

## Challenges, Barriers, and Approaches for Providing Digital Citizen Information. A Case-Study in North Rhine-Westphalia, Germany

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### Abstract

*In this article, we present a case study of the limitations and barriers concerning digital citizen information systems in North Rhine-Westphalia (NRW), Germany. We define citizen information as information that satisfies citizens' needs and interests regarding their country, state, or municipality. Local governments can use information systems in the form of official websites, social media, council information systems, mobile applications, and open data portals to disseminate information. Aspects like transparency, participation, and collaboration can thereby be strengthened. We assessed citizens' views of such systems via a questionnaire and addressed their wishes in expert interviews. The results suggest that NRW has good prerequisites to provide digital citizen information systems, but the municipalities still have to overcome several barriers. We suggest six central approaches: development of a social media strategy, creation of digital competences, establishment of standards, strategies for increasing awareness, development of innovative services, and strengthening cooperation between municipalities.*

### 1. Introduction

Governments worldwide are facing challenges of using Information and Communication Technology (ICT) appropriately to provide information to citizens and to encourage participation in policy-making. To digitize processes and services in public administration intends to facilitate aspects involving information, communication, and transaction. Goals concerning digital government are deeply related to the notion of open government. By opening towards the public, trust in democracy and efficiency of governmental work is supposed to increase. The beginning of this movement is often associated with the memorandum entitled "Transparency and Open Government" by former US President Barack Obama [1]. Three core principles form

the basis of this idea:

- transparency - public administrations have to provide information regarding their work and corresponding decisions,
- participation - citizens should be empowered to participate in policy-making actively,
- collaboration - public administrations should use innovative tools and methods for collaborating with other administrations, the public, and non-governmental organizations.

Since the release of Obama's memorandum, efforts concerning open government increased all over the world. Still, several barriers exist in this regard. For example, with the range of possible ICT solutions, public administrations face the challenge of choosing appropriate channels accepted by the public for providing information and facilitating communication.

The German government has also acknowledged the importance of the open government movement. Since 2016, Germany has taken part in the Open Government Partnership (OGP), an international initiative that obliges participants to put transparent government and administrative procedures into action. In 2019, the federal government developed a second national action plan with the public's participation, which entails obligations to implement open government principles. In addition to the federal program, several German states designed their corresponding open government concepts. One of these states - North Rhine-Westphalia (NRW) - implemented its "Open.NRW" strategy in 2014. Three main goals are listed in this strategy: enhancing the dialog between governments and citizens and thereby strengthen trust; establishing new practices to inform citizens better and to open towards participation; making innovation potentials of the open government principles usable.

In this article, we concentrate on the German state NRW as a case study and examine established channels of digital citizen information. Several previous studies

have investigated the adoption of e-government services [2, 3, 4, 5], whereby cultural differences were identified [2]. With this study, we aim at analyzing the adoption of local digital citizen information offerings in NRW. The goal is to identify challenges and barriers for providing digital citizen information and then to develop approaches to face those challenges.

In the following section (sec. 2), we will discuss the theoretical background of different citizen information services. After that, we will present the methodological approach of our study (sec. 3). Subsequently, the results are presented (sec. 4), followed by a discussion of the underlying implications (sec. 5).

## 2. Theoretical Background

In this article, we define citizen information as any information that satisfies citizens' needs and interests concerning their country, state, or municipality. This information can relate to topics relevant to everyday life, e.g., issues concerning construction projects in the neighborhood, but also information regarding citizens' general rights and claims as well as their obligations towards the government. A further essential type of citizen information is information that helps to assess the government's work critically and to resolve grievances [6]. Providing this kind of information thus also aims at improving participation and transparency.

Digital citizen information narrows the above definition to information that is available in a digital format. Governments can apply different systems and channels to provide such information online, including official websites, mobile applications, open data portals, council information systems, and social media. In the following, we use the term "(digital) citizen information system" to include all of the above examples. For convenience, we drop the prefix 'digital.'

