
Actors' Roles in Citizen-driven Innovation

Timon Sengewald*

Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg,
Germany.
E-mail: timon.sengewald@fau.de

Angela Roth

Friedrich-Alexander-Universität Erlangen-Nürnberg, Nuremberg,
Germany.
E-mail: angela.roth@fau.de
* Corresponding author

Abstract: Amidst the global polycrisis, municipalities are urged to boost their resilience, with innovation playing a pivotal role in responding to challenges. Citizen-driven innovation has proven effective during the COVID-19 pandemic, with numerous solutions emerging from civic hackathons. However, while open innovation in businesses is well-researched, the dynamics of social and citizen-driven innovation remain less understood. Engaging civil society actors can advance municipal innovation and mitigate crises. This study, using a multiple case study approach with a qualitative content analysis of interviews and other available materials, aims to enhance our understanding of coordinating citizen-driven innovation and the interplay of different actor roles. By understanding the roles of actors and the unique aspects of social and public open innovation, municipalities can unlock the full potential of their citizens. This research offers insights to help cities harness the power of citizen-driven innovation more effectively.

Keywords: public open innovation; citizen-driven innovation; innovation actor roles

1 Introduction

Municipalities face major societal and sometimes global challenges, such as climate change (Sengewald et al., 2024), unaffordability, poverty, and inequality regarding access to education and healthcare (Rosemann et al., 2021), and must adapt to protect their populations. In addition, municipalities are also significant contributors to emissions and can contribute positively to sustainability goals by optimizing their infrastructure (Bassett and Shandas, 2010; Posselt et al., 2022). Both phenomena require a transformation of municipalities through incremental and radical innovation with increased resident participation (Sengewald et al., 2023).

Against the backdrop of a situation characterized by multiple crises, there has been a renewed call for municipalities to enhance their resilience (e.g., Degirmenci et al., 2024; Desouza et al., 2024; Desouza and Flanery, 2013; Miller et al., 2024; Pizzo, 2015; Posselt et al., 2022). The resilience of urban areas is inextricably linked to their capacity for innovation, which enables them to respond to crises in a reactive or proactive manner (Ciccarino and Rodrigues, 2023; Westley, 2013). In particular, social innovation, which refers to the collaboration of stakeholders from different sectors to innovate for the benefit of society. Social innovation is beneficial to municipalities because it increases the number of people working on solutions, thereby increasing the flow of ideas. For example, during the corona crisis, it has been shown that open innovation tools such as the German government's “#WIRVSVIRUS” hackathon¹, with over 28,000 participants and 1,500 ideas developed, can be used to develop solutions very effectively and on a large scale by civil society (Gegenhuber et al., 2023; Gegenhuber and Mair, 2024). The hackathon served as a tool for orchestrating innovation participation by the federal government, which made the networking of various actors from civil society possible. Similar hackathons have been used and reported in other countries like Spain (Criado et al., 2020; Criado and Guevara-Gómez, 2021), Brazil (Gama, 2021), and the European Union (Bertello et al., 2022; Gama, 2021). In addition to federal approaches such as civic hackathons, the deployment of open innovation tools to facilitate citizen-driven innovation at the municipal level is also evident.

This phenomenon is often described in the broader context of social innovation in the academic literature. However, if the right conditions are met, social innovation can also emerge independently (Micelli et al., 2023). When a social innovation approach is primarily initiated or led by citizens, we can speak of citizen-driven innovation. Similarly, Gegenhuber et al. (2023; 2024) advocate for research that examines ways in which government actors can facilitate the empowerment of citizen innovators. To facilitate the process of self-organization within society, it is essential to better understand how different actors interact with each other. While social innovation has demonstrated its potential, there are still aspects that could be improved, particularly the management of roles within these projects. Effective role management is critical to the success of citizen-driven innovation. However, the academic literature does not provide information on which functions different actors perform in citizen-driven innovation projects and which are relevant for the success of the projects.

RQ: How can the various roles in citizen-driven innovation projects be categorized?

This study used a qualitative multiple case study approach, analyzing interviews and other publicly available materials about each case. The actor roles presented here can assist in developing a deeper comprehension of the ways in which citizen-driven innovation can be more effectively coordinated and how different roles can be connected.

