

# Concept of a Digital Communication Platform to Increase the Citizens' Interest in Spatial Planning

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**Abstract:** Driven by the boom of mobile devices, such as smartphones and tablet PCs, the digital transformation of everyday life is progressing. While social media and digital forms of communication are already used extensively in the private sector, the digitalization of participatory processes in spatial planning is still in the beginning phase of development. Especially Geoinformatics and Geographic Information Systems offer innovative approaches to integrate citizens in planning processes. This paper introduces the concept PUBinPLAN, which aims at combining GIS-based crowdsourcing and Augmented Reality. Both methods will help to increase the interest in the participation and involvement of citizens. In addition to the design considerations of PUBinPLAN, first results of the application's use are presented.

**Keywords:** Crowdsourcing, participation, spatial planning, GIS

## 1 Introduction

Experience shows that it is difficult to arouse citizens' interest in municipal issues and even more so to maintain it over longer periods of time. The current structure and organization of informal forms of participation require a high level of self-interest and demand the involvement of citizens in order to compensate deficits in the participation processes (ALBRECHT et al. 2013). Due to demographic and socio-cultural changes and the resulting double burden of the middle generation (e. g. more single parents, full-time working couples), an additional commitment at the local level is often no longer possible. Clubs or voluntary organizations notice a significant decline in volunteer members for similar reasons (FEHRES et al. 2010). However, this does not mean that there is no interest in municipal issues by the public. Especially the political change - away from major political parties towards a differentiated political landscape - shows a contribution to concrete questions and problems and not to the ideology of individual parties. Communities of interest are formed as loose (online) associations across social, public and party boundaries. To this end, the digital transformation offers new possibilities and increases the quantity and range of communication. Although this makes communication much easier and faster, a targeted approach is required for generating benefits for participation.

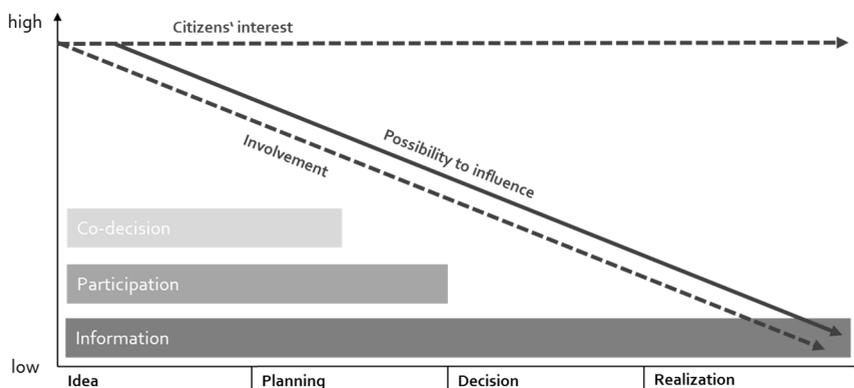
The present article describes the concept of a digital geo-based participation platform called PUBinPLAN and presents first results of a usability workshop with 13 experts. PUBinPLAN combines crowdsourcing with the possibilities of Augmented Reality (AR) and embeds the digital applications into the chronological sequence of the planning process. The platform ensures that the public has access to project information and documentation during the entire project. Participants find transparent information about the planned project, its status and its progression. They have the possibility to collaborate and participate at all levels, from information to involvement to co-decision. Although PUBinPLAN's focus is on digital participa-

tion, it can and should be supplemented by conventional forms of participation, so that citizens who do not have an affinity towards digital media or do not have access to the platform are also able to participate in the planning process.

## 2 Participation in Spatial Planning

Dealing with the question of how citizens can sufficiently participate, ARNSTEIN noted as early as 1969 that there is a “critical difference between going through the empty ritual of participation and having the real power needed to affect the outcome of the process” (ARNSTEIN 1969, 216). The focus on the effect of participation appears more relevant than ever (SELLE 2013) and also raises questions regarding current political demands for more participation. Derived from the communication concept, SELLE (2013) distinguishes information, participation, coordination and cooperation. The composition and the scope of use of these forms of communication determine the participation process as well as the outcome.