Governmental organizations are using official websites to disseminate content broadly and to increase the visibility of this content. The availability of certain citizen information on official websites is a significant dimension in this regard [7]. Citizens should be able to use government websites like a menu that provides them with relevant citizen information on an anytime-anywhere basis [8]. Relevant information can thereby be present in the form of current news, reports on political activities, council orders, statistics, and datasets. Topics can include several domains, including categories like recreation, tourism, culture, art, education, and economy. Municipal websites further often refer to essential contact points like public offices or authorities.

Several municipalities and other governmental

organizations further use different social media to disseminate citizen information. In contrast to websites, social media allow users not only to consume content but also to share it [9]. Citizens can further form a dialog related to the published content, which is not possible concerning the content posted statically on websites [10]. By using social media, citizens can leave their passive role and become 'customers' interacting with the government [7]. The use of social media by governmental institutions can have a positive impact on citizens' engagement. A simplified and advanced access to political information can revive citizen participation by increasing political knowledge and encourage corresponding discussions [11]. The simplicity is another advantage of social media: The management and design of content do not require technical skills, interfaces are often easy to use, and many services are free of charge. Social media thus offer a highly interactive and communicative platform [12]. A study that also concentrated on municipalities in NRW found out that the most common municipal social media platforms are Facebook and Twitter. In 2017, 37% of the municipalities had an official Facebook account, and 19% offered an official Twitter account [13].

Digital government can also be represented by mobile applications, thus referring to mobile government or ubiquitous government [14, 15]. Through mobile applications, location-based services are possible [16]. "[C]itizens can get immediate access to certain government information and services on an anywhere-anytime basis. The government can use the scalable and swift wireless channels to send time-sensitive information such as terror and severe weather alerts to citizens quickly and directly" [17, p. 54]. Location-based participation, e.g., by reporting on problems in a city, is also possible. Applications that intend to solve urban problems are also called citizen apps [18]. A critical success factor of mobile government services is the service's perceived usefulness [19].

Beside these services, publishing datasets is another form of informing the public. Open data refers to data that is freely accessible online in a machine-readable format, while there are no technical or legal restrictions to reuse it [20]. Open data, and in particular open governmental data is being published in an increasing number of countries and their subordinate administrative units. There are different types of sources for open government data, in particular at the local level: official statistics, sensor-based data, and user-generated content [21]. Opening datasets in a city can contribute to innovations and value-added city services [22, 23]. Several cities are hosting specific open data portals

to present all kinds of open datasets on one central platform. First-generation open data infrastructures mainly provided the possibility to download datasets, while second-generation infrastructures include further features, e.g., for data processing and visualization, thereby eliminating the clear distinction between data consumers and producers [24].

Lastly, a council information system is a particular information system, i.e., it serves to collect, store, and process data into information [25]. Several German municipalities use such a system to make documents and information concerning the council work accessible to the public. Citizens are thus enabled to inform themselves about local politics and to monitor council actions and decisions.

Previous studies have investigated the adoption of e-government services [2, 3, 4, 5]. The perceived usefulness of a service has been identified as a main factor for using governmental services [4]. Governments are facing several challenges regarding citizens' e-government adoption [2]. The provision of different kinds of citizen information via the various channels is often lacking on different levels.

For example, municipal websites are often far off a satisfactory standard which would help provide transparency and accessibility [26]. Website usability plays an essential role in the quality of an official website and the transparency of the provided information thereon. Usability and credibility on government websites seem to correlate, whereby typical problems associated with credibility are missing contact information or non-updated content [27]. In an analysis of official websites in 31 global world cities, the accessibility of information turned out to be insufficient [28].

Another example is the insufficient use of social media, as existing potentials are not properly exploited [29]. For a successful application of social media, “[p]latforms should be part of a strategic governance program and not simply offered for the sake of offering” [8, p. 262]. Besides, appropriate staff should be involved in social media activities, and suitable feedback possibilities should be available [8].