¹ For further information please see <https://wirvsvirus.org>

2 Theoretical Background

Innovation in the municipal context

In traditional conceptualizations, a distinction is typically drawn between invention and innovation (e.g., Kastle and Steen, 2011; Sieklicki and Tanev, 2023). Invention is thereby defined as the creation of novel concepts, technologies, and so forth and innovation, which is the implementation of new ideas, processes, or services (Kastle and Steen, 2011; Zheng, 2010). This definition is distinct from the view that innovation is the management of ideas (Kastle and Steen, 2011). Value in this definition was also to be understood in a broader sense, not just economic value as in cost reduction or revenue increase, but as something that fulfils a need of an individual, group or society (Meynhardt, 2009). The primary distinction between invention and innovation is that the latter encompasses a vast array of concepts, including the adaptation of ideas from disparate contexts, markets, and organizational structures. The innovation process can be divided into the following phases: the idea phase, the consulting and screening phase, the experimentation phase, the commercialization phase, and the implementation phase (Mariello, Alissa, 2007). Other conceptualizations include the stages prompts, proposals, prototypes, sustaining, scaling, and systemic change (Chesbrough and Di Minin, 2014).

This is more aligned with the objective of this work, that is, to gain insight into the relevant actor roles within the process of transforming an idea into its implementation.

Open innovation is increasingly used in the public sector (e.g., De Vries et al., 2016; Fuglsang, 2008; Kankanhalli et al., 2017; Mu and Wang, 2022; Ojasalo and Kauppinen, 2016) and is important in the digital transformation toward *smart municipalities* (e.g., Cohen et al., 2016; Mainka et al., 2016; Yun and Lee, 2019). The concept of open innovation was first coined by Henry Chesbrough (Bogers et al., 2017) and describes a shift from closed to open innovation processes involving external stakeholders (Chesbrough, 2003). In E. von Hippel's (2009) perspective, open innovation is primarily driven by actors interested in using rather than selling it (user-driven). Both theoretical approaches are equally crucial for better understanding how municipalities can orchestrate open innovation.

This evolving use of the open innovation paradigm in the public sector is closely related to the scholarly discussion about how citizen/resident participation must move more towards co-creation processes to better align with residents' needs (Fuglsang, 2008; Gupta et al., 2019; Olphert and Damodaran, 2007). In such open innovation approaches, municipalities involve external actors in their innovation processes or even enable bottom-up innovation by residents (Ojasalo and Kauppinen, 2016). Both require good infrastructure of digital technologies and an efficient allocation of resources to potential innovators (von Hippel, 2009). The use of digital technologies in open innovation processes is often associated with liberation from time and space constraints (Nambisan et al., 2017).

Citizen-driven versus government-driven innovation

Public open innovation can generally be distinguished between citizen-driven and government-driven innovation (Lee et al., 2012). Government-driven innovation is the widely used form of public open innovation and the government as the dominant actor has

nearly the full control over the innovation process (e.g., Porwol et al., 2013). This approach is particularly important when the interests of different resident groups need to be considered and balanced or if it is within the sovereign area of responsibility of a government. In contrast, citizen-driven approaches (e.g., Eskelinen et al., 2015) can address ideas that may not be addressed by the local government (e.g., without its public mandate). In this case the government acts more as a consultant and domain expert for the addressed issue (Porwol et al., 2013). While the public sector can benefit from this approach of ideation to get new impulses on how to better adapt to the needs of its citizens, it also costs operational capacity to evaluate and align the incoming ideas (Schmidhuber and Hilgers, 2017) and sometimes the administration is not the best choice to implement some of these ideas.

Prior research about actors in social and citizen-driven innovation

The literature on open innovation has distinguished between internal and external actors (e.g., Abhari et al., 2022; Bogers et al., 2017; Neyer et al., 2009; Ojasalo and Kauppinen, 2016). In this context, the term 'external actor' can for example refer to research institutions, companies, citizen (Ojasalo and Kauppinen, 2016), customers or in general users (Bogers et al., 2017), and is used to describe an external source of knowledge inflow. This distinction is primarily used to understand knowledge flows within and beyond a focal organization. However, it is less effective in explaining the genesis of grassroots innovation initiatives such as in open social innovation. Open social innovation is defined as a collaborative approach involving the participation of diverse stakeholders from multiple sectors (Gegenhuber and Mair, 2024).

