

Citizen Participation via Digital Maps: A Comparison of Current Applications

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Abstract

The effects of digitization on social coexistence have been a subject of controversy not only since the increased use of social media for political campaigns. Digital platforms are also being developed which, from the perspective of spatial planning and geography, enhance communication between administrations and citizens at the local municipal level. These applications are being developed in relation to three areas: (1) the everyday experiences and competences of citizens in dealing with geomeia, especially the use of smartphones; (2) the individual process design for a particular participatory case; (3) the desired societal or local political benefit. This paper deals with these three aspects and discusses five selected examples of how digital participation platforms can be designed to include the use of geomeia. Based on experiences with the proprietary development of the web application PUBinPLAN in particular and on its comparison with other platforms, insights can be derived with regard to success factors as well as to opportunities and risks.

Keywords:

geomeia, participation, digitization, success factors

1 Geomeia in everyday life

According to Döring & Thielmann (2009, p. 19) and emphasizing the spatial aspect, geomeia in this article are defined as ‘media in which spatial coordinates and/or physical localization are necessary conditions for their functioning’. The continuing rapid technological progress in mobile technologies (notebooks, smartphones), digital map services (Google Maps, OpenStreetMap etc.), and localization systems (GNSS, GSM, WiFi, RFID etc.) is propelling the use of geomeia. Together, these technologies are prerequisites for geolocalization (Genevois & Delorme, 2010, p. 41), which in turn forms the basis of numerous services. Examples for this are geocoded tweets, restaurant ratings that give georeferences, navigation apps or pedometers: geomeia have long been an integral part of digital and connected everyday life.

While initially services focused on providing information to one’s individual position (location-based services) or route suggestions, the current trend is towards Web 2.0 applications, where

the user him/herself becomes the data supplier (Thielmann, 2014, p. 26). This trend is increasingly affecting social networks by geotagging tweets or by leveraging features like ‘my position’ on Google. Social networks benefit from this trend, first because all these services are Internet-based and require an application connection and, second, because of the openness of many citizens to providing a wealth of personal data (partially) publicly. Examples are pulse rate or oxygen saturation recorded and shared via fitness apps using hardware such as wearables. New visualization techniques, such as augmented reality, which display real-time interactive environmental information (Goudarznia et al., 2017, p. 250), will enable new features, for example virtual sports competitions, which will further promote the connection between social media and geomeia.

Taking these developments together in combination with the possibility of capturing not only measurable sensor data but also citizens’ individual wishes, sensitivities and opinions in a geo-based manner, geomeia allow innovative approaches in citizen participation. In this paper, we define citizen participation, after the upper levels of the ‘Ladder Of Citizen Participation’ of Arnstein (1969, pp. 217, 221-223), as an honest partnership between citizens and authorities, in which event-based decision-making powers are shared and citizen engagement is strengthened. Nevertheless, there is a need for critical scientific underpinning, which is why this article deals with two main questions: What are the potential uses of geomeia in the field of digital participation in collaborating with municipal institutions? And what prerequisites should be met?

Section 2 will look at the state of the art. Sections 3 and 4 will then discuss the relevance of geomeia for participation and compare five examples of digital participation that use geomeia. The analysis focuses on the application context and the accessibility of the services. The findings are then assessed in Section 5, critically questioned, and finally used to answer the research questions presented above.

2 State of the Art

Inviting people to comment on and add to the virtual world of maps presented publicly via the Internet, as exemplified by Google or OpenStreetMap (Boeckler, 2014, p. 4), is often used in the literature in conjunction with the term ‘neogeography’ (Turner, 2006, p. 3). Current approaches in this field are concerned with the integration of real-time data into maps (Steiger et al., 2016), the development of geographic online platforms for the public sector (Pietsch et al., 2016), or the quality assurance of user-generated content (Aden & Kirchner, 2016).