The quality of open data infrastructures is an essential factor for successful open data provisions. Besides, citizens' perception of open data service quality is an important driver for trust in the data [30]. In NRW, the usability of existing open data portals has been rated as insufficient [31]. Similarly, previous works have shown that council information systems in Germany are often not promoted on official websites and designed without a user-friendly interface [32].

### 3. Methods

In a first step, we identified existing offerings concerning digital citizen information in the 396 municipalities of NRW, Germany. For each municipality, we assessed the availability of an official website, social media accounts on Twitter and Facebook, an open data portal, and a council information system. To identify challenges, barriers, and possible solutions concerning the provision of digital citizen information in NRW, we applied a twofold approach. First, we concentrated on existing challenges and barriers regarding digital citizen information in NRW by conducting an online survey. Based on the survey results, we conducted expert interviews to identify approaches to meet the challenges and obstacles.

The theoretical background and an interview with an expert in the field of open data, digital government, and open government formed the basis for the questionnaire. The goal of this first interview was to use the expert's extensive experience in his field of expertise to generate various topics and questions for the questionnaire. For this purpose, we formulated eight questions. The interviewed expert was asked again to evaluate the survey results and was thus interviewed twice within the scope of the study (see Table 1, E3).

At the beginning of the poll, we provided a short introduction to the topic of digital citizen information and essential definitions. After that, we gathered some demographic data. The main section then entailed 29 questions concerning digital citizen information. Based on the familiarity with certain aspects and systems, not every item was visible to all participants. For example, we asked whether the participants were aware of any digital citizen information system in their municipalities. If the answer was “yes,” we further wanted to know for each channel or system (e.g., social media, website, open data portal) if the participant had already actively used it. Questions concerning the types of used systems and their usability, as well as general assets and drawbacks regarding these, only followed when the participants indicated an active use. We also included items concerning the participants' assessment of the potential and further development of digital citizen information systems. Regarding participation possibilities, we added questions about the participants' perceptions of being enabled to be actively involved in political processes through citizen information.

The questionnaire contained single- and multiple-choice items, questions on a 7-point Likert scale [33], and free text fields for more in-depth individual responses. The survey was created using

“UmfrageOnline”<sup>1</sup>. It was shared from October 2019 to January 2020 through our personal and professional network (e-mail, Facebook, and Twitter) using a snowball technique, i.e., asking participants to distribute the link further. Thereby, we aimed not only to reach out to experts in the field of citizen information but also to laypersons to get a more diverse picture.

To address the perceived benefits and challenges resulting from the survey responses, we conducted seven semi-structured interviews with experts in the field. The criterion for a person to be considered an expert was a proven experience with digital citizen information, either professionally or voluntarily. The experts further had to be affiliated with NRW to assess the specific circumstances in this state. Based on the questionnaire results, we formulated questions that formed the basis for our interview guideline. We used a semi-structured approach so that the experts were motivated to add any further thoughts on the specific topics. We conducted the interviews between February 2020 and May 2020; each conversation lasted between 25 and 45 minutes. An overview of the interviewees is given in Table 1.

**Table 1. Summary of interviewed experts**

	<b>Expert qualification</b>	<b>Sector</b>
E1	Research on open government and open data; civil engagement “Open Knowledge Lab”	Science, IT
E2	Employee in the Ministry for Economy, Innovation, Digitization, and Energy of the state NRW; responsibility for the portal “Open.NRW”	Public administration
E3	Head of the business unit “IT” in a municipal data processing center in NRW	IT
E4	Independent Geospatial Professional; part of a local government in NRW	Politics, IT
E5	Employee in a local open data team	Public administration
E6	Head of the team “digitization” for a municipal IT service provider in NRW	IT
E7	Chief Digital Officer of a municipality in NRW	Public administration

<sup>1</sup><https://www.umfrageonline.com/>

## 4. Results

In February 2020, all of the 396 municipalities in NRW disseminate citizen information on an official website, whereas 238 have a Facebook and 127 a Twitter account (Table 2). However, not all social media accounts were active; i.e., did provide up-to-date content. On eleven Facebook accounts and 31 Twitter accounts, the most recent posts were from 2018 or before. Only 54 of the municipalities provide official statistics on an open data portal. Some cities make this kind of data available on the official website and do not use a specific portal. In these cases, the number of offered datasets is limited. In contrast, most municipalities host a council information system. At the time of our analysis, only nine communities did not offer such a system, whereby eight expressed the intention of implementing one soon. In the following subsections, we will present the results from the questionnaire (4.1) and the expert interviews (4.2).

