BeCoDigital – Digital Co-Creation of Public Services with Citizens: Understanding Pre-Conditions, Technologies, and Outcomes

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Abstract

This article presents the research objectives, methods, and expected outcomes of the BeCoDigital project. The objective of this project is to develop and validate a practical roadmap to guide the implementation of digital co-creation methods. In the context of BeCoDigital, co-creation is defined as an exchange of knowledge and resources among citizens, the government, and other stakeholders that aims to improve the delivery of public services. To achieve its objective, the project studies (1) the pre-conditions of digital co-creation participants, (2) the complementarity between methods and the challenges of interaction between participants and processing of the information resulting from these methods, and (3) the outcomes of digital co-creation. This article focuses on the second area. It details the proposal of creating a modelling framework to study the complementarity of methods, and of using artificial intelligence as a tool to process the co-creation information and provide a personalized feedback to participants.

Keywords

Digital co-creation, Roadmap, Network-based modelling, Artificial intelligence

1. The BeCoDigital Project

Digital government consists in using digital technologies to improve the internal functioning of administrations and the delivery of services to companies and citizens [1]. However, discussion amongst scholars is ongoing regarding what the next stage of digital government will be. Numerous authors call for a digital government that is citizen-centric [2], open to external innovations [3], or that integrates citizens' input and ideas for smarter decisions [4]. All these visions about the "next step" of digital government converge toward a changing relationship between citizens and government, and argue for the digital co-creation of public services with citizens. Co-creation can be defined as a process in which actors exchange resources and jointly create value through an engagement interface [5]. Co-creation can be implemented using traditional (i.e., non-digital) methods such as mail surveys or town hall meetings, digital methods such as living labs or online platforms [4], or a combination of both kinds of methods. The

confluence of four major factors has redefined the role of citizens in government to turn them into potential co-creators of public services instead of passive beneficiaries [6]. First, citizens have increasingly higher expectations regarding public services and expect more personalized public services as well as opportunities for participation. Second, public organizations are limited by their resources and their knowledge of what citizens need and therefore require innovative ways to develop solutions. Third, the problems faced by governments are increasingly complex (e.g., reaching Sustainable Development Goals) and call for collaborative approaches that include external partners, including citizens. Finally, the use of digital technologies allows making co-creation easier and more cost-effective. For these reasons, digital co-creation methods present a highly promising avenue for improving the delivery of public services. However, due to the rapid evolution of digital technologies and the resulting diversity of co-creation methods, it is tedious for governments to implement the most optimal co-creation strategy given the stakeholders they wish to involve and the outcomes they wish to achieve. Therefore, the objective of the BeCoDigital project is to **develop a practical and scientifically grounded roadmap (consisting of organized guidelines) to support citizen co-creation through digital technologies, and to validate it with use cases in a government context**. To achieve this objective, the BeCoDigital project is structured into three work packages (WP), each of them studying one aspect of digital co-creation and converging toward the roadmap.

In the first WP (WP1), pre-conditions toward digital co-creation are studied. Several previous works [7, 8, 9] identified motivational factors for citizens to co-create and found that motivations of citizens to participate differ depending on the nature of the co-creation method and their digital skills, among others. In addition, the vast body of literature on technology acceptance provides numerous insights on psychological, task-related, and technology-related motivational factors that may affect a citizen's willingness to co-create [10]. Bringing together the currently scattered results will allow obtaining a more thorough understanding of the roles, competences, motivations, and barriers necessary to enable co-creation. Also, as this part of the literature focuses on citizens, it will be complemented by surveying other stakeholders such as political representatives or public servants, who also have important pre-conditions regarding co-creation [11, 12].

In the second WP (WP2), the complementarity of digital co-creation methods and the processing of the information obtained from their implementation are studied. Although research can be found for individual co-creation methods such as participation platforms and social media [13], the complementarity and coherence of these methods have hardly been studied. Porwol et al. [14] underline the importance of building synergies between different methods. Co-creation methods are more effective when used in combination with each other to reach as many citizens as possible and ensure the validity and representativeness of the collected input [15]. However, combining several co-creation methods poses the challenge of integrating and processing the overwhelming information resulting from these methods. The digital character of the methods also implies rare real-time interaction between participants, which can be problematic in a co-creation process. To answer these problems, we will explore how artificial intelligence can assist (1) the interaction between participants and (2) the processing of participants' contributions stemming from a combination of digital co-creation methods.