Geomeia are also discussed as scientific tools, data sources or research topics per se in the literature. Groß & Zeile (2016, pp. 273-278) describe how geo-referenced vital signs (pulse rate, temperature etc.) are recorded by means of body sensors, which allow conclusions about the psycho-physiological status of humans and thus provide information about stress levels and the level of (perceived) danger in situations like road traffic, for example. There are also novel possibilities of location-based research using geomeia, such as the study of emotions associated with earthquakes or responses to global events – especially from social media, like Twitter (see e.g. Fearnley & Fyfe, 2018, pp. 97-98).

Concepts such as the ‘Ladder Of Citizen Participation’ (Arnstein, 1969) or the ‘Public participation ladder’ (Wiedemann & Femers, 1993, p. 357) classify citizen participation in levels, from manipulating via consulting up to public partnership and even citizen control. Today, digital maps, geoinformation and geomeia also play an increasingly important role (Zink et al., 2016, pp. 489–490), as has been seen for quite some time in approaches such as Public Participation Geographic Information Systems (PPGIS), as discussed in Carver (2001), Weiner et al. (2002) or Sieber (2006); Volunteered Geographic Information (VGI) (Goodchild (2007)); Crowdsourced Maps as presented in Neis et al. (2012); Participatory Sensing (Goldman et al., 2009); Urban Sensing (Campbell et al., 2008); Citizen Sensing (Sheth, 2009), and the Geospatial Web (Atzmanstorfer & Blaschke, 2013).

3 Relevance of geomeia for participation

Geomeia of various forms play an important part in the everyday lives of many people, both technically and socially. Due to their everyday significance, geomeia can also be highly relevant for participation in social/civic contexts. This results in a triad comprising previous experiences with geomeia, instruction to participation and the social benefits of geomeia (see Figure 1), which will be discussed below.

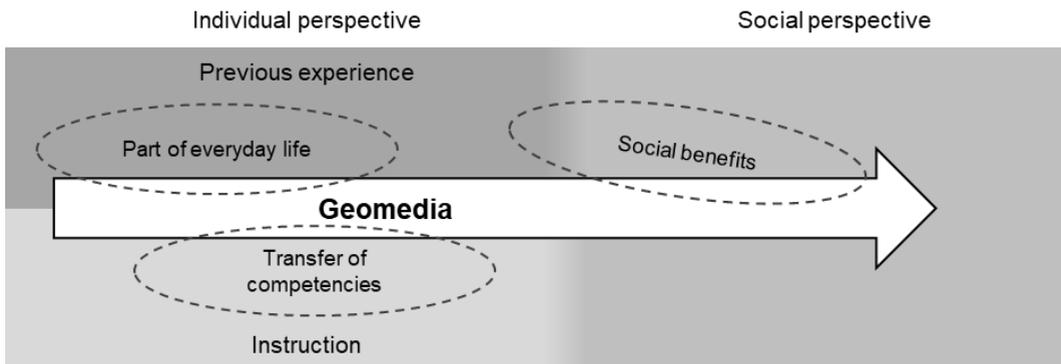


Figure 1: Relevance of geomeia for participation

3.1 Geomeia as a part of everyday life and as a starting point for participation

Since Google Earth in particular came on the scene, digital maps have been present in people's everyday lives, in a form that people can actively help to shape (Manovich & Thielmann, 2009, pp. 383, 389). In the meantime, the maps are interwoven with personal information, friendships and other content that is important to individuals (Gordon, 2009, p. 398). This everyday presence also has an age-related aspect. In discussions connected with participation, decision-makers at municipal level (mostly mayors) often express the hope of using digital methods to address new and, above all, younger citizens – the so-called digital natives.

This results in playful approaches that have the potential to increase both the attractiveness of geomeia and participation by young people in particular. Computer games such as *Minecraft* or *Cities: Skylines*, in which buildings, streets or infrastructure can be planned and visualized in an interactive virtual world, allow an initial approach to topics of spatial planning, making the subject more accessible and easier to understand for many people (Andorfer et al., 2016, pp. 534-535, 538). The game environment promotes a better understanding and offers novel participatory and collaborative possibilities (virtual tours, building work, changing or expanding planning etc.) combined with a motivating effect.