**Table 2. Digital citizen information systems in 396 municipalities in NRW, Germany**

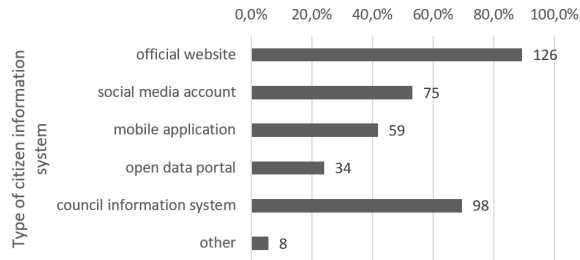
<b>Type of system</b>	<b>no.</b>	<b>%</b>
Official website	396	100.0
Official Facebook account	238	60.1
Official Twitter account	127	31.1
Open data portal	54	13.6
Council information system	387	97.7

### 4.1. Questionnaire

In total,  $n_1 = 204$  participants fully completed the questionnaire. The participants’ age ranged from 13 to 74, with a mean value of 42.3. We had 115 male (56.3%) and 86 female (42.2%) participants. More than two thirds ( $n_2 = 141$ , 69.1%) were familiar with any citizen information system in their municipality, and  $n_3 = 112$  (54.9%) have already actively used one.

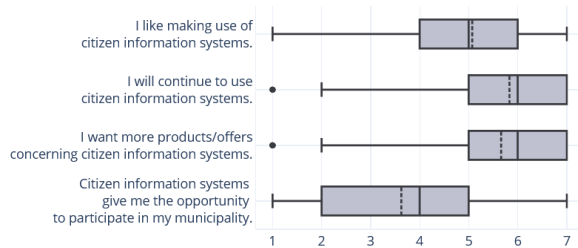
Most participants (126, 89.4%) familiar with citizen information systems ( $n_2 = 141$ ) are aware of the official website of their city (Figure 1). Similarly, 98 (69.5%) have heard of a council information system in their municipality. Social media accounts (75, 53.2%), mobile applications (59, 41.8%), and open data portals (34, 24.1%) are less familiar but are also less prevalent as described above. However, when asking about the active use of these systems, only 51 out of 112 (45.5%) participants named the official website, 10 (8.9%) social media accounts, 4 (3.6%) mobile applications, and 5 (4.5%) open data portals. We further asked the  $n_3 = 112$  active participants for their primary motivation to use such systems. Most (89, 79.5%) named information,

nine (8.0%) participation, six (5.4%) communication, and five (4.5%) curiosity.



**Figure 1. Citizen information systems that are familiar to  $n_2 = 141$  participants**

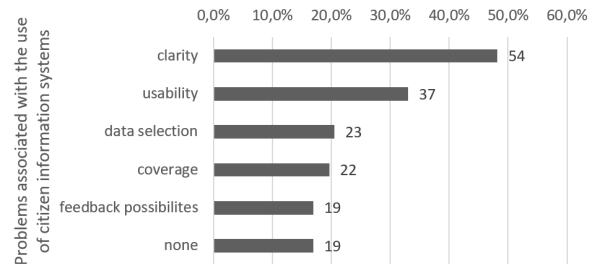
The following questions referred to the assessment of citizen information systems regarding the actual participants' experience (Figure 2). Out of 112 participants who are actively using these systems, 25 strongly agree (7 on a 7-point Likert scale) that they like using them. In sum, 76 tend to agree (5 or higher on a 7-point Likert scale) to this statement, while 17 tend to disagree (3 or lower), which results in a median of 5. The questions whether the participants will continue to use citizen information systems and if they want more offerings in this regard were both rated with a median of 6. In detail, 98 respective 92 participants tend to agree to this statement (5 or higher) from which 51 respective 46 strongly agree. In contrast, the question if citizen information systems allow participating in the municipality was only rated with a median of 4. Here, only twelve participants strongly agree (7), and 22 strongly disagree (1).