In the third WP (WP3), the evaluation of the outcomes of digital co-creation is studied. Mainly positive outcomes are identified within the co-creation literature such as bringing opportunities

of learning [16] and increased service quality and policy effectiveness [17]. However, several scholars warn about the potential dark side of co-creation and value co-destruction, and mention that digital co-creation is too often studied through tech-optimism [18]. The exact relation between digital co-creation and these various outcomes remains a black box and calls for appropriate metrics to evaluate the outcomes [13, 18]. In order to capture the diversity in co-creation outcomes, we propose to build on the multidimensional policy network outcomes frameworks by Klijn and Koppenjan [19] and Voets et al. [20]. By developing and testing such a multidimensional outcome evaluation framework, we extend the conventional understanding of digital co-creation outcomes, and allow for a balanced evaluation of their outcomes.

The described contributions of the three WPs (i.e., (1) pre-conditions, (2) complementarity and processing, and (3) outcomes) will then be integrated into the roadmap, which will be validated via use cases and refined iteratively. In order to successfully integrate the contributions of the three WPs into this validated roadmap, we will rely on the well-established Design Science Research methodology [21]. This approach has clear guidelines and has been applied in similar research undertakings before to deliver value to both research and practice. The integration and validation activities are part of WP2. Figure 1 summarizes the three WPs and shows how they integrate into the roadmap.
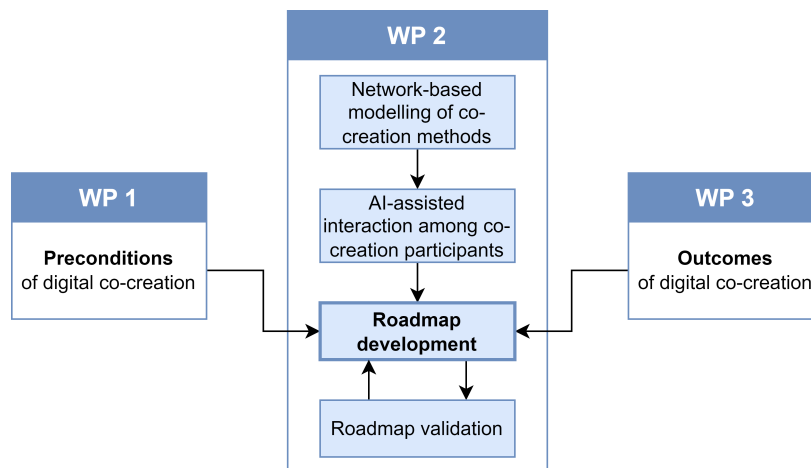

Figure 1: Integration of the three BeCoDigital work packages.

2. Zoom on WP2: Co-creation Methods Complementarity and Information Processing

This paper primarily focuses on the second WP of the BeCoDigital project, that is, the study of the complementarity of co-creation methods and the challenges of interaction between participants and processing of the information resulting from these methods. These two research directions are critical to the project development and closely related to the Information Systems discipline. The following two subsections further develop how these two directions will be addressed in the project.

2.1. Methods Complementarity: A Novel Modelling Framework to Describe Co-creation Methods

The proper study of digital co-creation methods and their complementarity requires the use of a common general framework that embodies all these activities [14]. Following this approach, the literature on citizen participation and co-creation has focused on providing a common vocabulary and a suitable definition of the main concepts involved in these fields. Most works have attempted at providing ontologies, metamodels, and semantic descriptions of actors, processes, and context involved along the different stages of co-creation [22, 23].

The BeCoDigital aims to go a step further in the description of this kind of processes, by not remaining at the conceptual level, but applying these concepts to describe the relations between the different actors and actions being carried out, and identifying different roles [24, 25] and motivations [9] of each implementation. This approach will allow describing the features and characteristics of each method through the same lens, while providing the peculiarities of each practical case where a same method is implemented.

We propose to model co-creation processes by relying on a network-based approach [26], where the nodes are (groups of) actors involved in the co-creation process and the edges represent connections and interactions between actors. By modelling these processes as a network, e.g., an agent-based model [27], the distribution of roles and the main interactions during the co-creation process can be formally represented, explicitly accounting for the heterogeneity in the participation process [28]. Additionally, this network representation allows making use of network properties to evaluate the implementation and performance of the co-creation process [29]. A clear example would be the computation of some measure of centrality, e.g., number of connections, to evaluate the level of linkage in the implemented method. Moreover, this approach can be later extended to model different kinds of participant, based on their interaction and frequency of participation [30, 31], or to perform simulations based on opinion dynamics [32].