PORTZ et al. (2013) distinguish between information, participation and co-decision and relate these terms to the participation paradox. Based on the consequences of the participation paradox they describe a participation optimum for preventing social conflicts during infrastructural projects. The participatory paradox describes a diametrical increase of citizen’s commitment and interest in relation to the possibilities of intervention during the planning process. To solve the paradox, it is proposed to stimulate the citizens’ interest in the planning process at the earliest possible time and to keep it up during the entire project (see Fig. 1). However, it is doubtful if it is possible to solve the problems by raising interest. Following the above-mentioned reasons, it is also challenging to preserve citizens’ commitment at such a high level over a long period of time. PORTZ et al. (2013) therefore propose to adapt the commitment and the public’s design intent to the possibilities of the actual influence and to end the phase of public involvement with the decision of democratically legitimized committees. Thereby the public participation is reduced to information consumption at the step of the decision.



**Fig. 1:** Idealized course of participation according to PORTZ et al. (2013, 24, modified)

The digital transformation of society can be perceived through the high relevance that social media have gained in recent years. Against this background, it is necessary to develop the model shown in Fig. 1. Besides the paradox we have, on the one hand, lengthy planning processes, e. g. for infrastructure projects or projects of regional, urban and rural development. On the other hand, the processes of digitalization facilitate an acceleration of communication.

### 3 Participation and Geoinformation

According to CROOKS et al. (2014), the massive increase in georeferenced information has in recent years led to the development of GeoWebs. Digital texts, images, videos or data are assigned with a spatial location on a geobrowser (such as Google Earth). As a result, new thematic maps are created. Following THIELMANN et al. (2012), the user is simultaneously producing and consuming maps. Furthermore, geomeia affect more and more social areas and penetrate everyday life. KANWISCHER (2014) states that social and technical reductions of complexity are accompanied by the continued development of digital applications.

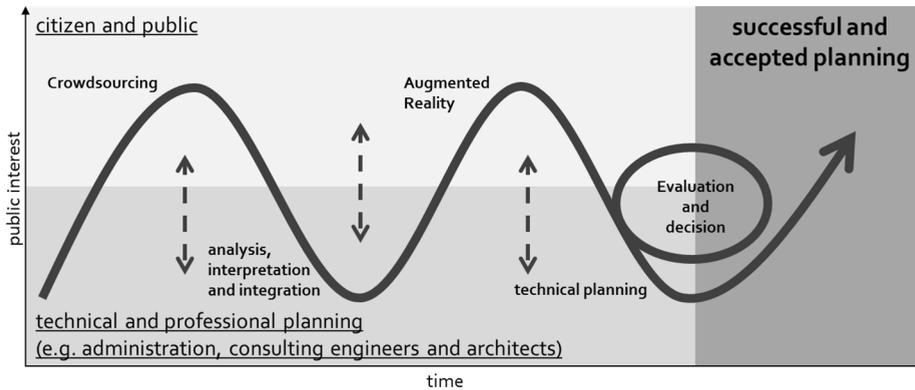
The inclusion of geoinformation and geomeia in participation processes can play a significant role either at the level of sensitization and information provision or at the level of information generation. Thus CARVER (2001) and SIEBER (2006) write about Public Participation Geographic Information Systems (PPGIS) in the context of combining participation and GIS. The geo-based generation of information is referred to as volunteered geographic information (VGI) (GOODCHILD 2007) and enables the opportunities of Web 2.0 by allowing volunteers to provide spatially relevant information on the Web. With these collection procedures via user participation it is possible to map topographic objects as well as totally new individual information. Examples for crowdsourcing platforms are OpenStreetMap (OSM 2016) for mapping topographic objects or Meldemax (WHERE GROUP GMBH & Co. KG 2016) or “Interaktiver Landschaftsplan Königslutter” (STADT KÜNIGSLUTTER AM ELM 2016) for the detection of problems and suggestions from the general public.

### 4 Geo-based Participation Platform PUBinPLAN

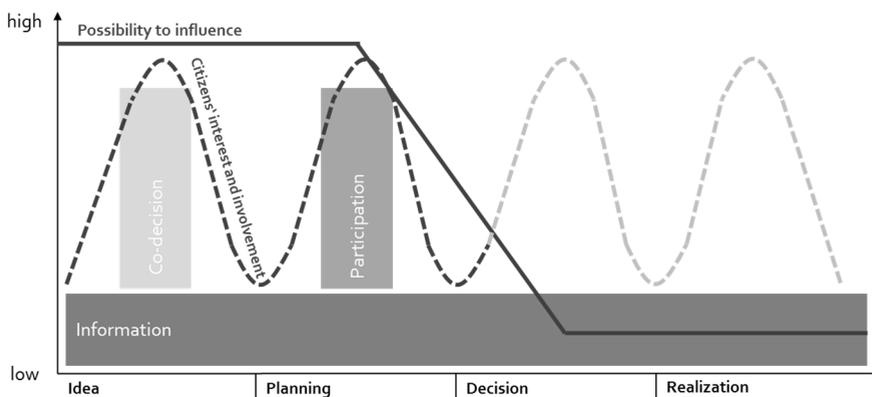
PUBinPLAN, an acronym for “public in spatial planning supported by information and communication technology”, is a digital geo-based platform that aims at increasing stakeholder participation in spatial development and planning processes. It was specifically designed and customized for infrastructure measures and rural and urban development projects. The technical focus is on the development of a browser-based application including crowdsourcing and a native application for AR (ZINK et al. 2016). Both applications should help raise the interest of citizens to participate actively at the right time (see Fig. 2).