**Figure 2. Participants' general assessment of citizen information systems ( $n_3 = 112$ )**

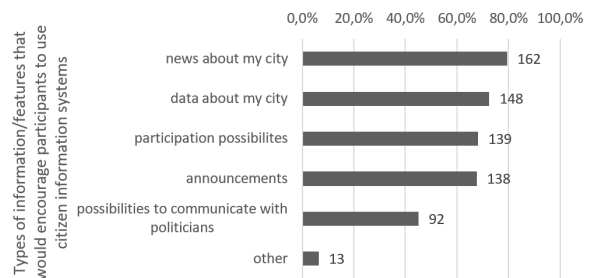
We also asked the participants to choose those areas of citizen information systems where they currently see problems according to their experience (Figure 3). From the 112 participants, 19 (17%) did not see any problem area at all when using citizen information systems. In contrast, 54 persons rated the clarity of the offerings as not sufficient. The usability was also named by 37 participants, followed by the data selection and coverage

with 23 and 22 mentions, respectively. In a free text field, some persons explained that they often could not find what they are searching for, or that information and data are incomplete. Search functions were also named as insufficient. Finally, 19 participants were not satisfied with the given feedback possibilities regarding their concerns.



**Figure 3. Problem areas associated with the use of citizen information systems ( $n_3 = 112$ )**

We asked all of the  $n_3 = 204$  participants what types of information or features would encourage them to (further) use citizen information systems (Figure 4). The most popular answers were news and datasets about their own municipality with 162 and 148 mentions. Additionally, participation possibilities are also desired by 139 participants. Announcements (e.g., construction plans) would encourage 138 persons to use citizen information systems, while 92 want to have possibilities to get in contact with politicians and public administration. Further answers in a free text field revealed that the participants wish to replace more physical visits to public authorities with digital solutions. Some further want to have network possibilities with other citizens, while others would appreciate reporting deficiencies online. The option to find all kinds of relevant information in one place was also mentioned.



**Figure 4. Types of information/features that would encourage participants to use citizen information systems ( $n_1 = 204$ )**

## 4.2. Interviews

In the expert interviews, we addressed three central topics derived from the questionnaire:

- Raising awareness for citizen information systems
- Strengthening participation possibilities via citizen information systems
- Enhancing user experiences in citizen information systems

### **Raising awareness for citizen information systems.**

The survey revealed that many participants are not familiar with all of the offerings concerning citizen information systems in their municipality. In particular, the active use of such systems is still rare, according to our case study. With the first question, we addressed this circumstance and asked the experts for approaches to reach more citizens. Six out of seven experts stated that it is necessary to promote the existence of local citizen information systems actively. One expert said that municipalities should concentrate on promoting new digital services (e.g., through press releases), but a general advertisement regarding all existing local services is not necessary. Four further experts also addressed the role of the (local) press. *E3* added that the local media are regularly using several citizen information systems for their investigations, but often do not insert these sources in their news releases. By referring to these sources, awareness for different offerings could be raised. *E4* further mentioned that the systems' advertisement should include emphasizing one of the main advantages of the municipal services: their function as a reliable information source, not as an entertaining channel. Two experts focused on the interlinkage of different information systems. For example, the official website should link to all available services transparently. *E3* stated that several offerings, like council information systems or open data portals, are often hidden on municipal websites. Similarly, *E5* added that open data portals should be prominent on official websites. Thereby, new datasets could be promoted with current topics to enhance awareness.