The methodology proposed for the development of the modelling framework is the following. First, based on the co-creation methods listed in the literature [4], we will evaluate which are the main describing characteristics of these methods. Then, based on existing conceptual models [14, 23] we will associate these characteristics to well-established terms and concepts. This step allows relying on a properly defined collection of terms while assessing the important aspects of the literature in co-creation methods. Based on this comparison, and taking into account the scope of the framework, we will add any missing variable or we will group the concepts that do not provide any additional insight in the proposed approach. This is to be achieved by properly linking them to the existing literature and by collecting information from interviews with stakeholders involved in the implementation of these methods. We will validate the descriptiveness of the model and its added value by comparing it to real use cases found in the literature and provided by co-creation practitioners who are partners of the BeCoDigital project. A further validation, using experimental design, will be carried out by examining the response from practitioners to the use of the proposed framework and comparing it to their response when this tool is not available.

2.2. AI-assisted Interaction: Information Processing and Collaboration in Digital Co-creation Methods

In order to improve the processing of information available to policy-makers and participants of digital co-creation methods, we propose the study of AI capabilities and the creation of a direct feedback loop to citizens. Taking inspiration from some early attempts performed in the urban planning context [33], the goal is to enhance the citizen's experience in the co-creation process by providing processed information [34] or direct feedback to their contributions [35].

We propose to enhance the collaboration in digital co-creation methods by exploiting the advantages of AI tools [36]. Digital co-creation is often an asynchronous process where direct interactions and real-time feedback among participants is rare, because they do not all access the platform simultaneously. For example, via topical analysis, AI makes it possible to identify the ideas most related to a participant's contribution. It can therefore act as a bridge between ideas and between these participants expressing similar concerns at different times. This allows participants to have an easy access to related contributions and to enhance their own thanks to this direct and personalized feedback, as in the case of chatbot applications [37]. A schematic representation of this idea is depicted in Fig. 2.
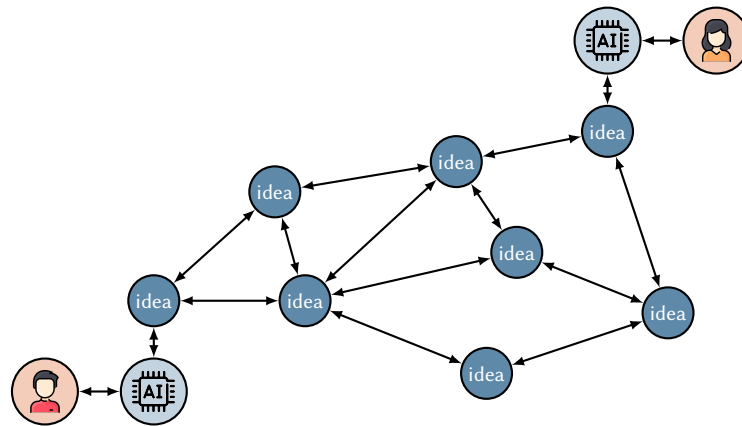

Figure 2: Schematic representation of the AI-feedback approach.

The following methodology is proposed. First, we aim at developing a tool able to extract the main idea from the text generated by the participant (e.g., [38]). This tool will allow creating a network of ideas, based on the participants' input, connected semantically and by importance. Once this network is created, we can exploit this structure to vary the kind of feedback provided to the participant. Namely, comparing it with other similar ideas or proposing ideas that expand the scope proposed by the participant [39]. This first part of the implementation will be evaluated qualitatively and quantitatively, by performing user testing [40] of the tool and by monitoring quantitative indicators such as the number of generated ideas. To be able to provide meaningful results, we will initially focus on a specific case study (e.g., online idea submission), so to implement a functional proof of concept that can be later extended to other applications. Finally, the developed tool will allow testing approaches and concepts from other fields such as creativity [41], music, and other arts [42] in the context of digital co-creation.

3. BeCoDigital Current Status and Expected Outcomes

At the time of writing this paper, the BeCoDigital project (https://unamur.be/becodigital) has been funded and has started since one month. It is scheduled for 24 months, from January 2023 to December 2024. Three universities are involved and the availability of real use cases to validate the project contributions is ensured by partnerships with digital co-creation practitioners. The expected outcomes pertaining to the second WP of the project are:

1. A **modelling framework** allowing the representation of different digital co-creation methods in a unified way and to compare them properly;
2. A **novel application of AI** in the context of digital co-creation as a tool to process information and connect participants and their contributions;
3. A **roadmap** in the form of organized guidelines integrating the two aforementioned contributions of WP2 as well as those of the other work packages.

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