The crowdsourcing tool of PUBinPLAN connects the technical and professional planning with the citizen. Crowdsourcing describes the outsourcing of a problem’s solution to an (un-) certain group in the form of an open call via an internet platform (CLEMENT & SCHREIBER 2013). Participants can use the application to generate VGI. While the specialist planners are experts in technical, legal or administrative matters, the volunteers are seen as experts for local and regional issues. The citizens can post georeferenced notes and project proposals

and interactively discuss them. Hence the crowdsourcing application of PUBinPLAN captures the citizens' local and regional knowledge and prepares the VGI for implementation in the technical and professional planning.



**Fig. 2:** Performance and operations of PUBinPLAN



**Fig. 3:** Optimization of participation projects with digital participation platform

The second application within the framework of this concept includes the visualization of the results of the technical planner's consultation process with the help of geographical augmentation technique. According to GRAHAM & ZOOK (2014), AR is the expansion of physical locations by digital information. On the one hand, AR can help to visualize the postings from the crowdsourcing tool in a new, interactive way. What is even more interesting, on the other hand, is the opportunity to visualize first plan designs which have also emerged from the mutual cooperation of citizens and professional planners. Thus, the application can help all citizens understand the concrete elaboration of individual measures, such as the installation of a wind turbine or the construction of a building. Instead of marker-based AR (ROCKMANN & ADLER 2015), PUBinPLAN uses location-based AR. The desired combination of online-based participation (e-participation; cf. NANZ & FRITSCH 2012) and visualization of the

results can increase the success and acceptance of planning processes. This especially applies when an easily and playfully interactive application is used (BROSCHART et al. 2013).

SELLE (2013) notes that participation processes have only been superficially facilitated due to the use of internet. The attempt to mobilize the community through the whole planning process in a steady manner leads to fatigue, boredom and disinterest. Therefore, PUBinPLAN aims at raising citizen interest and commitment at the highlights of a project's individual phases (see Fig. 3). Thus, people are able to influence the process at critical points. Citizens become aware of their opportunity to collaborate and to participate in the decision-making process. This means that citizens can step back from the operational "daily business" of spatial planning. Citizens, experts such as architects or engineers, and decision-makers interact and work together for a common purpose (citizens + experts + community).

## 5 Usability Test with Experts

In order to live up to the intention of the broadest possible participation of the public, the application must be usable on different end devices and different operating systems. The technical implementation based on a cross-platform application provides a fast solution to the requirement of supporting various kinds of end devices. Following the technical paradigm of responsive web design, the crowdsourcing tool is implemented as a web application based on HTML5, JavaScript and additional frameworks such as CakePHP / Bootstrap / jQuery. PUBinPLAN can therefore be opened with all popular browsers (Chrome, Internet Explorer, Safari, Opera, ...) and be used on all end devices.

The interface is primarily designed for use via mobile devices such as tablet PCs or smartphones (see Fig. 4). The interactive map view, which is the core of the crowdsourcing application, is based on the usability of common operating formats. Smartphone users are familiar with applications such as Google Maps. To determine the geographic location of the postings, PUBinPLAN uses the GPS sensors of the device. In addition to the text postings, PUBinPLAN offers the functionality to take geotagged pictures. If geopositioning based on GPS is not possible, a manual positioning of the post can be carried out. Basemap for the crowdsourcing tool is OpenStreetMap (OSM). The map can be customized by an implemented interface to Desktop GIS. Thus, planners can visualize their own sketches, plans or geodata.