We further asked the experts about the role of social media for advertising citizen information systems. Six experts recommended an expansion of local social media activities. A social media strategy is essential in this regard to systematically develop concepts for information dissemination and communication. Four interviewees addressed the role of different target groups for a successful social media strategy. In particular, it should be acknowledged that social media activities

might not reach some age groups. Besides, those persons who use social media to gather information might be interested in different types of information. *E2* added that social media should also be used to foster the dialogue with citizens, not only to disseminate content. *E1* emphasized the significance of up-to-date and high-quality content. Three experts mentioned the importance of trained staff for social media activities and regular training for employees.

### **Strengthening participation possibilities via citizen information systems.**

The survey also revealed that citizens mainly use digital offerings for receiving information. Digital participation possibilities are less prevalent. According to *E2*, the mere provision of information can lead to participation when it gives citizens the possibility to make decisions based on different published data and documents on the part of a city. For this purpose, the corresponding information has to be available quickly and fastly. On the one hand, social media can provide such fast and easy access to information; on the other hand, *E2* emphasized that these channels are not suitable to discuss in-depth topics. Social media allow quick responses and short interactions, but a more detailed discussion is challenging. *E3* stated that the general political will to foster citizen participation is missing. In general, all experts welcome the expansion of digital participation possibilities, in particular separate participation platforms. *E3* reported that a statewide participation portal is planned for NRW. The interviewee added that promoting participation at the state level is necessary and serves as a model for its municipalities. The experts also addressed the importance of acknowledging and communicating the limitations of citizen participation formats. *E5* and *E7* argued that a clear goal of participation possibilities must be visible. Besides, it should be clear beforehand what happens with participation results and how they will feed into decision-making processes. Another limitation mentioned by *E1* and *E2* is the assumption that digital participation possibilities are mainly used by those citizens who are already active and would appreciate participation possibilities regardless of its format. Furthermore, every citizen should have the possibility to take part in digital participation formats, and corresponding portals should be designed barrier-free.

### **Enhancing user experiences in citizen information systems.**

In the questionnaire, the participants named

some areas of citizen information systems which they deemed insufficient. In particular, the offerings' structure is not always clear, and the usability is sometimes not satisfying, according to the participants. Four experts stated that a general fundamental rethink in public administration is necessary. Often, systems do not have a user-centered design. According to *E3*, websites, in general, are becoming more and more user-centered. In contrast, several official websites are often many years old and do not meet current standards. Council information systems imply another peculiarity: These offerings were initially designed for the council's work, less for the public. Now, citizens are also using them to gather information. For laypersons who are not familiar with these systems, the user experience is often reduced. *E3* stated that the producers of such systems should recognize the interest of the public and consider this when they design their products. For this purpose, it could be useful to bring together producers and citizens, so that the needs of the public can feed into the applications. Similarly, *E7* suggested to include citizens in the development of new digital applications in general.

Some participants also mentioned that they wished to have one service where they can find all kinds of relevant information. In particular, some persons deemed a mobile application for their city useful. Hence, we asked the experts about possibilities to consolidate different offerings. The interviewees stated that the development of one mobile application could be difficult for municipalities, particularly for small ones with a tight budget. *E1*, *E3*, and *E5* think that mobile optimization and responsive design of current offerings are necessary. *E1* further recommended an expansion of open source applications. *E3* stated that the search on websites and council information systems should be connected and unified. When citizens gather information from an official website, hits from the corresponding council information systems should be included. For this purpose, a full-text search of documents in council systems has to be implemented. To consolidate offerings from different municipalities is a further challenge caused by historical reasons, according to *E2*. The districts have autonomously chosen IT service providers and software, which has led to a heterogeneous landscape of different offerings and services. When different platforms are to be merged, standardization should be a central aspect. *E7* added that standardized platforms that are designed similarly would enhance user experiences as they would be already familiar with similar designs. Running license agreements pose a further challenge for municipalities to develop new, consolidated services.

