A Bottom-up E-Participation Process: Empowering Citizens to Innovate the Public Administration and its Sphere of Influence

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Abstract. Citizen participation procedures are increasingly used as a democratic instrument in political processes. While e-government development is slowly producing digitized solutions for implementation, there is potential for involving citizens in innovation processes in public administration. Currently, such operations are initiated reactively by the public sector in response to problems for which solutions are pursued. With a structured innovation process, the creativity of citizens can be used participatory to further develop the public administration and its services proactively, i.e., without a specific problem background. This paper describes current characteristics of e-participation and open innovation based on related literature and discusses their use for a proactive, bottom-up public innovation process. Furthermore, Business Process Model & Notation (BPMN) is used to illustrate a simple conceptual process for contributing and assessing ideas supported by an idea management system.

Keywords: Public Innovation, E-Participation, Collaboration, Public Sector, Idea Management System

1   Introduction

The politics of democratic countries are based on the participation of citizens through the execution of the right to vote enshrined in the form of government. This also applies to the European level through the Treaty on European Union in article 10, paragraph 3: "Every citizen has the right to participate in the democratic life of the Union. Decisions shall be taken as openly as possible and as closely as possible to the citizen." [1]. Citizens, e.g., directly or indirectly elect the composition of government bodies or decide on specific laws. So, participation is related to the political system, but its implementation varies from country to country; e.g., implementation in Germany, Austria, and Switzerland are not uniform. The understanding of the term is different in many places, and it is often used as a political buzzword, representing an increase in the power of the people.

In Germany, referendums are held at the municipal, state, and government levels. Participation can therefore take place at different levels. The spectrum of the

involvement extends across different tiers: (1) inform, (2) consult, (3) involve, (4) collaborate, and (5) empower [2]. Up to now, this system has been used chiefly reactively in the interaction between the state and the citizens, i.e., usually, the state triggers the process of citizen participation with a specific topic to be decided on, e.g., on urban development (top-down principle). We see a great potential to develop and establish a proactive system that gives citizens the opportunity to share their ideas and creativity and contribute to the innovation of public life, which follows a bottom-up principle. The German Federal Ministry of Education and Research is making citizen participation a focus of the year of science 2022 to strengthen the exchange between science and society and involve the public even more intensively in research policy discussions [3]. Some regions or states have a basic suggestion system in place [4–6], but the handling, transparency, and process are no longer in line with the digital age, nor is there a standard. This is particularly noticeable with silo solutions created for dedicated federal states or ministries.

As defined in the Toyota management principles, not using employees' creativity in a company or organization counts as waste [7]. This basic idea can also be applied to the relationship between the state and citizens, while the state is the organization, and the citizens are the employees and/or customers. Within the population are individuals with a wide variety of qualifications, backgrounds, cultures, and communities. They all have desires and can generate innovative public ideas that lead to incremental, radical, or disruptive innovations. It is essential to use this potential and provide citizens with a barrier-free opportunity to participate and motivate them to use it.

In the course of global digitization, governments and their processes are becoming increasingly electronic (e-government) and therefore creating new access points for interaction through the virtualization of service processes. E-participation should be an essential component throughout the development towards e-democracy that includes several online elements [8]. Currently, there is a lack of standardized processes for digital participation opportunities in the public sector, as well as an easily accessible IT system suitable for capturing, evaluating, tracking, and transparently managing the ideas received [8]. However, these ideas and innovations, initiated bottom-up by citizens, are themselves important in driving the digital transformation forward [9]. Public administration in Germany has a reputation for being less innovative, as shown by its 25th-place ranking in the E-Government Development Index [10], which still has significant potential for improvement. An image that will have to change in the future within the context of digitization and the opportunities it offers [11]. Citizen-driven innovation can play a major role in this, which is why, e.g., the German Federal Ministry for Economic Affairs and Energy has embedded an open innovation platform in its Digital Strategy 2025 [12, 13].

Section 2 of this paper explains the used methodology. Section 3 defines and characterizes e-participation by means of relevant literature and selects a procedure suitable for a structured open innovation process. With this foundation, in section 4, we model and present a conceptual process using Business Process Model & Notation (BPMN) [14] for proactive digital citizen participation to receive and manage ideas. Section 5 concludes the paper with a discussion of the results and a conclusion with approaches for further research.

