the following months (Display solution) and years (Web/App solution).

The Impact on the Municipality

The co-creation methodology implemented during InformAria proved successful, and the Municipality of Milan is considering extending it to other local challenges connected to the EU Mission "Climate-Neutral and Smart Cities", in which the Municipality is committed. Among the advantages identified by their representative and presented in the public events organized at the end of the co-creation pathway, not just a "raising awareness" aim was reached. InformAria allowed setting the ground for a new way of collaboration between the public authorities and the citizens, to interrupt a relationship usually top-down, and to optimize resources thanks to the voluntary participation of citizens with different expertise.

During the concluding event of InformAria, a specific interactive session was devoted to the identification of potential further challenges that could benefit from a collaborative approach to innovation. Several topics were mapped by the audience, among which representatives from the quadruple helix were present.

Feedback from the InformAria Participants

The InformAria experience was positively evaluated by participants and co-creation proved to be a solid approach in order to contribute to building bridges and trust among different stakeholders and opening the innovation process to the society at large. Virtuous collaborations initiated during the project are expected to grow beyond MOSAIC lifetime.

In order to understand how the co-creation process impacted the participants, the representatives of the two successful groups were invited to answer to an online evaluation questionnaire (e.g., on their level of satisfaction and gratification in taking part to the process, on their view around the valorisation of their different competences, on their experience in interacting with other people and actors, on the replicability of the approach to solve other challenges). The feedback were gathered anonymously between June and July 2023.

88.2 % of the 17 respondents considered InformAria's co-creation process applicable to areas such as mobility, planning of green areas, city and suburban infrastructure, and civic education.

According to them, the opportunity to participate in InformAria activities and contribute to the common good was a source of gratification for volunteers. Approximately 90% of the participants expressed an extremely high degree of satisfaction with the process, and the percentage rises to 100% when the degree of satisfaction concerns the solution developed as teams.

The participants felt pleased also in terms of valorisation of their expertise and skills (over 90% felt valued in their group and appreciated the dialogic way as main method of co-creation and the contributions received from external experts).

Participants outlined the valorisation of competencies outside their job context as one of the most valuable components of their participation in the InformAria co-creation journey. Other particularly appreciated aspects of the InformAria experience were the opportunity to collaborate, exchange points of view with other citizens, and meet new people, the facilitation, the bottom-up approach, and the chance to contribute to solving a collective problem felt by the community.

Finally, the evaluation questionnaire showed that InformAria allowed participants to broaden their views, sometimes very different from their own; as well, being in direct contact with the public administration, participants realized the complexity of their work.

DISCUSSION

Based on the pilot experience of InformAria, we analysed the factors that enabled the participants and the organizers to reach their co-creation goals successfully. With the aim to inspire other projects and open innovation experiences, we identified five key-elements for replication of effective co-creation processes.

These enablers will be particularly useful for projects aiming to answer local challenges in a practical way, beyond the production of recommendations for implementation.

Preparation is key

Gathering participants around a clear challenge is a key starting point for meaningful engagement. Co-creation requires a lot of effort from all the actors volunteering in the process in terms of time, resources, and involvement. Participants may have different reasons for being on board (networking and business opportunities, interest in the outcomes, civic spirit, contributing to the common good, etc.), but clear goals and procedures are needed in response to their expectations. Therefore, preparatory

actions before embarking on co-creation are key in order to frame an effective and actionable process that leads to concrete impacts.

In concrete terms, attention should be dedicated to the selection of the challenge, to the means for inclusive recruitment of participants, defining clear "rules of the game" from the very outset.

Selecting the Challenge and Anchoring to Public Policies

Not all challenges are suitable for co-creation. In the case of InformAria, the challenge was jointly selected by Bassetti Foundation and the Municipality of Milan, based on a series of meetings and dialogues. Four main points were considered for this scope:

- the challenge must be socially relevant;
- the challenge should be framed in a way that it makes possible to involve all the actors of the quadruple helix in the process: public administration, research institutions, businesses, citizens, and civil society representatives;
- the challenge needs to be focused on a goal to be pursued rather than on a potential solution already identified upstream (e.g., "informing about air quality" and not "developing an app to inform about air quality");
- anchoring the challenge to public policies or initiatives that are already in place can be a factor of success for co-creation.

Based on these elements, the organizers decided to focus the process on 'the co-creation of a tool that allows citizens and city users to make informed decisions on air quality in Milan and adopt appropriate behavior, based on measured data'.