Both the everyday and the gaming experiences of citizens offer numerous starting points for digital citizen participation. As a central component, geomeia create added value for participatory processes by making citizens' high regional and spatial knowledge and competence usable for the planning process in an innovative and often ludic manner (Zink et al., 2016, p. 488). However, an institutional and technical framework that sets out both the process of participation and the functionalities of digital participation remains essential. Accordingly, users require training and need to learn how to handle geomeia.

3.2 Transfer of competences as a prerequisite for civil use of geomeia

The ability to interpret and critically interrogate maps and other spatial representations, to communicate through maps, and to express location-based opinions through the use of geomeia is helpful for engaging in societal developments and projects (Gryl et al., 2010, p. 7). Although learning how to use geomeia does not need to be institutionalized, especially as digital natives use most applications intuitively, support at different levels can be helpful: on the one hand, the creation of basic skills over the longer term and, on the other, short-term and project-related instruction.

For the former, Hoffmann (2018, pp. 7, 9) argues for a stronger orientation towards problem solving and the future in geography lessons, in order to broaden how the complexity and current challenges of the modern world are dealt with. According to Harris (2018, p. 17), students should learn to deal with geographical data and facts, because factualness is seen as an effective antidote to misinformation and suggestibility.

Project-related guidance refers to a specific case. Digital citizen participation should not take place in a manner that is detached from social processes, but rather be embedded as a complementary tool. This embedding requires the adaptation of the digital participatory process to the task at hand (for example, long-term urban development, or short-term infrastructure measures), with a corresponding definition of the process, participation functions and co-determination rights (e.g. voting, commenting or moderating). It is the responsibility of instructors to deliver the relevant information and training, which must take into account previous individual experiences and competences of citizens, as well as to moderate the facilitation.

3.3 Social use of geomeia as a participatory instrument

Because of the high costs and lack of clarity about the supposed benefits of public works, it is important to involve citizens already during the design and planning process (Bitsch et al.,

2016, p. 353). This is important for successfully developing target-group-oriented solutions. If citizens are able to submit their opinions and suggestions for improvement spatially by using geomedial, these can be included much more effectively (Herbst et al., 2016, p. 271).

Combining advantages of social media with Web-GIS applications, innovative and practical tools for participatory processes can emerge. Better provision of information to citizens, more flexible handling of the individual steps in the participation process, avoidance of media discontinuities, greater clarity about spatial interconnections in planning, purposeful facilitation, as well as clear orientation in the complexity-reduced procedure are all objectives of participation that can be helped by the use of geomedial (Helbig et al., 2016, pp. 509-517). Especially helpful in achieving results is the visualization of projects in 2D or 3D. Both support more efficient communication throughout a project, to the public as well as to experts (Schaller et al., 2017, p. 110).

The aim of geo-based digital participation platforms should be to provide interfaces for citizens as well as for experts (planning offices, construction companies, technicians, legal advisers etc.). This ensures that information can be retrieved centrally and the process can be stringent. Managing the participation process centrally enables a temporary allocation of active and passive roles to individual groups. If actors work periodically but purposefully on individual project steps, a productive way of working with a high degree of acceptance on the part of citizens is guaranteed (Küspert & Zink, 2017, pp. 138-139).

Scheffer (2018, p. 46) also mentions disadvantages of using geomedial. Dangers for politics and society must not be overlooked, notably if people as individuals or as part of a group use filters and other functions to focus increasingly on things which affect their own interests. Participatory processes – analogue and digital – should strengthen social discourse and allow a multifaceted opinion to emerge. Table 1 summarizes opportunities and risks that may result from the use of geomedial in general, and participatory geomedial in particular.

Table 1: Opportunities and risks resulting from geomedial

Advantages / Opportunities	Disadvantages / Dangers
<ul style="list-style-type: none"> ▪ Improved orientation / visualization. ▪ Social networking / community. ▪ Making contributions that are useful to other people (personal expertise). ▪ Benefits for science and research. ▪ Contributing to the formation of public will. ▪ Motivation for a stronger (active) social commitment. ▪ Assisting in and contributing to decision-making. ▪ Modernizing geography lessons. ▪ Improving (working) relationship between citizens and state/municipalities/authorities. 	<ul style="list-style-type: none"> ▪ Untrue entries (fake messages). ▪ Abuse by hackers, bots etc. ▪ Inappropriate comments, hate speech etc. ▪ Privacy issues. ▪ Traceability of personal opinions, wishes, movements, etc. ▪ Unwitting data transmission to third parties. ▪ Lack of knowledge regarding how data is used. ▪ Concerns about monitoring / control. ▪ Being unwittingly manipulated by other users or by technology (filter functions, algorithms etc.). ▪ Use with bad intentions.