2 Method

A profound insight into the subject area and a presentation of the current state of the art are necessary to characterize participation methods and robustly model a structured participatory open innovation process. For this purpose, we consulted suitable German and English literature to obtain an overview [15, 16]. In the first step, inclusion and exclusion criteria were discussed and defined to systematically decide which contributions were relevant to the topic, see Table 1. Then, various search terms were used via Google Scholar to identify and include as much relevant literature as possible.

The specific search terms and queries were initially: "e-participation," "citizen participation," "Bürgerbeteiligung," "(e-participation OR Bürgerbeteiligung) AND (best practice OR methods OR Methoden)," and "open innovation." The results were selected and sorted by titles and keywords. From this first round of scanning, some additional interesting terminology of existing research was filtered and considered in a second round of searching. The following search terms and queries were added: "public innovation," "(citizen participation OR Bürgerbeteiligung) AND (characteristics OR Merkmale)," and "public participation AND methods." The search did not specifically narrow down the publication date so as not to exclude older analog methods that may now be digitized. Then, the literature was first sorted based on the abstracts before the remaining papers were fully screened and assessed according to the criteria in Table 1. Finally, a forward and backward search was performed.

Table 1. Inclusion and exclusion criteria for the surveyed literature

Criteria for inclusion	Criteria for exclusion
The article examines suitable citizen participation processes and their characteristics using traditional or digital methods.	The article examines participation processes in a purely corporate or economic context.
The article examines ICT tools for use in citizen participation processes, e.g., idea management systems.	The article does not consider the area of public administration or only marginally.
The article deals with citizen-initiated innovation methods, e.g., open innovation approaches.	The article focuses exclusively on the theoretical behavioral level or motivational factors.

Based on the literature and best practices, a conceptual bottom-up e-participation process for capturing and evaluating ideas using appropriate IT tools was developed and illustrated using BPMN [17]. The resulting process is intended to facilitate the initiation and development of an open and structured e-participation process to collect innovative ideas arising from the creativity of citizens.

3   Theoretical Background

This section presents theoretical background on e-participation, the benefits of open innovation in public administration, and idea management systems as a supportive tool in open innovation processes.

3.1   Definition and Classification of E-Participation

E-participation can be defined as the use of information and communication technology (ICT) in support of engaging citizens in an exchange with government entities and politicians [18]. ICT can hereby be used in support of other analog information channels or as the sole interaction channel [19]. Many Countries implement e-participation processes as a digital democratic element with the goal of creating decision-making structures that are more participatory, transparent, and responsive to improve democratic exchange between citizens and government [8, 20]. Another purpose of e-participation is the general improvement of citizens' trust in political and public administration processes as well as the legitimization of government actions [21]. E.g., a common method is e-consultation, which actively collects feedback from citizens on a given question or information set. E-polling and e-petitions are procedures in which ICT are used to obtain citizens' opinions on specific topics and address them directly to decision-makers [21].

Participation is one of the three pillars of the open government concept besides transparency and collaboration [21], as shown in Figure 1. The intentions of the concept, which is particularly characterized by Web 2.0 techniques, overlap in many ways, e.g., the efforts are intended to achieve greater transparency and more intensive collaboration between the administration and the citizens. So, e-participation is often mentioned as a component of open government [21]. In general, the participation pillar comprises more traditional participation projects, while the collaboration pillar describes new forms of cooperation between government and civil society, such as the co-creation of new services [21].
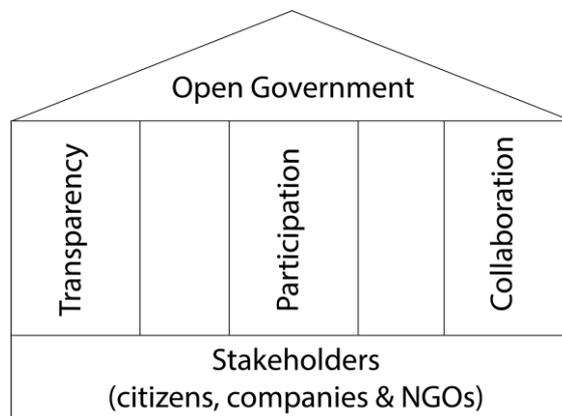