In addition, previous research has also looked at the geographical aspects of the actors involved (e.g., Noack and Federwisch, 2019). To illustrate, the interconnection between rural and urban regions represents a pivotal factor, and social innovation frequently necessitates cross-border cooperation between stakeholders from different territories (Noack and Federwisch, 2019). Noack and Federwisch (2019) illustrated the influence of actors that were responsible of outside-in knowledge transfer. Other authors have proposed a classification of actors according to sectors and their organizational form or political hierarchy level (Jungsberg et al., 2020). In their analysis, Jungsberg et al. (2020) differentiate between three distinct sectors: civic society, the public sector, and the private sector. The public sector can be distinguished from one another by the levels at which it operates: local, regional, national, and international. Civic society can be divided into organized and individual in a community (Jungsberg et al., 2020). Each of these distinct sectors performs a distinctive role within the context of open social innovation. While academic literature has devoted considerable attention to the subject of private social entrepreneurship (Gegenhuber and Mair, 2024), it has not accorded sufficient attention to other sectors and especially the collaboration between different sectors.

Other conceptualizations assign different roles to actors, e.g. more functional roles of actors such as ideators, who describe participants who submit idea proposals, or innovation sponsors, an actor role who provides the challenge in a traditional innovation approach (Abhari et al., 2022). Nevertheless, the extant conceptualizations are inadequate for providing a comprehensive understanding of the functional roles that actors fulfill within the innovation process.

3 Research Design

General approach

This research was embedded in a multiple case study (Eisenhardt, 1989; Yin, 2018) of four different citizen-driven innovation projects. A multiple case study can help determine whether a phenomenon observed in a single case is a mere coincidence or has been replicated in several cases, thereby enhancing the robustness of the empirical evidence (Eisenhardt and Graebner, 2007). This case study employs a qualitative research methodology, utilizing interviews with a diverse range of stakeholders from various sectors, including administration, academia, and civic society, who were directly or indirectly involved in the innovation projects. For the data analysis, the qualitative content analysis approach according to Rädiker and Kuckartz (2020) was used. It uses an inductive-deductive method and is suitable for highly open-ended research questions (Kuckartz, 2019; Rädiker and Kuckartz, 2020). The specifics of the research approach are explained in the following paragraphs.

Case description

The sample consisted of individuals from diverse sectors, including civic society, academia, business, and public administration. We used a variety of different examples of citizen-driven innovation projects as cases to ensure that the derived roles were sufficiently general enough to fit different use cases. All of the selected cases can be classified as retrospective cases (Eisenhardt and Graebner, 2007), given that the data collection for this study commenced at the same point in time that the projects in question were already implemented. For the purpose of this paper, the cases have been renamed. These cases, including descriptions, are listed in Table 1.

Table 1 Case description

<i>Case name</i>	<i>Case description</i>
Case A (SocialCollab)	The SocialCollab provides a venue for a variety of events, including workshops, team meetings, and open gatherings. This offer is directed towards individuals, organizations and collectives who aspire to enhance the quality of life in Nuremberg and the surrounding region. The SocialCollab provides a platform for individuals and organizations to implement creative ideas, innovative projects, and collaborative activities. A common obstacle to the implementation of such projects is the lack of suitable and affordable spaces. Many initiatives fail because of the difficulty in finding suitable spaces that are both functional and financially affordable. The SocialCollab aims to fill this gap by offering a flexible, accessible, and affordable event space that meets the needs of its target group.
Case B (SocialIncubator)	SocialIncubator provides counsel and incubator services for prospective social entrepreneurial projects. The offer is directed towards individuals who are seeking to implement solutions to

social problems in an entrepreneurial manner. SocialIncubator serves as a nexus, think tank, and platform for social, ecological, and cultural innovations and start-ups within the Nuremberg metropolitan region. As an incubator, SocialIncubator aims to facilitate the transition of promising social entrepreneurial project ideas from the conceptual stage to implementation. Through peer exchange, creative workshop formats, and individualized services such as consulting, coaching, and networking, SocialIncubator equips individuals with the tools and support necessary to turn their visions for solving social problems into reality in an entrepreneurial manner.

Case C
(GreenSpace)

GreenSpace was a social entrepreneurship pilot project that aimed to revitalize neglected areas by transforming them into green spaces that promote biodiversity and climate resilience. The project partnered with a local public institution to revitalize an unused space and also has engaged volunteers to take part of the recreation process. This collaborative effort not only beautified an unused area, but also created a more inviting and environmentally friendly environment for residents to spend time in.

Case D
(VolunteerMatch)

VolunteerMatch is a digital web application designed to connect individuals as volunteers with local organizations that best match their interests. Users answer a series of short questions, and the app suggests the most compatible organizations and encourages them to start volunteering. By facilitating this matchmaking process, VolunteerMatch promotes community engagement and supports local initiatives.