## 5. Discussion

Through transparent, well-prepared dissemination of information, municipalities can position themselves as competent representatives of civil interests via citizen information systems. The importance of citizen information in building trust and legitimizing political work shows that a greater focus on this topic, especially on digital channels, is of great value for municipalities. There are many different methods for designing digital citizen information. In general, the term "citizen information" includes a lot of different information that citizens need or can use to deal with various issues. Among other things, they can serve the population for participation, transparency of political institutions vis-à-vis the people, or information on relevant topics in their municipality. The study looked at various digital platforms through which such information can be obtained from citizens. This includes municipal websites and social media offerings, council information systems, mobile applications, and open data portals.

According to the concept of open government, government work should be based on three principles: transparency, participation, and collaboration. By joining the Open Government Partnership in 2016, Germany has already committed to implementing this type of governance. Digital citizen information systems can play an essential role in this resolution. For example, official websites often serve as the first point of contact for citizens in their city. With the help of websites, municipalities can follow the guidelines anchored in the principles of open government, such as creating transparency and providing a wide variety of information and distributing relevant content to users. Municipal websites enable citizens to meet general information needs regardless of the time and solve specific problems using various services. Social media can also be used by municipalities to reach citizens and provide them with relevant information. These platforms offer an uncomplicated way to live open governmental action by allowing interactions between public administration and the citizens. Besides, council information systems also function as an essential form of open government principles. By making documents and information resulting from daily council work publicly available, transparency regarding government work is enhanced. Citizens can also monitor and evaluate the work of the elected representatives and, based on the knowledge gained therein, make informed decisions regarding their political commitment. The provision of open data on open data portals is also an essential component in the implementation of open government action. If these data meet specific

requirements, such as the free availability for all citizens and a machine-readable format, they can be combined and used to create new applications for a municipality, a federal state, or an entire country.

In general, open government in NRW is promoted by the Open.NRW strategy that also pursues the core goal of informing the population faster and better and thus opening up politics to society, businesses, and science. This study has shown that there are fundamental prerequisites for a comprehensive information provision for the citizens in the state of NRW. In contrast, there are still several barriers and needs for improvement. Compared with previous studies [13], there is a positive trend concerning the coverage of social media. Still, it would also be desirable to find an even larger proportion of municipalities to be active on social media. The low availability of open data portals is inadequate, given the need for participation as an essential pillar of open government principles.

Our study also showed that many citizens in NRW are currently not actively using citizen information systems and confirmed previous studies that reported about adoption barriers [2]. Therefore, the aim should be to create added value for the entire population and, accordingly, to achieve an even higher level of awareness among a broader public. The survey participants were primarily familiar with municipal websites and, to a certain extent, council information systems. The usage numbers for other offerings such as official social media accounts, open data portals, and mobile applications were lower. Accordingly, motives such as participation or communication came up short. Similarly, the statement that the offerings allow users to get involved in the community was rather rejected. This also supports the realization that the offerings are used by the survey participants primarily for information gathering. However, this is not sufficient for the extensive implementation of open government principles. In addition to creating transparency through information, participation and collaboration are also part of a goal-oriented open government concept. Here, social media and open data come into focus, as these represent offerings that the population could use to contribute to the shaping of politics actively. Conversely, these channels could also help authorities to benefit from the knowledge of the general public. Although, similar to the findings of [28], the usability of the systems and the possibility of receiving feedback scored poorly in the assessment, the willingness to continue using digital citizen information systems showed a generally positive trend.

Specifically, the interviewed persons want more relevant information regarding current developments in

their city in the form of a wide variety of datasets and announcements communicated by the municipalities. Simultaneously, the creation of opportunities for participation was emphasized regarding the future expansion of offerings. The participants further desired consolidated services. With the lack of standards, the heterogeneous IT infrastructure makes it extremely difficult to combine offerings, even if the public authorities would welcome these. In addition, many municipalities suffer of a lack of financial, technical, and human resources to further expand their offerings.