Figure 1. Pillars of open government based on [22]

E-participation can be divided into formal and informal planning process methods [23]. Formal methods are a direct democratic act mostly prescribed by law. Informal methods are usually not required by law and focus more on the collaboration aspect [21]. Examples of formal e-participation can be found in particular in urban development or land use planning. In these cases, the public administration is obliged by national law to involve citizens in the planning process [24]. Unfortunately, this is often done later in the planning process, limiting citizens' practical influence on the outcome. This is because many fundamental decisions have already been made before citizens can actively participate [23]. Informal e-participation, on the other hand, is often done independently or before the start of administrative planning processes and therefore has the chance to impact results more efficiently [23].

The UNs typology of e-participation combined with the Macintosh Levels of Engagement and OECD[1] findings provide the foundation for categorizing citizen-government interaction, see Table 2 [8]. The UN EPI[2] Framework provides the categories e-information, e-consultation, and e-decision-making. E-information describes a one-way availability to datasets and information on government websites or social media in different languages [25, 26]. Macintosh describes e-enabling as supporting people who do not normally have access to the internet to access large amounts of information and make it understandable. The role of citizens here can be described as passive [27]. E-consultation refers to two-way interactions with citizens to achieve their contribution and input on public services and policies. Here, surveys, petitions, and forums are used as online tools [25, 26]. According to Macintosh, this can be classified as e-engaging, a top-down approach that consults citizens as an active broader audience to provide deeper input and support debates on policy issues [8, 27]. E-decision-making describes a progressive two-way approach to empowering citizens by actively involving them in the design and production process of policies, services, and implementation modalities [25, 26]. Macintosh describes this as e-empowerment, a bottom-up approach in which citizens contribute their own ideas to influence the political agenda [27].

Table 2. General characteristics of e-participation based on [8]

OECD Government-Citizens Interactions	UN EPI E-participation Framework	Ann Macintosh Levels of Engagement	Citizens' Role
Information (One-Way)	E-Information	E-Enabling (level 1: Accessibility & Understandability)	Passive
Consultation (Two-Way)	E-Consultation	E-Engaging (level 2: Top-Down)	Active
Active Participation (Advanced Two-Way)	E-Decision-Making	E-Empowerment (level 3: Bottom-Up)	Active

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[1] OECD – Organisation for Economic Co-operation and Development

[2] UN EPI – United Nations E-Participation Index

3.2 Open Innovation in Public Administration

Open innovation describes an opening of the flow of ideas in the innovation process. It is based on the principle that ideas, as part of the innovation process, come not only from within the boundaries of an organization but also from outside it [28]. In contrast to the centralized research & development of the closed innovation paradigm with its silo structures, this changes the logic through the availability and quality of external ideas [29]. E.g., Procter & Gamble, as a corporation, promotes an open innovation strategy by following an approach of selling ideas to the external market if they are not used internally within three years [30]. Thus, unused intellectual property can become a business model in its own right by generating profit from its sale [29]. This openness creates new ways of (co-)creating value and market strategies as well as improved accessibility to innovations [31]. Research is also benefiting, e.g., in public administration through the increasing linkage with citizen science approaches [32]. In this context, citizens can actively participate in research projects as experts or laypersons by, among other things, asking research questions, making observations, or taking measurements. Particularly noteworthy is the outside-in principle, bringing in external knowledge and a different perspective by involving people outside of an organization or project [33].

Open innovation procedures can be differentiated by two characteristics in particular with two manifestations, resulting in four cases, as shown in Table 3 [30]. Along with the pure forms of these cases, hybrid types can also be implemented [34].