The InformAria challenge was anchored to public policies in two ways: 1) at the European level, as it was linked to the objectives of the EU Mission "Climate Neutral and Smart Cities"; 2) at the local level, since raising awareness on greenhouses emissions and air quality is a goal of the Air and Climate Plan (Piano Aria e Clima), the strategic document of the Municipality of Milan for the mitigation of air pollution, aimed at protecting citizens' health and environment towards a more sustainable city (see also the Introduction). What authors observed in the process is that linking the challenge to local policies enhanced the credibility and the soundness of the entire process, also bringing more actors on board (especially public authority representatives).

Recruiting Participants

InformAria officially started with the launch of *a* public call open to all interested actors to apply and participate in the process. The call was launched through the official communication channels of the Municipality (i.e., Newsletter, the website "Milano Cambia Aria", social media), and through the channels of Bassetti Foundation (website, Newsletter, social media). An online webinar was also organized, advertised on the same channels and held in order to disseminate the call and to answer to potential questions regarding the participation.

It remained open for about one month (until the end of February 2023) and the procedures to apply were kept as easy as possible by uploading 1) a form and 2) the ID. The text of the call was written by the Municipality, with the support of the Bassetti Foundation, and included the project and policy framework, the main steps of the process, as well as the rules of selection and exclusion criteria (see section 2.2), the intellectual property issues, so as to ensure transparency.

Because the participation of stakeholders beyond the "usual suspects" is essential to provide an effective co-creation process, an extensive mapping of potential participants and active recruiting was also conducted. While requiring a relevant effort from the conveners, this endeavour demonstrated to strongly enrich the overall process.

Transparency and Accessibility of Information

Communication before, in between, and after the co-creation activities is fundamental to set-up a transparent and accessible process and to build trust between the participants and the conveners. The InformAria call was published on the Municipality of Milan's webpage dedicated to the Air and Climate Plan ('Milano Cambia Aria') in a specific section dedicated to the InformAria project - which then became the 'place' for collecting the updates and materials produced throughout the process - and was launched at an online event organised by the Bassetti Foundation and the Municipality of Milan.

Setting up a virtual space and public events to share both the process and the results is as important as the process in itself and the possibility of hosting InformAria content on an official website of the Municipality certainly guaranteed legitimacy, efficacy, and visibility of the project.

Facilitating Balanced Groups Around Clear Objectives

Facilitation is key in order to ensure an inclusive and functional process.

Depending on the challenge, different conflicting interests or existing lobbies might emerge that need to be carefully managed by professional facilitators. Formats of the discussion, plenaries and meetings of working groups need to be wisely designed and implemented, maintaining a certain degree of flexibility.

In InformAria, facilitators enabled the process through a series of key actions: 1) guiding the discussion between participants; 2) supporting participants in building balanced working groups (e.g., in terms of the presence of all the four helices in each team); 3) providing the participants with a workspace (physical and online), tools and templates for setting objectives according to the various work phases; 4) acting as a bridge between the participants and the Municipality; 5) bringing the discussion back within the scope of InformAria when needed.

A key lesson learned in InformAria is that the teams embarking on co-creation must be formed around clear and concrete ideas responding to the challenge. Having a shared and well-defined goal is the best way to encourage collaboration and engage participants.

Valuing and Integrating Competences

Co-creation builds on the idea that different actors can bring different knowledge and perspectives to the table of innovation, making both processes and outcomes constructive and effective. Valuing the time, competencies, and experiences of participants is therefore a key aspect of co-creation. Facilitators can put in place a series of measures to enhance the skills and views of volunteers, for example, through a detailed preparation of each meeting, providing tools and templates, as well as being flexible to participants' practical needs (e.g., also in terms of scheduling of the meetings, online vs offline discussion, etc.).

According to InformAria's experience, the participating teams can also benefit from the consultation with external experts. They should be enabled to integrate their own expertise with that of professionals outside the co-creation track.

Co-creators might also benefit from the collection of inputs from the potential users of the co-creation outcomes. In order to understand the Milan citizens' perception of the air quality and what current and potential tools of information they use/would use, a survey was conducted during the final stage (Project Phase). Under the supervision of the Bassetti Foundation's researchers, the questionnaire was jointly developed by the participants of both groups and based on their specific objectives.

Responding to Expectations

The idea of collectively contributing to the common good can be an extremely rewarding experience for participants. In this sense, a robust co-creation path significantly contributes to strengthening the civic sense of those who participate and to bringing together the different actors in the local ecosystem.