Source: Own representation.

Data collection

As retrospective cases typically rely on the analysis of interviews and archival data (Eisenhardt and Graebner, 2007), we have also used publicly available information about the different cases as additional material to get a better contextual information before the interviews were conducted. Interviews with individuals involved in citizen-driven innovation projects were conducted using the problem-centered interview technique developed by Witzel (2000). The “problem-centered interview” focuses on the subjective perspective of actors and is especially suited to study phenomena from an individual’s perspective (Scheibelhofer, 2008). At the beginning of the interview, we asked the interviewees to describe the project and tell us a little about how they got involved with the project or project idea from their own perspective. These types of questions are important for a PCI interview to elicit storytelling from the participant rather than a question-and-answer game (Witzel, 2000). We then proceeded with the main question of the interview, which was to describe us different main actors that were relevant to the successful completion of the project. If the interviewees had already mentioned some in their introduction, we picked them up and asked further questions about their support of the project. In addition, we asked ad hoc questions (Witzel, 2000) to gain a better understanding of the case or the specific roles an identified actor had played within the project.

The interviews were audio recorded and then transcribed semi-automatically for data analysis. We used AI-based transcription software, the output of which was then manually revised using a literal transcription with the following rules according to Dresing and Pehl (2015): Indication of pauses, emotional nonverbal utterances, and incomprehensible words. Omission of informal contradictions, affirmative utterances by the interviewer, word or sentence breaks, and stuttering. Words of special emphasis were CAPITALIZED.

All participants were offered financial compensation in accordance with the minimum wage in Germany for the time invested by the participants. The topic of participant compensation is frequently addressed in the academic literature in the context of ethical considerations or data quality concerns. However, various scholars have also highlighted the difficulty of this discussion, citing the lack of transparency in published studies regarding the payment of compensation (e.g., Head, 2009; Masoumi, 2024; Pater et al., 2021; Rao et al., 2023). For example, Masoumi (2024) states that the compensation fee should not be much higher than the equivalent of the market value of labor (or minimum wage, so to speak), which was not the case in this study as we only have offered the equivalent of the German minimum wage. Furthermore, like social innovation, citizen-driven innovation projects often aim to create public value rather than being profit-oriented (Ricciardelli et al., 2020). Thereby, the individuals involved frequently dedicate a considerable amount of their personal time to addressing public or social issues. Compensation can therefore be a useful tool for appreciating and valuing participants' time and can even increase the quality and richness of the data (Masoumi, 2024). A potential bias related to participant compensation often cited is false information (Head, 2009), but because we interviewed multiple people for each case, we were able to cross-check the claims with the other interviews. Moreover, as our research was exploratory in nature rather than confirmatory, and the research design included an open-ended interview format that was designed to focus on exploring new information, we would not expect an acquiescence bias related to the payment.

Data analysis

We used a qualitative content analysis approach, which is appropriate for exploratory research questions and allows for rule-guided inductive analysis and synthesis of qualitative data (Mayring, 2000). The principal objective is to ascertain the fundamental consistencies and to gain insight into their significance within the context of the material collection (Prasad, 2019). Qualitative content analysis is a well-established methodology within the social sciences that can be tailored to various research objectives (Kuckartz, 2019; Prasad, 2019; Schreier et al., 2019) and is especially often applied to case study research (Kohlbacher, 2006). A qualitative content analysis can be applied to different types of qualitative material, often using different sources of material within one analysis (e.g., Kohlbacher, 2006; Prasad, 2019). While the academic community has developed a variety of approaches to qualitative content analysis, the two most prominent authors in this field are Mayring and Kuckartz (Schreier et al., 2019). Kuckartz's methodology is more suited to interpretive studies with a strong focus on qualitative analysis of textual fragments. Mayring's methodology is more structured and focuses on summarizing and quantifying the material. In this respect, the methodology of Mayring is more applicable to larger data sets (Schreier et al., 2019), which were not relevant for this study. Rather, we

aimed to take a more interpretive approach to better understand the meaning and context of the data.

The interpretation of the text and other steps of the analysis process were supported using the specialized software MAXQDA, which is recommended to enhance the efficiency and systematic organization of the process (Kuckartz and Rädiker, 2019; Mayring, 2000).

Memoing was used for data analysis to ensure that our interpretations were systematically and transparently documented. For example, memos were employed to all documents and disseminate meta-information regarding the collected data, thus ensuring its accessibility to all researchers engaged in the data analysis (Kuckartz and Rädiker, 2019). Moreover, we have employed the use of memos to document the crucial stages of the research process (Kuckartz and Rädiker, 2019).