Table 3. Typology of open innovation based on [30]

	Inbound innovation	**Outbound innovation**
Pecuniary compensation	Case 1: acquire technology. Buy intellectual property (patent license). Use market for technology	Case 2: sell technology. Sell IP (patent license). Use market for technology
Non pecuniary compensation	Case 3: cooperation. Use external source of knowledge and projects in cooperation with external partners. Collaborative innovation	Case 4: free revealing into community of practices. Business model of the open source software. Collective invention

Case 1 describes the procurement of technology in the form of patents or intellectual property rights, which are pecuniarily obtained from outside in a marketplace and therefore called inbound innovation. Organizations that choose this procedure require a high level of expertise to identify, integrate, and deploy the most appropriate external intellectual property for their infrastructure [35]. Case 2 outlines how companies bring their own innovations to market through patents and intellectual property to create

value. This approach is often a chance to balance out research and development costs of projects which did not reach the desired maturity. Some organizations even build their business model on selling technologies and innovations [35]. Case 3 is a type of open innovation that characterizes the development of innovations in collaboration with other companies or organizations such as public research institutions. In this case, openness is the basis of collaboration, as the companies externalize some parts of their production process. [35]. This case corresponds to collaborative innovation. Case 4 is an approach in which the company or inventors voluntarily waive their exploitation rights and make the innovations available to the market. It is assumed that with such an approach of collective invention, market participants will initiate a positive cycle of information and knowledge exchange between them [35].

A dialogue opportunity must be created to use the available potential in the form of citizens' ideas and creativity. This case can be clearly classified as inbound innovation without pecuniary compensation so that typologically it is case 3. Since the goal of the public administration is to create public value, this approach allows public sector actors, citizens, and other service users to collaboratively and openly contribute to innovation and the creation of value [11]. The fundamental prerequisite for success is that the groups of different stakeholders are willing to engage in a trust-based dialogue to work together to create innovations [11]. The participants in such groups are loosely connected and motivated by comparable interests.

Collaborative innovation would help public sector organizations source and release unforeseen innovation potential within their sphere of influence by integrating new perspectives and knowledge from external actors. Additionally, this can lead to sustainable and long-term innovation partnerships [36]. When companies participate and pool resources with public sector entities, synergy effects can be exploited in joint innovation projects by sharing research & development costs between the different organizations [36]. Besides economies of scale, collaboration also acts as a positive incentive through the possibility of obtaining funding for joint proposals at national and international levels. Another possible effect is the improvement of the level of awareness and branding of the collaborating organizations [36]. For the people involved, participation in such innovation projects can lead to an enrichment of their work and possibly have an impact on motivation and the working atmosphere [36].

Deeply entrenched bureaucratic silos in the public sector pose one of the biggest challenges to collaborative innovation. By combining appropriate methods, intuitive ICT tools, and the will for positive change, there is a chance to sustainably overcome archaically anchored functional and regional silos [13, 30, 37]. As the COVID-19 pandemic has already shown, digital forms of communication can give rise to entirely new collaborations, even across regional and national borders [38]. In their study, Fetter et al. also illustrate how open innovation strategies can transform public administration to accelerate the creation and use of innovation by collaborating within organizations and with external parties [34]. Process-supporting ICT tools are a vital component in this effort [39].

3.3 Idea Management Systems as Supportive ICT Tools in E-Participation

Idea management systems (IMS) can be considered a pillar of innovation management. They serve as an opportunity for an organization and external parties to collect, assess, manage, document, and archive ideas. Around the 1990s, IMS as valuable factors for continuous improvement have been evolved out of the suggestion box, which was historically used to manage and coordinate employees' creativity [40]. Thus, they support the creative value creation process through human resources. Without a sustainable and methodical process, collecting ideas alone does not necessarily lead to innovative processes and products or a stronger customer focus or better performance of the organization as a whole [41]. A strategically planned and implemented IMS, on the other hand, can contribute significantly to the success of an organization [41].

It allows constant tracking of the status of ideas for all stakeholders, and by providing digital access to this information, an IMS can increase the transparency of the innovation process. Furthermore, the applications provide a database to capture and search for ideas, which also serves to prevent duplicates [41]. Ideas should be submitted through an electronic interface accessible to the entire organization. A standardized input screen should guide the users through all of the predetermined characteristics of an idea during data entry [41]. The assessment process of submitted ideas can be individualized with experts or supported by crowdsourcing elements where the community, e.g., votes on submitted ideas [41].