At the same time, should participants' expectations be betrayed (for example, if the public authority fails to fulfill its commitments), a challenging pathway such as that of co-creation would have a boomerang effect. Instead of strengthening trust relationships within the community, the opposite effect would be achieved.

This is precisely why the goals of the co-creation experience and the roles of the different actors that come aboard (and, in particular, the commitment on the part of the participating public authority) must be defined upstream.

For example, in the case of InformAria, the Municipality of Milan committed to considering the technological solutions that would emerge from the pathway since the beginning of the process. But only after the delivery of the two solutions and following a robust feasibility study examination, both technical and political, they committed to implementing the solutions.

CONCLUSIONS

Findings from the InformAria experience show that co-creation works and can deliver results very fast. As a multi-stakeholder engagement strategy, co-creation can accelerate the production of concrete solutions in local settings to respond to urgent challenges.

To succeed and be replicable, a series of key elements must be taken into account.

- **Identification of the challenge.** It must be easily understood by potential participants without predetermining possible solutions. Before the *Gathering*, it is important to organise a preparatory training meeting with the presence of experts (both in the fields of science, technology, and social sciences), who can provide reliable background information and interact with the participants. The presence of experts is desirable throughout the whole process.
- **Investing resources and time in active recruitment.** Having a diversity of stakeholders beyond the "usual suspects" is essential to provide a qualitative co-creation process. Extensive mapping of potential participants requires a lot of effort but strongly enriches the process and ensures a comprehensive understanding of the challenge.
- **Playing in advance.** Internal or external contingencies can very easily lead to an extension of the time needed to complete the various steps of the co-creation process. Time and space-wise, it is necessary to organise activities in such a way to ensure flexibility.
- **Sharing to build trust.** Building trust among the different actors in the process is possible; at the same time, it is also easy to incur misunderstandings that can lead to criticism and abandonment of the activity. To develop a transparent, trustworthy process that triggers virtuous mechanisms of collaboration, it is essential to clearly define the rules of the game (e.g., to clarify the intellectual property issues from the application stage, the benefits of participation, the absence - or presence - of rewarding mechanisms, etc.).
- **Working together, 'facilitated'.** Facilitation is crucial for the effectiveness of the process and requires a consistent investment of time. The process must rest on a solid foundation and, at the same time, on the ability to assess, adapt, and respond to specific issues. Continuous liaison between the facilitators who accompany different groups is essential.
- **Checkpoints.** Not all the groups formed during the *Gathering* may be able to proceed to the next stages of the process: providing checkpoints to possibly stop (or convert) the activities of these groups is important to avoid a waste of energy by participants, facilitators and the convenors.
- **Online and offline.** Online meetings can help in keeping everyone on board, but a few in-person meetings are needed, especially when forming teams and at the core of the co-creation process.
- **Communicating is part of the process.** Public communication is an integral part of the process and must be planned and organised from the very beginning.

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REFERENCES

Arnaldi S., Crabu S. & Magaudda P. (Eds.) (2023) - Co-creazione e responsabilità nell'innovazione tecnoscientifica dal basso. Mimesis.

European Commission (2022) - Missions 100 Climate-Neutral and Smart Cities. Luxembourg: Publications Office of the European Union.

Manzoli F., Simone A., Pellizzone A. & Mazzonetto M. (2024, February 28). Co-creation in open innovation settings. An Italian case study, https://doi.org/10.31235/osf.io/bzwxg.

Mazzucato M. (2018) - Mission-Oriented Research & Innovation in the European Union: A problem-solving approach to fuel innovation-led growth. European Comission.

Robinson D.K.R., Simone A. & Mazzonetto M. (2021) - RRI legacies: co-creation for responsible, equitable and fair innovation in Horizon Europe. Journal of Responsible Innovation, 8(2), 209-216, https://doi.org/10.1080/23299460.2020.1842633.

Schütz F., Heidingsfelder M.L. & Schraudner M. (2019) - Co-shaping the Future in Quadruple Helix Innovation Systems: Uncovering Public Preferences toward Participatory Research and Innovation. She Ji: The Journal of Design, Economics, and Innovation, 5(2), 128-146, https://doi.org/10.1016/j.sheji.2019.04.002.

von Schomberg R. (2013) - A Vision of Responsible Research and Innovation. In Responsible Innovation (eds R. Owen, J. Bessant and M. Heintz), https://doi.org/10.1002/9781118551424.ch3.