4 Results

As a result, eight functional actor roles were derived that are specific to citizen-driven innovation processes.

Table 2 Overview of the functional actor roles

<i>Actor role title</i>	<i>Actor role description</i>
Challenger	Act as critical actors who identify and question systemic deficits. Motivated by direct experience or perceived inefficiencies, they initiate transformative processes by pursuing new solutions.
Ideators	Address identified problems or systemic deficits by developing novel concepts and strategies for their implementation, with the objective of solving specific problems.
Developer / Co-Creator	Contributes their personal skills and expertise to the practical implementation of project ideas. They are central to the development and realization of innovative solutions by making technical or creative contributions.
Manager	Uses organizational skills to effectively move projects forward, but does not need to be involved in the ideation phase. They coordinate resources, plan processes, and ensure timelines are met to ensure the successful completion of projects.
Mediator	Facilitates communication and resolves conflicts among the various stakeholders involved in a project. Their role is critical in ensuring that projects do not fail due to conflicts between different parties.
Matchmaker	Connects projects to other relevant stakeholders, including potential sponsors or experts. Their ability to build and maintain strategic

relationships facilitates access to resources, knowledge and support and is critical to the implementation and success of projects. Matchmakers use their social capital to open doors, create synergies and foster collaboration.

Sponsor	Provides financial or material resources without being directly involved in projects. Their role can be critical to the implementation and scaling of projects by providing the necessary infrastructure and resources for implementation when they cannot otherwise be funded.
Operator	These are institutionally organized actors that enable the economic realization of projects through their infrastructure and operational capacities. Their role can be crucial in transforming ideas into marketable products or services when a separate foundation does not seem viable or when these cannot be operated by a municipal entity.

Source: Own representation.

Challengers

In their role as "challengers," they serve as pivotal figures who identify and challenge systemic deficiencies, refusing to acquiesce to the prevailing status quo. Challengers may be individuals or organizations. These individuals are driven by a combination of personal experiences, observed inefficiencies, and a deep-seated desire for improvement. Those who are inclined to challenge the status quo may also develop an idea to solve the problem, thereby becoming ideators. Organizations that act as challengers are quite different from individuals. These organizations are established and guided by individuals who have identified a systematic significance that extends beyond their immediate scope of action. By relentlessly questioning existing norms and structures, they spark transformative changes. They actively seek innovative solutions, advocating for progress and inspiring others to support their vision of positive change. Their tenacity and willingness to confront difficulties make them catalysts for meaningful evolution within their environments.

In our sample case GreenSpace (Case C), the social entrepreneurs behind the idea used an innovation competition to apply for their first project. This innovation competition was a fictional scenario about 25 years in the future, and sketched a city threatened with extinction by the effects of the climate crisis. The goal of the innovation competition was to make the city more climate-resilient. Various projects were invited to submit proposals for this fictitious scenario and what would have to change to prevent it. In this way, the organization that initiated this innovation competition acted as a challenger that identified a systemic problem. In this case, the climate crisis and the need for the local community to develop climate actions to protect its residents.

Ideators

Ideators address the concerns identified by challengers by developing innovative concepts and strategies. They often have first-hand experience with the problems they aim to solve.

Once challengers have identified particular issues or broader deficiencies, ideators address these concerns by developing innovative concepts and strategies to address specific problems. In the sample cases SocialCollab (Case A) and SocialIncubator (Case B), the initiators acted as both challengers and ideators. This implies that they developed these concepts based on a problem they had experienced first-hand.

Developer / Co-creators

The role of the developer represents the core of the innovation team. A developer is an individual who is actively engaged in the project development process. They contribute their expertise in a particular domain and collaborate closely with other team members to facilitate project advancement. However, the composition of the team may evolve over time, contingent upon the necessity for supplementary expertise or a dearth of motivation, time, or other factors that may impede continued participation in the project. In the case studies presented here, all of the ideators were also engaged in development work on the project. Nevertheless, some ideators may encounter challenges in identifying the requisite developers to collaborate with. Open innovation formats can serve as a conduit for connecting ideators and developers. These formats are valuable because some individuals express interest in supporting social projects but lack the initiative to pursue their own ideas. They actively seek out projects that align with their interests, such as hackathons. Others join through more serendipitous means, based on existing connections and friendships. This underscores the importance of social connections in open innovation.