The crowdsourcing application has already been tested as part of a usability test by an expert group (13 persons) consisting of architects, landscape architects, as well as spatial planners and delegates of regional development institutions. The task was to assess the application's functionality on mobile devices by specifying the area of the "Landesgartenschau Deggendorf" (a 2014 horticultural show) as case study. Smartphones with the operating systems Android, iOS and Windows Mobile were used with corresponding browsers. The survey was carried out by accompanying the participants (7 supervisors) during the assigned tasks as well as interviewing them after the test phase.

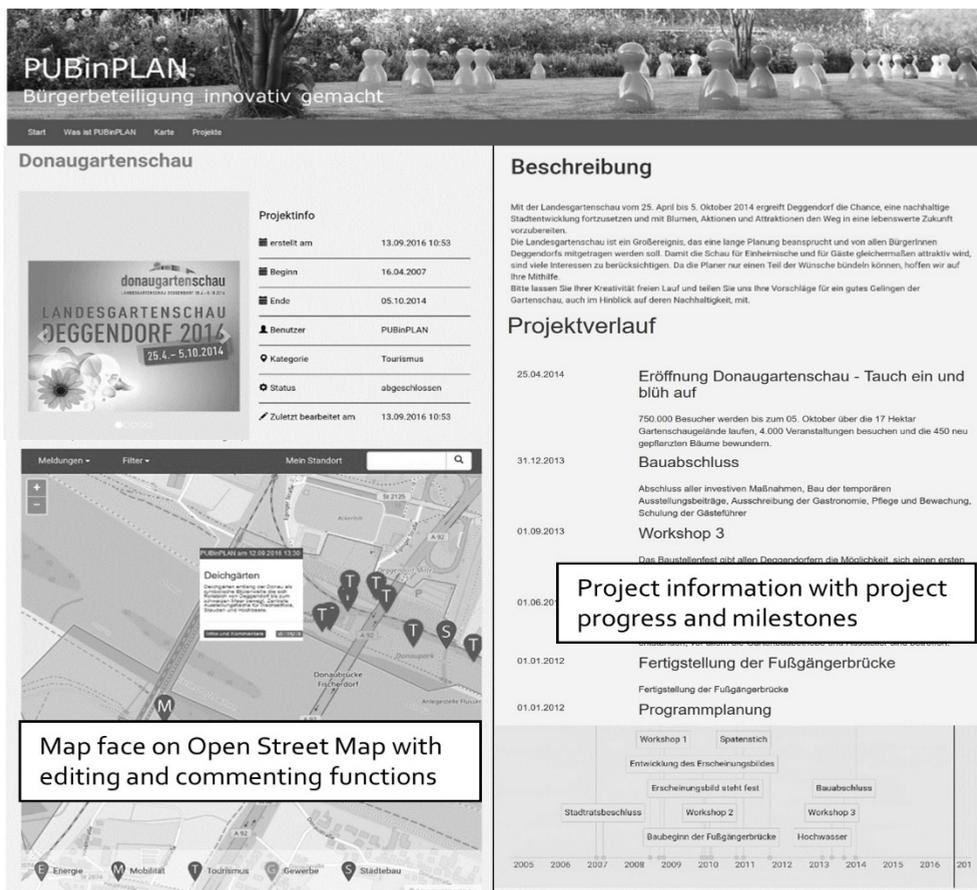


Fig. 4: Selected screenshots of PUBinPLAN desktop view

The workshop’s results show the importance of a user-friendly interface. Although the majority of attendees consider themselves experienced in navigating the Internet via smartphones, they were unsure as to whether the posted messages or comments were correctly registered. The challenge is to achieve a balanced relationship between extensive information and clarity. The intention of all information being available on all end devices is to be questioned critically, since the desktop view allows much more information to be displayed than the smartphone does. Despite efforts to counteract this with the afore-mentioned paradigm of responsive web design, participants indicated being overwhelmed by too much content, preventing them from finding the information they were looking for.

The central functions of PUBinPLAN, such as determining one’s own position, working with the map and, above all, creating and commenting on messages, are easily put into practice by the attendees. In summary, the pretest illustrates the importance of usability for the success of a digital participation platform and thus for the success of e-participation. Once participants succeed in orientating themselves on the page, the application is extensively used. The focus of further development is therefore to improve the menu navigation in order to

keep entry barriers as low as possible. The more intuitive and easier the operation, the higher the likelihood that the application will later be used extensively for spatial planning.