4 Examples of participation using geomedia

The following examples show the use of geomedia in connection with participation in space-related planning, with a focus on accessibility and functionality. After describing some functionalities of the in-house development PUBinPLAN, the platforms Betri Reykjavik, Frankfurt gestalten, Mängelmelder and Sag's doch are shown, in particular to illustrate different ways of accessing platforms. They can be seen as examples for the variety of platforms.

PUBinPLAN (<https://pubinplan.th-deg.de>) is a browser-based application which aims to integrate citizens affected by a project into spatial planning processes right from the start. The range of applications includes village, urban and regional development as well as school projects. PUBinPLAN combines project management approaches with geomedia and participation functionalities.

Frankfurt-gestalten (<https://www.frankfurt-gestalten.de>) is a platform with three functions. First, an information service covering ten years of local politics in the city of Frankfurt. Second, the platform aims to facilitate exchanges between citizens. Third, citizens can become actively involved by posting their ideas on the website. Regionally, the platform focuses on the city of Frankfurt and addresses the whole spectrum of city administration and urban development.

In contrast to Frankfurt-gestalten, which expresses its regional focus in its name, Mängelmelder (<https://www.maengelmelder.de>) focuses on a very specific topic. The platform allows everyone to report local problems of all kinds. Photos and text can be added. One version of Mängelmelder is operated by the city of Jena (<https://maengelmelder.jena.de/de/report>). Depending on the category selected (trees, streets, etc.), an e-mail is sent to the relevant city authority (JENA TV, 2018). Although the reports can be made anonymously, this has not resulted in particularly significant levels of misuse: of the 300 or so concerns that were sent to the city of Jena within the first month, only a few were ambiguous in intent (JEZT AKTUELL, 2018).

Sag's doch (<https://sags-doch.de>) is similar to Mängelmelder. It allows problems to be posted on the platform, but ideas can also be introduced. Together with citizens, the city of Friedrichshafen and the District Office of Bodenseekreis want to develop realistic but also creative solutions to local political issues.

Using Betri Reykjavik (<https://betrireykjavik.is/domain/1>), an example from Iceland, citizens can express ideas on issues regarding services and operations in the city of Reykjavik and discuss proposals that have been made. Top-rated ideas are processed by standing committees. Lesser-rated ideas are noted by representatives and city administrators.