Managers

Managers drive the project forward and take on key organizational roles. The number of managers required may vary depending on the project's scale. However, in each project there was at least one person who was instrumental in driving the project forward and taking on key organizational roles. As previously stated, there are instances in which the involvement of multiple managerial figures is required, particularly in the context of projects that encompass a considerable number of individuals. For example, the GreenSpace (Case C) required the assistance of a considerable number of volunteers. These individuals hailed from a diverse range of backgrounds, necessitating guidance and task allocation for some. The project initiators were obliged to invest a portion of their working hours in the supervision of the volunteers. However, this entailed a certain degree of compromise, as for certain tasks that demanded a higher level of expertise or for reasons of safety, such as the operation of specialized machinery, they were also required to perform the tasks themselves, thereby limiting the resources available for the management of the volunteers. It was therefore highlighted by the project initiators that one of the volunteers provided a significant contribution to the project by supporting the coordination of the volunteers, which was made possible due to his extensive prior experience. It is noteworthy that one interviewee observed that individuals who have previously completed a project successfully often express a desire to oversee new projects in a managerial role for others subsequently. However, we did not conclude from our cases that it would be easy to find such experienced people to support as managers.

Matchmaker

The role of matchmaking in initiating contacts within the context of open social innovation is of particular importance. Furthermore, matchmaking represents a known significant challenge within the context of open innovation, particularly for companies seeking to identify external sources of knowledge (Meulman et al., 2018). The actors that fulfil the matchmaking function may originate from a variety of sectors. In the case studies that were analyzed, SocialIncubator (Case B) presents itself as a provider of such matchmaking services. It not only offers advice to potential entrepreneurs, but also facilitates connections between them and relevant partners from its own network. In this case, we speak of active matchmaking. This means that the actor uses its own network to establish active relationships. On the other hand, public actors can also act as matchmakers, although this often takes the form of passive matchmaking. Open innovation formats, exemplified by hackathons, represent a case in point. As evidenced by the "#WIRVSVIRUS" hackathon, such formats facilitate the convergence of potential innovators. The defining feature of these formats is that they do not require all participants to possess an idea; rather, individuals with diverse motivations can also engage with another project. Consequently, those who provide ideas seek out potential collaborators on such formats.

The team behind VolunteerMatch (Case D), for instance, has employed a civic hackathon as a means of not only identifying prospective collaborators but also to find municipalities that would be interested in becoming a partner as potentially test users and customers.

Mediators

The role of the mediator is to facilitate communication and resolve conflicts among the various stakeholders involved in a project. Mediation can be of the utmost importance in ensuring that projects do not fail due to conflicts between different parties during the implementation phase. Social innovation is often characterized by collaboration and cooperation between actors from different sectors (Haskell et al., 2021). It is important to note that different sectors, such as the private and public sectors, and even individual institutions, have their own logic and legal requirements that may not be readily apparent to others. In particular, in the case of citizen-driven projects that require the cooperation of other sectors and where the various requirements for implementation, for example with regard to permits, are not clear, the involvement of mediators can be helpful in mediating between the divergent interests. In the case of GreenSpace (Case C), such actors were needed who were part of the project stakeholders but who were aware of the different institutional logics and acted as a third party to mediate between them.

Sponsors and Supporters

In the functional role of sponsors, all stakeholders who support innovation projects are grouped by providing resources. Sponsors can provide either financial resources or other necessary materials, machines or services, as well as space and facilities. The provision of such resources by sponsors is neither gratuitous nor unsolicited. The functional role of sponsor also includes actors who provide these resources at significantly reduced rates or,

for example, at cost. Such facilities may take the form of FabLabs or open workshops (e.g., Redlich et al., 2016), which typically provide access to a range of machines and guidance on their use in a single, shared space. The provision of materials is typically subject to a cost-based fee. From our cases, the SocialCollab (Case A) project itself provides an illustrative case of the functional role supporter. It offers a co-working space at a solidarity-based price, enabling individuals and groups with limited financial resources to access spaces for project meetings. The pricing model outlines a reduced rate for space rental for start-ups and project groups working for the common good. Alternatively, if this is not affordable, the price can be further negotiated. In this way, SocialCollab (Case A) offers two distinct advantages to those involved in innovation projects. First, they are able to access space at a discounted or even free rate. Second, they can rent these spaces on a flexible basis, as and when they need them, without having to commit to long-term leases or to occupying an office space for an extended period of time.