Leible et al. have shown potentials for the use of IMS in public services for innovation processes with digital citizen participation [42]. Using a digital platform for citizen participation and innovation could form the basis for a more process-oriented approach in which the IMS becomes a key component [9]. It would create a space for interaction and the exchange of information between the public administration and the citizens as well as enable new ways of value creation by continuous reintegration of information [9]. This collaboration can improve citizens' identification with and trust in their regional administration and the state as a whole [43]. The expected consequence is a higher participation rate among citizens [43].

The high scalability and the simple digital accessibility, with which silo boundaries can be overcome, ensure the sustainability of IMS [44]. A large joint network for federal states would be desirable in the long term, which avoids wasting resources by having to solve the same problems multiple times in different regions since solutions are not shared. In particular, this would allow diverse groups with different qualifications to solve problems faster and more efficiently [45]. The dialogue can also be turned around by the public administration issuing challenges top-down via the platform, and citizens as well as organizations such as companies or research institutions can respond to them [42]. With little adjustment effort, IMS can also be used for special events such as hackathons or design thinking workshops [42].

4 An IMS supported Bottom-up E-Participation Process

In this section, we present a simplified digital e-participation process modeled with BPMN to harness the creativity of citizens. The first subsection describes and classifies the model, and in the second subsection, the process itself is illustrated.

4.1 Model Concept and Classification

Citizen input is most often used to gather information about user behavior and feedback after new or modified services have been introduced or to gather ideas at the beginning of projects that are initiated top-down [9]. An informal, continuously available, and bottom-up way for citizens to participate in the design and innovation of public administration and its sphere of influence has not been widely and sustainably established. Our proposed exemplary process model aims to exploit the potential that introducing an IMS holds as an ICT tool for creating a digital, open, and transparent interaction channel between citizens and government [19]. This will improve and expand democratic processes and dialogue with citizens, as well as encourage and motivate participation [19].

Besides the results of the included literature, we examined two best practice applications. The first e-participation example is "FixMyStreet," where citizens can send their request for a necessary repair in their community directly to the responsible department in the local public administration [46, 47]. The second example is "Melde-Michel" in Hamburg, Germany, which citizens can use to report infrastructure damage in the city [48]. Both of these cases are done proactively, i.e., before any concrete awareness of the problem has been raised by the city. Services like FixMyStreet or Melde-Michel have a direct connection and efficacy between the contribution and the result [49]. This indicates that continuous access to participation is possible, but is currently provided mainly for predefined areas such as, in this case, cleaning and repair tasks.

The factor of meaningfulness and the direct influences on the outcome should be taken into account when designing participation processes [49, 50]. This factor is fulfilled in our simplistic process model by examining the ideas through an individually composed (assessment) board. The core requirements imposed on the process include high transparency, trustworthiness, low complexity, and a systematic approach. Other requirements, such as intuitiveness, scalability, and functional scope, relate mainly to the software used, where we recommend an IMS. In an evaluation of different IMS, OpenideaL (open source, non-commercial) and Q-ideate (commercial software) were particularly highlighted [42].

Based on the characteristics presented in section 3.1 and Table 2, our proposed e-participation process can be classified as informal since it is not required by law. According to OECD, citizen interaction is done as an "advanced two-way" by involving them not only in the innovation process as bottom-up idea contributors but moreover in the design and implementation [8]. In this way, citizens actively participate in what happens in government and democratically shape the policy agenda, leaving the role as mere consumers, thus classifying the process as e-empowerment according to the Macintosh levels of participation [8]. According to the EPI Participation Framework, the presence of appropriate ICT tools, such as an IMS that enables dynamic dialogue and co-creation of products or services between citizens and government, categorizes our model as e-decision-making [8]. Overall, the characteristics of collaborative innovation are thus fulfilled with the created process. We want to note that our process model presented in the next section explicitly covers idea capture and assessment as a