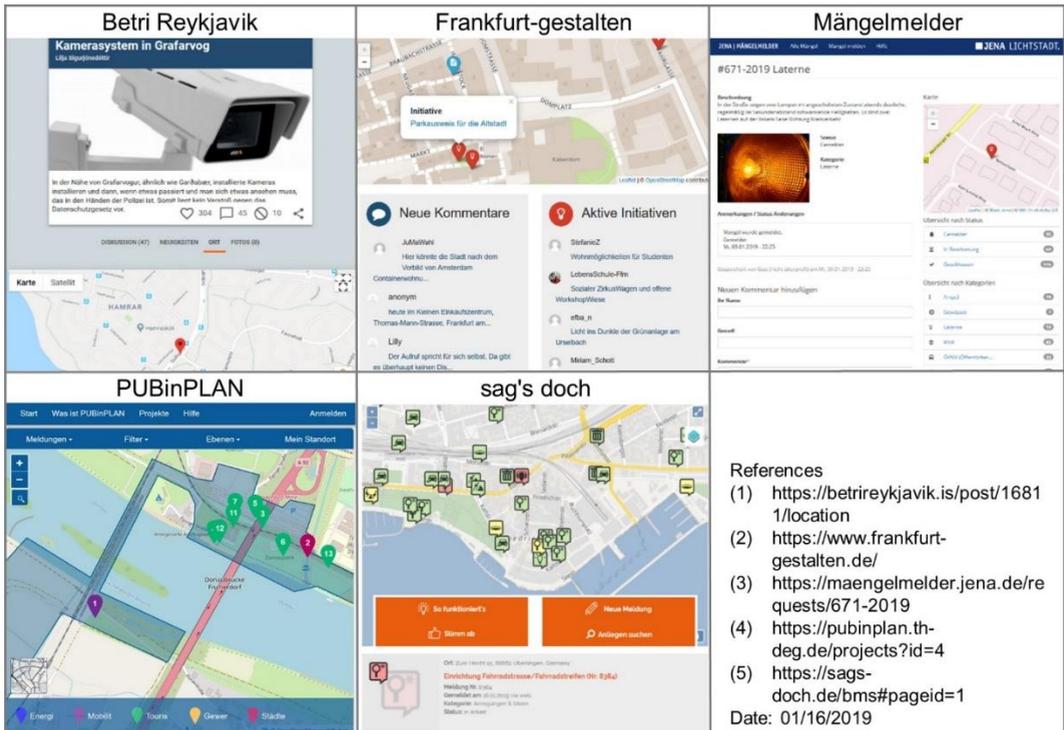


Figure 2: Excerpts from chosen participatory geomeia

The use of interactive maps is common to all platforms (see Figure 2). The maps are intended for orientation as well as for presentation of content provided by users or those who manage the platforms. They are intuitive to use, which was tested on devices with different screen sizes (notebook and smartphone). The preparation of data, simple presentation, as well as intuitive comprehensibility and operability are important factors for the success of participatory geomeia (Mueller et al., 2016, p. 500). An uncomplicated subscription and participation option – all examples can be reached via a URL – is also generally considered to be attractive for smartphone or online services (Scheffer, 2018, p. 44). Table 2 compares the platforms for selected criteria.

Table 2: Comparison of selected participatory geomeedia

Examples	<u>Betri Reykjavik</u>	<u>Frankfurt-gestalten</u>	<u>Mängelmelder city of Jena</u>	<u>PUBinPLAN</u>	<u>Sag's doch</u>
Criteria					
Costs for citizens	None	None	None	None	None
Registration process	Registration	Registration	No registration needed	Registration and activation for non-public projects	Registration
Required user data	Name and e-mail address	Name and e-mail address	None	E-mail address	Name, age, e-mail address, place of residence, communication path
Process of participation	Find Log In Capture message correctly	Find Log In Capture message correctly	Find Report a problem	Find Log In Capture message correctly	Find Log In Capture message correctly
Focus	Submitting ideas and discussion	Submitting applications	Reporting defects	Shaping policy and projects	Reporting ideas and defects
Level of participation according to Arnstein (1969)	Partnership	Placation	Consultation	Partnership	Partnership
Level of participation according to Wiedemann & Femers (1993)	Defining interests and determining the agenda	Informing the public	Right to object	Recommending solutions	Recommending solutions
Number of initiatives since start (as at 06/09/2019)	8,895 since 2010	169 since 2010	1,557 since 2018	1,303 since 2017	8,946 since 2014

The registration process and the user data that may be required already constitute important criteria for participation. If registration is required, information provided by the user will be linked to the corresponding account (clear name or pseudonym), whereas in the case of there being no registration obligation, contributions may be provided anonymously. At the same time, however, hurdles to participation increase when login processes are more complex or if user data are required. Here, Mängelmelder presents the fewest hurdles, as participation can start immediately after opening the homepage. Figure 3 shows excerpts from the examples' registration processes.