By discussing the limitations of current citizen information systems in NRW within seven expert interviews, we regard six topics as essential for overcoming the barriers:

- Development and application of a social media strategy for municipalities
- Creation and promotion of digital competences
- Establishment of standards
- Increasing awareness for citizen information systems
- Development of innovative services
- Strengthening cooperation between municipalities

Some of these aspects are of great importance for any kind of information system but especially in the context of citizen information emphasizing the mentioned topics is crucial as they support transparency and accessibility of essential information for citizens. With the help of the discussed issues regarding expanding and improving offerings of citizen information, political participation can be further enhanced.

For social media to become “part of a strategic governance program” [8, p. 262] a successful social media strategy with qualified staff is essential, as well as regular training. Besides, the approach has to include a definition of different target groups and has to be monitored continuously. Regarding the creation of digital competencies, the establishment of a decentral digitization team can be beneficial. Such an organization can pool digital skills and improve usability at various levels in public administration. The inclusion of citizens in this process and user-centered designs are desirable in this regard. The establishment of standards affects all kinds of citizen information systems, including official websites that are as diverse as the cities themselves. Besides, data standards in open data portals and formulation standards in council information systems are essential to overcome existing adoption problems



of these offerings in NRW [31, 32]. To increase awareness for citizen information systems, a marketing budget, and the local press can form a significant role. Information events can be another way to promote these services. Innovative solutions can be present in the form of consolidated services. For example, citizen dashboards could include all kinds of information and participation offerings of a municipality. In particular, smaller municipalities might not have the budget to apply the above measures. Therefore, strengthened cooperation between cities is desirable. Often, bigger cities can implement professional solutions. Districts with fewer resources could learn from these.

This study has some limitations. Our questionnaire was completed by 204 participants, from which only 112 actively use citizen information systems. This is a small number of persons compared to the whole population of NRW. Nevertheless, we could get an impression on citizen's concerns regarding digital citizen information systems. Furthermore, the derived measures rely on the experts' who were recruited via a snowball method. In the future, analyses should further concentrate on citizens' perceptions of the limitations and barriers of these information systems. The scope of the investigation should also be expanded to other states and countries to make comparisons possible. In addition, it has to be clarified to what extent the proposed measures actually lead to the desired results. In the context of a case study, for example, various individual measures could be implemented to evaluate whether some of the measures are more successful than others.

## 6. Conclusion

Overall, the survey participants perceive the relevance of digital citizen information systems, and their further development as clearly worth striving for. The wishes and demands formulated by the respondents coincide with the goals set by the North Rhine-Westphalian government in 2014 in the Open.NRW strategy: improving dialogue, expanding structures that enable faster and more detailed information, and using the innovation potential of open government. It is essential to continue to pursue the objectives already stated at that time and fill them with life. While the respondents mostly named information as the goal of use, the desire for more participation via digital services became clear. Besides, users see public digital offerings as tools with which bureaucracy can be reduced, and everyday life can be simplified. To achieve this, however, aspects such as accessibility and information quality within the various offerings must be improved in the first

step. In general, there is a need to rethink public administration and prioritize digitization, for example, through a corresponding e-government strategy in the municipalities to implement digital citizen information systems in the authorities successfully.

The evaluation of the results also showed clear challenges that arise in the provision of digital citizen information by public administrations. The current offerings in this area do not seem to meet the expectations of the citizens. One of the big problems in this context are resources in public administration. The results suggest that there is a general interest in topics such as open government and citizen participation in many municipalities. However, too often, there is a lack of financial, technical, and human resources to shape these topics. A lack of resources makes it difficult to push ahead with the expansion of offerings. Not all municipalities can, for example, form specific digital teams, which from then on, exclusively deal with the further development of the offerings. A stronger focus of collaboration between municipalities can be a realistic measure.

Overall, the identified problems do not stand on their own, but all interrelate and influence each other. Therefore, the challenges can not only be met with individual measures, but instead require a professional strategy with many different aspects. An adequate relationship between local authorities and citizens should be aspired, which should, above all, be characterized by transparency and participation. To initiate and implement this cultural change in public administration could be the most significant challenge.

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