A second example is the provision of financial support for projects that are not aimed at commercial gain. In other words, when the idea cannot be turned into a business. A well-known example is private foundations, both small and large, which often provide financial support for charitable projects when alternative sources of funding are not available. In the case of VolunteerMatch (Case D), such financial support was essential at several stages. For example, the project team was able to obtain support from a funding program called the "Prototyp Fund"¹, which was made available from federal government sources for further development of the software. However, the prerequisite for this is that the software is made available as open source and serves the public good. It can be assumed that most of the sponsors are in the prototype phase. However, this example shows that they are also relevant beyond this phase.

Operator

Operators can be beneficial to innovation team in two distinct ways. Firstly, they can provide invaluable assistance during the innovation phase by offering their legal form, for example as a company, to facilitate market participation. Secondly, operational activities have the potential to act as stewards of a developed concept, assuming control of it and integrating it into their own service offering.

The initial variant was pivotal for our sample cases, SocialCollab (Case A) and SocialIncubator (Case B). In the current configuration, the operator has afforded both projects the opportunity to participate and offer their services within their legal structure. This enabled the teams to test the ideas and concepts and to identify a suitable business.

The second variant played a pivotal role in the context of VolunteerMatch (Case D). While the original team developed the concept, created a prototype and successfully implemented the solution in collaboration with three municipal partners, the question arose as to how the idea could be scaled up further and how software could be offered in the future. In lieu of establishing a new company, the team opted to merge with an existing organization, the operational structure of which adheres to that of a cooperative. The aforementioned cooperative was itself a market actor with its own software product but with a different purpose, which was similarly targeted also at municipalities. Consequently, a merger was deemed a logical step in order to benefit from synergy effects. This enabled

¹ For more information, please see <https://okfn.de/en/projekte/prototypefund/>

the VolunteerMatch (Case D) team to circumvent the considerable financial and legal burden associated with establishing a new company. The acquired company was able to leverage this acquisition as a source of additional revenue, thereby enhancing its overall financial stability and enabling more efficient cost management.

5 Discussion

In this study, we have reflected the different functional roles that actors can play in citizen-driven innovation projects: 1) Challenger, 2) Ideator, 3) Developer/Co-Creator, 4) Manager, 5) Mediator, 6) Matchmaker, 7) Sponsor, and 8) Operator. Operators are of particular importance in maintaining the viability of innovations, serving as a framework that facilitates economic activity within a protected environment or institutionalized legal form that allows to participate in the market, as well as a potential source of operational expertise when the core team lacks the capacity to take on this responsibility. The challenger role provides an external impetus for ideators to think about a problem and create a specific solution, as this external impetus seemed necessary in only two of the cases. The roles of ideator, developer/co-creator, and manager can perhaps be described as the core innovation team, as these three roles are primarily involved in the design and implementation of the innovation. Mediators, matchmakers, and sponsors can be described more as supportive roles that are mostly external. Whether these roles are needed seems to depend more on the case and the skills and resources of the project team. It is interesting to note that none of the selected cases seemed to rely on an actor providing a physical space for testing or prototyping, such as a makerspace, fablab, or living lab as these were often identified as important in the innovation literature (Perez et al., 2024; Redlich et al., 2016). This is probably related to the nature of the selected cases, but it is not clear whether these actors would play a separate role or whether they would be characterized as sponsors within the current framework. The role mediator was only apparent in case C, which was a cross-sectoral collaboration between a public institution and the civic society. Because of this probably more complex nature and the different institutional logics, the mediator role seemed really necessary for this case to mediate between the ideators and one of the sponsors. In conclusion, the role of mediator does not seem to be necessary for every project, but very important for the success of different stakeholders who have a potential conflict that could lead to the failure of the collaboration. In cases A, B, and D, it was important to have the organization act as the operator so that the project initiators did not have to spend too much time or money setting up and maintaining a legal form on their own. For case C, the role

Implications for research

The success of citizen-driven innovation seems to depend on a wide range of different actors with unique functional roles in how they contribute to the innovation process. Prior research has focused on the roles that stakeholders from different sectors (Gegenhuber and Mair, 2024; Jungsberg et al., 2020) or the spatial dimension (Noack and Federwisch, 2019).