conceptual approach and should be adapted and extended for individual needs and use cases.
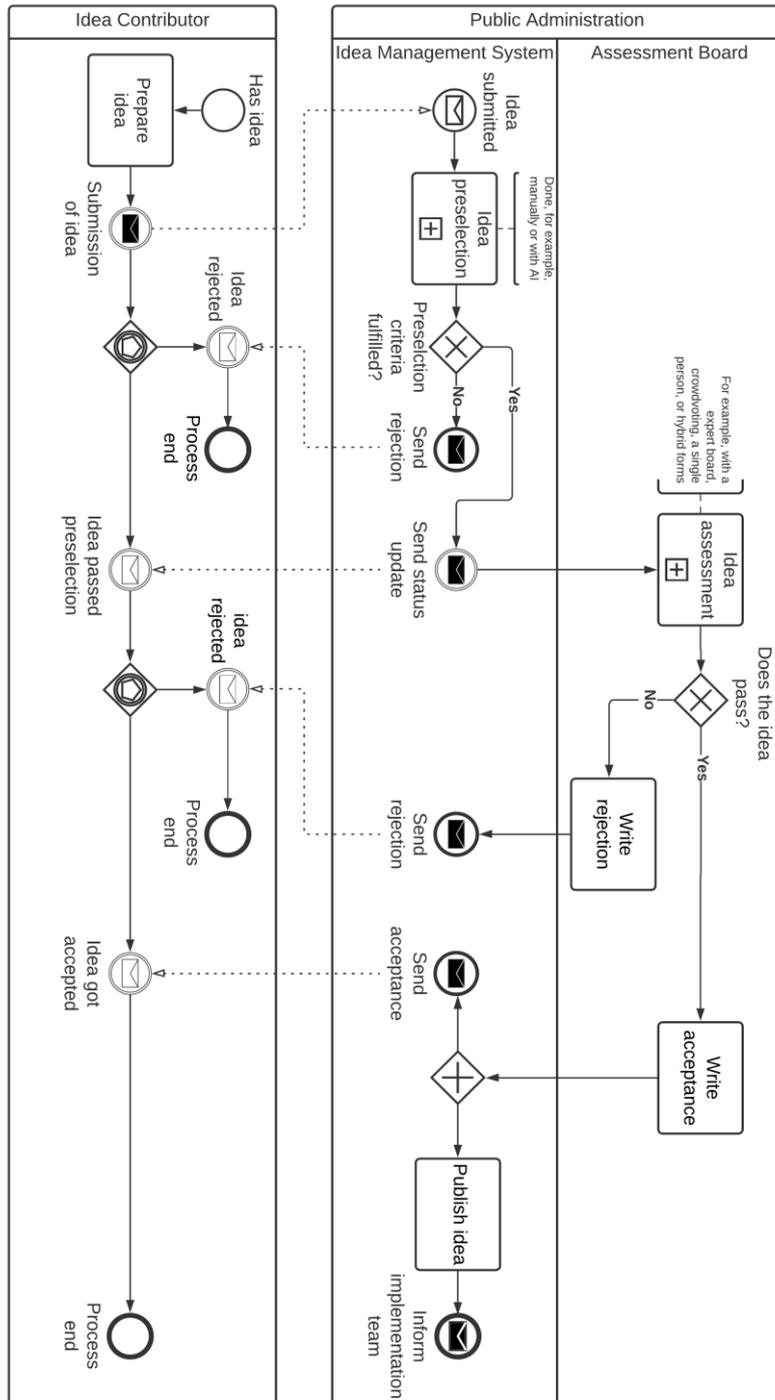
4.2 Conceptual Process Model

Our proposed e-participation process is modeled using BPMN. It consists of two pools and three lanes representing the entities and responsibilities of the process, as shown in Figure 2. The upper pool shows the public administration as an organization with the lanes "Assessment Board" consisting of one or a grouping of people and the digital "Idea Management System." The lower pool consists of a lane, the "Idea Contributor," which can represent a citizen or even an organization. The model builds on Gerlach et al.'s model for a generic idea management process [41].

The overall process is triggered by the event "Has Idea," which means that a citizen or organization has an idea that they would like to submit. The idea contributor then prepares his idea according to an individual template for submission via the IMS. The template can, e.g., be visualized via a defined input mask. When submitting the idea, an automated check should be performed to ensure that all required fields are filled in and that the idea has not already been submitted [41]. If the defined criteria are met, the idea is stored in the system, and a digital request for review by the assessment board is created.