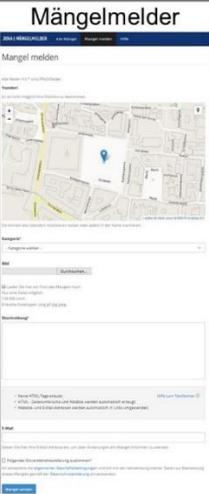
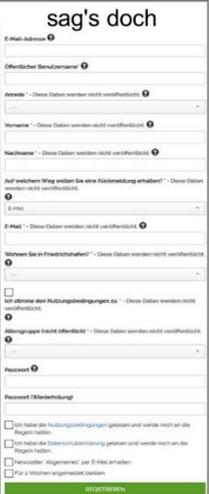
Betri Reykjavik	Frankfurt-gestalten	Mängelmelder	PUBinPLAN	sag's doch
 <p>ANMELDUNG NEUER BENUTZER</p> <p>Facebook Login island.is</p> <p>Vollständiger Name</p> <p>Email</p> <p>Passwort</p> <p>ABBRICHEN NEUES PASSWORT BENUTZER ERSTELLEN</p>	 <p>FRANKFURT GESTALTEN</p> <p>Suchen</p> <p>Registrierung</p> <p>E-Mail</p> <p>Benutzername (mindestens 6 Zeichen)</p> <p>Passwort (mindestens 8 Zeichen)</p> <p>Passwort bestätigen</p> <p>Normal abbrechen Ich die Spalte(n)</p> <p>Registrieren</p> <p>Passwort vergessen Kam die Verifizierungs-E-Mail nicht an?</p>	 <p>Mangel melden</p> <p>Suchen</p> <p>Registrierung</p> <p>E-Mail</p> <p>Benutzername (mindestens 6 Zeichen)</p> <p>Passwort (mindestens 8 Zeichen)</p> <p>Passwort bestätigen</p> <p>Normal abbrechen Ich die Spalte(n)</p> <p>Registrieren</p> <p>Passwort vergessen Kam die Verifizierungs-E-Mail nicht an?</p>	 <p>PUBinPLAN</p> <p>Hinweis: Nach erfolgreicher Registrierung und anschließender Anmeldung können Sie Ihren Freischaltcode unter "Ihr Name" → Einstellungen → Projekt-Zugangsschlüssel" eingeben und somit freischalten.</p> <p>Benutzername</p> <p>E-Mail Adresse</p> <p>Kennwort (8-20 Zeichen)</p> <p>Kennwort bestätigen</p> <p><input type="checkbox"/> Ich habe die Nutzungsbedingungen gelesen und erkläre mich damit einverstanden.</p> <p><input type="checkbox"/> Ich habe die Datenschutzerklärung gelesen und erkläre mich damit einverstanden.</p> <p>Senden</p>	 <p>sag's doch</p> <p>Öffentlicher Benutzername</p> <p>Anrede</p> <p>Vorname</p> <p>Nachname</p> <p>Auf welchem Weg wollen Sie eine Rückmeldung erhalten?</p> <p>E-Mail</p> <p>Wohin Sie in Freundschaften?</p> <p><input type="checkbox"/> Ich akzeptiere die Nutzungsbedingungen</p> <p><input type="checkbox"/> Ich habe die Nutzungsbedingungen gelesen und werde mich an die Regeln halten</p> <p><input type="checkbox"/> Ich habe die Datenschutzerklärung gelesen und werde mich an die Regeln halten</p> <p><input type="checkbox"/> Newsletter "Allgemein" per E-Mail erhalten</p> <p><input type="checkbox"/> Ich 3 Wochen angemeldet werden</p> <p>Passwort</p> <p>Passwort (Wiederholung)</p> <p>Registrieren</p>
<p>References: (1) https://betrireykjavik.is/domain/1 (2) https://www.frankfurt-gestalten.de/users/sign_up (3) https://maengelmelder.jena.de/de/report (4) https://pubinplan.th-deg.de/users/signup (5) https://sags-doch.de/login?referer=https%3A%2F%2Fsags-doch.de%2F, Date: 01/16/2019</p>				

Figure 3 : Comparison of the examples with regard to the registration process

Personal reference and/or project reference (see PUBinPLAN) allows the digital participation process to be customized. First, one can moderate the discourse to avoid hate posts or insults and establish productive communication. Second, user groups can be defined and given appropriate rights of participation (e.g. voting, commenting or moderating). Third, concrete projects are placed at the centre, which in particular supports 'shaping'. Finally, the level of citizen empowerment is probably the key criterion for participation. Among the chosen examples, PUBinPLAN, Sag's doch and Betri Reykjavik offer higher levels of citizen empowerment than Mängelmelder or Frankfurt-gestalten. It is interesting that this also seems to reflect the number of initiatives handled by the platforms.