The literature seems to focus primarily on people who can be conceptualized as innovators, which would refer to people who identify problems, develop a solution, and get to implement it (e.g., Chen et al., 2020). A second area of focus in the literature seems

to be the perspective of external knowledge inflow and use regarding the conceptualization of social innovation (e.g., Chesbrough and Di Minin, 2014; Gegenhuber and Mair, 2024). Nevertheless, as evidenced by our case studies, the success of innovation was contingent upon the collaboration of a multitude of actors, each occupying a distinct functional role within the process. Not all of these actors were involved in the entire process from ideation to implementation, but rather contributed at different stages to support the project initiators. The success of the projects may be attributed to the presence of social capital among some project members (Pylypenko et al., 2023), which enabled the team to secure the essential resources, including finances and materials, and other pertinent assistance from their personal networks. External actors are needed when the original project cannot fulfill a specific functional role. However, not all functional roles appear to be necessary, and it is also possible that one actor may have dual or multiple roles for different functions. Thus, the failure of some projects may be related to the lack of such social capital and the possibility of acquiring functional roles that would have been relevant for the successful completion of the project. The functional roles presented could be used as an analytical framework in empirical studies to understand the relationships between success or failures of projects. Thereby, the framework can help in analyzing why some municipalities or urban areas have a higher innovation capacity for citizen-driven innovation than others. By comprehending and proficiently overseeing these roles, municipalities can cultivate a more inclusive, collaborative, and efficacious innovation process.

Implications for practice

Understanding the different functional roles that are central to citizen-driven innovation can be helpful for municipalities seeking to foster citizen-driven innovation. While it is known that, for example, civic hackathons can be used as a networking opportunity for the participants (Yuan and Gasco-Hernandez, 2021), our framework of functional role could be used to cluster such participants and thus enable more effective networking during the event. A second use case would be to use it strategically to search for and invite specific actors to the event to ensure that projects can be developed beyond the ideation phase. For example, previous research has found that hackathons often lack the problem of ideas or prototypes not being developed further into implementable solutions (e.g., Hjalmarsson et al., 2014; Yuan and Gasco-Hernandez, 2021). One of the reasons is that participants sometimes do not have the time or resources to further develop the solution further after the hackathon (Hjalmarsson et al., 2014) and that public institutions sometimes do not have the budget to pay developers to implement the solution (Yuan and Gasco-Hernandez, 2021). On the other hand, local charitable foundations or other institutionalized actors may be interested in these solutions and therefore want to connect with the team. By reaching out to these potential sponsors and bringing them to a hackathon, more projects may be funded and implemented as a result. Similarly, connecting project teams with potential operators can help transfer concepts to the implementation phase if the development team is unable to pursue them independently.

Limitations

A potential limitation of this study is that the sample only comprises successful retrospective cases. As Chesbrough has also outlined, the majority of studies in this field focus on the success of open innovation, rather than its failures (Chesbrough, 2024). A further investigation of additional cases that focus on failures may therefore yield further information and potentially provide insights into the functional roles that are absent in these cases and that would have been necessary to be successful. The comparison of successful and unsuccessful case studies is also referred to in the literature as polar types (Eisenhardt, 1989; Eisenhardt and Graebner, 2007).

Future research areas

The findings of this study offer a foundation for a number of promising avenues for further investigation, which could be pursued in future research. As previously indicated in the limitations section, future studies may wish to extend the results by examining polar cases such as failures.

An additional avenue for investigation is the utilization of the extant taxonomy to enhance comprehension of the genesis of citizen-driven innovation in conjunction with spatial units (municipalities, regions, nations). This prompts the inquiry of why certain spatial units are more prolific in fostering innovation than others. For example, social capital has been identified in previous studies as a relevant factor in the emergence of innovations (Putnam, 1995; Pylypenko et al., 2023). Social capital can be defined as the quantity and density of relationships within a social system. The functional roles delineated in this study may also be employed to more effectively examine the nature of the relationship between social ties and innovation. To illustrate, a spatial unit with low social capital may potentially benefit from the services of matchmakers. Consequently, if the pertinent government units were to promote or implement such services themselves, this could have a favorable impact on innovation within this spatial unit.

Building upon these findings, future research may examine the dynamics and interplay between the various functional roles in greater detail. For example, it would be beneficial to determine how the specific functions and activities of each role contribute to the overall success or failure of the innovation project, and how these roles interact with and complement each other to facilitate the innovation process. Furthermore, a more comprehensive examination of the operator's role and its implications for citizen-driven innovation could offer valuable insights. In particular, investigating how the operator's role affects the long-term sustainability and scalability of citizen-driven innovations would be a promising area for future research. Additionally, an analysis of the diverse motivations behind innovation teams' decision to include an operator and the varying motivations of operator actors in assuming an operational role would be a fruitful avenue for further research.

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