The assessment board can be compiled individually. (Interdisciplinary) experts from the administration who match the submitted idea and affected persons or even external persons are conceivable. Responsibilities should be transparent, clearly defined, and documented to avoid ideas being overlooked [51]. An alternative approach that is often part of idea assessment processes in IMS is to allow ideas to be evaluated by other idea contributors. Common methods are a like/dislike function or a 1 to 5 rating system [40]. This approach adds value by incorporating and leveraging the knowledge of the community in a kind of crowdsourcing [41]. However, the basic criteria for idea evaluation should be risk, effort, and benefit [40].

In case of a positive outcome of the assessment process, a message of acceptance is sent to the idea contributor via the IMS. Otherwise, a rejection message is sent. Transparency and feedback to idea contributors play a crucial role in maintaining motivation in the community, so in case of rejection, a factual reason should also be given [51]. Provided that the automated preliminary review or the review by the assessment board is negative, the process ends for the idea contributor. He then has the opportunity to revise his rejected idea and resubmit it.

After the acceptance of an idea, there could be an optional check on whether there is some kind of reward, e.g., monetary rewards, items, and vouchers. It is important to be careful when deciding on the form of reward and the type of recognition because of the risk of crowding-out effects and the possible perception of unfair treatment [51]. Both accepted and rejected ideas should be openly viewable by the community to inspire and stimulate new proposals. Transparency can drive innovation cycles here so that citizens develop and advance ideas submitted among themselves [52]. This procedure follows the open government approach and should lead to a more intensive and stronger collaboration through its openness.

Figure 2. Conceptual BPMN model of an IMS supported bottom-up e-participation process

5   Discussion and Conclusion

In the previous sections, we described the fundamentals of e-participation, open innovation in the public sector, and the opportunities of using an IMS for e-participation processes. Based on the findings from the literature and best practices, a conceptual process model was designed for capturing and assessing citizen-driven ideas.

In an increasingly digital society, public administration can and should take advantage of the growing potential created by digitization, such as that offered by the combination of e-participation, open innovation, and appropriate supporting ICT tools. The emerging will of the German government to exploit this potential is indicated by efforts such as the "Onlinezugangsgesetz" [53]. Just as it has long been the norm in the private sector to listen to customer feedback and make adjustments to business practices or products in response, citizens are synonymous with customers who should be satisfied in public administration. This approach is illustrated in this paper with a simple e-participation process that, by harnessing citizen creativity, can contribute as a catalysator to creating new and enhancing existing products and services in the public sector. Part of the demand for digital solutions by citizens can also be attributed to the private sector, with companies such as Amazon or Google offering users a convenient digital experience.

Innovation can arise and emerge in various ways, e.g., through a research and development department or digital innovation unit set up for this purpose within or attached to an organization. A complementary alternative that we propose is the suggestion system, applied using a digital IMS as a web platform and enriched with open innovation approaches. This allows, besides the bottom-up approach presented, also top-down participation in the sense of e-consultation using the same system [54]. Examples of this would be idea competitions with challenges or hackathons with the participation of citizens or organizations such as companies or universities.

Our presented model is based on current scientific findings and best practice applications and thus demonstrates its functionality on a conceptual level. However, it is limited by the lack of a sound empirical analysis through the use of a prototype in a real-world environment such as a government department. The results on how such a socio-technical platform is adopted by citizens and used in the short and long term provide valuable feedback for the proposed concept and further design of citizen-driven innovation systems. Thus, demographic data such as the age structure and IT affinity of active users are also relevant to identify and reduce barriers to participation in order to accommodate democracy and enable every citizen to participate in the same way. In addition, the technical system implementation should also be analyzed in detail.

The research area of e-participation has many more interesting questions. Examples here are questions about how citizens are motivated to participate in the sustainable long-term development of public administration or according to which criteria in detail ideas should be assessed and weighted after a submission. It has been shown that motivation is high when a system for submitting ideas is introduced but that it also drops off again quickly [51]. Our approach could be a step to develop a prototype, evaluate it practically in a case study, and gather further insights to sharpen the approach and the implemented solution.

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