5 Conclusions for participation using geomedia

The examples examined show that geomedia have their legitimacy within digital participatory processes, and should even be regarded as core to them. Here, then, is a summary of the uses of geomedia in municipal spatial planning:

- Citizen information: Using modern/contemporary digital tools to inform citizens.
- Citizen interest: Awakening/strengthening interest in local politics and municipal projects.
- Citizen dialogue: Creating a strong and innovative dialogue with and between citizens.
- Citizen communication: Considering citizens' wishes, sensitivities and knowledge.
- Transparency: Creating a better understanding (visualization) and a higher acceptance of a project through greatest possible transparency throughout the project's duration, by presenting background, alternatives, explanations, justifications etc.

- Acceleration and scope: Generating economic benefits through fast and effective communication between all stakeholders.
- Savings by consensus: Achieving compromises while reducing avoidable costs by including a variety of perspectives and expertise in all phases of the planning and implementation of public projects.
- Marketing: Improving the image of public administration as a modern service provider.

The second research question – what the prerequisites are for a successful use of geomedia in the field of participation – will be answered by experiences gained from using the platform PUBinPLAN. The ease of use of social media should be seen as a role model for digital participation platforms. The easier the access, the clearer the information and the more intuitive the participation, the greater the chance that citizens will participate actively. At the same time, civil dialogue requires balancing personalization with the lowest possible registration effort on the one hand, and ensuring privacy without making participation arbitrary and non-binding on the other.

A marketing strategy is also required which ensures that citizens know the digital participation offer and motivates them to use it actively. Availability of hardware or network coverage is not usually a barrier, especially in urban areas. However, in addition to participation via geomedia, conventional instruments such as community meetings, citizen surveys, workshops etc. are also needed to involve citizens who are more attached to these events. Digital instruments do not replace traditional ones; they complement them. To control this interplay of analogue and digital participation instruments, flexible project and process management is required that is geared to the specific project or individual municipality.

When this focus is on a particular municipality (spatially) or project (thematically), the appreciation by citizens that their participation is valued will also increase. This affects their motivation and thus whether they actively participate in municipal projects at all. On the one side, possible solutions focus on quality of life and topics of concern in the citizen's own region. On the other, there is the potential to transfer a fascination with new digital media and one's own individual experiences (for example with social media or computer games) to the topic of participation.

6 Geomedia as new potential for active citizens

The article highlights current efforts to transfer the booming geomedia sector to the socio-politically important field of public participation. The examples show opportunities and risks, but also make clear that municipalities and municipal administrations in particular, as well as social communication and the democratic order in general, cannot and must not shy away from the trends of digitization. At the same time, however, manifold technological possibilities appear to be devoid of social benefits.

Consequently, in addition to technical development, further scientific analyses are required. In future studies, municipal projects in which geomedia (as well as other instruments) are used for citizen participation need to be explored to answer the following research questions: What are the project- and context-related strengths and weaknesses of different forms of digital and

analogue participation events? How can these forms of participation (events) be optimally connected? Are there typical user groups? Questions remain open as to when and with what kind of functionality digital participation provides most added value for projects, and how success or failure in digital participation can actually be assessed or measured. Possible studies could be carried out in parallel to municipal projects. Existing project partners (citizens, responsible persons, experts) might then be won as participants in novel participatory events (e.g. as citizen sensors using geomeia) or as interviewees. A take-up rate of about 20 participants per event seems sufficient for the mainly qualitative orientation of such research.

Acknowledgements

The project Smart Landscapes is funded by the Bayerisches Staatsministerium für Bildung und Kultus, Wissenschaft und Kunst. The duration of the project is 30 months from October 2017. For further information, visit <https://pubinplan.th-deg.de/>.

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