The area of conflict is between comprehensive functionality for processing the information through the specialist planning (editing, evaluation, AR and CAD models) and ease of use with the citizen. PUBinPLAN therefore works with a shell model in which different user groups can be assigned different access and processing rights. This issue concerns the handling of objectionable posts as well. Although an open and transparent discussion of citizens' reports and visions is striven for, PUBinPLAN foresees the implementation of a moderation in order to be able to intervene promptly in cases of illegal content (e. g. hate speech). This function is assumed by the project manager, which was also suggested by the experts.

## 6 Conclusion and Outlook

Current society is not only experiencing a transformation towards an information society, but also and at the same time towards a geoinformational society. With the ubiquitous availability of digital geomedia by mobile and positioning-enabled devices, geoinformatics have attained a new status in society. The use of digital geomedia in everyday life not only changes our view of the world, but also makes it possible to shape it. Due to spatial, social or technical filters people see the world differently or shape it in a new way. This, however, has an impact on our actions. Complementing traditional participation processes by new digital opportunities can help approach the participation optimum. This may counterbalance negative developments of social upheaval, increase the acceptance of new infrastructure projects and development activities and also strengthen social cohesion. In regards to participation, the possibilities of digitalization should be interpreted as an opportunity to accompany the social transformation towards a digital society in the information age of the 21st century.

## 7 Acknowledgements

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## References

- ALBRECHT, R., GRÜTTNER, A., LENK, T., LÜCK, O. & ROTTMANN, O. (2013), Optionen moderner Bürgerbeteiligung bei Infrastrukturprojekten. Ableitungen für eine verbesserte Beteiligung auf Basis von Erfahrungen und Einstellungen von Bürgern, Kommunen und Unternehmen, Leipzig.  
[http://www.wifa.uni-leipzig.de/fileadmin/user\\_upload/KOZE/Downloads/Optionen\\_moderner\\_Bu%CC%88rgerbeteiligungen\\_bei\\_Infrastrukturprojekten\\_.pdf](http://www.wifa.uni-leipzig.de/fileadmin/user_upload/KOZE/Downloads/Optionen_moderner_Bu%CC%88rgerbeteiligungen_bei_Infrastrukturprojekten_.pdf) (11.02.2016).
- ARNSTEIN, S. R. (1969), A Ladder Of Citizen Participation. *Journal of the American Institute of Planners*, 35, 216-224. <http://www.tandfonline.com/loi/rjpa19>.

- BROSCHART, D., ZEILE, P. & STREICH, B. (2013), Augmented Reality as a Communication Tool in Urban Design Processes. In: SCHRENK, M. (Ed.), *Planning times. You better keep planning or you get in deep water, for the cities they are a-changin'*; Proceedings of the 18th International Conference on Urban Planning, Regional Development in the Information Society; 20-23 May 2013, Rome, Italy (= REAL CORP 2013 "Planning times"). Eigenverlag des Vereins CORP, Schwechat, 119-126.
- CARVER, S. (2001), Participation and Geographical Information: a position paper. [https://www.google.de/search?q=steve+carver+participation+and+geographical+information&ie=utf-8&oe=utf-8&gws\\_rd=cr&ei=r\\_6dVuOAFsflUZSegdAD](https://www.google.de/search?q=steve+carver+participation+and+geographical+information&ie=utf-8&oe=utf-8&gws_rd=cr&ei=r_6dVuOAFsflUZSegdAD).
- CLEMENT, R. & SCHREIBER, D. (2013), *Internet-Ökonomie. Grundlagen und Fallbeispiele der vernetzten Wirtschaft*. Springer, Berlin/Heidelberg.
- CROOKS, A., HUDSON-SMITH, A., CROITORU, A. & STEFANIDIS, A. (2014), The Evolving GeoWeb. In: ABRAHART, R. J. & SEE, L. M. (Eds.), *GeoComputation*. Second Edition. Taylor and Francis, Hoboken.
- FEHRES, K., BLESSING-KAPELKE, U., TZSHOPPE, P. & HARTMANN, S. (2010), Mitgliederentwicklung in Sportvereinen – Bestandserhebungen und demografischer Wandel.
- GOODCHILD, M. (2007), Citizens as sensors. The world of volunteered geography. *GeoJournal*, 69 (4), 211-221, doi:10.1007/s10708-007-9111-y.
- GRAHAM, M. & ZOOK, M. (2014), Augmentierte Geographien: Zur digitale Erfahrung des städtischen Alltags. *Geographische Rundschau* (6), 18-25.
- KANWISCHER, D. (2014), Digitale Geomedien und Gesellschaft. Zum veränderten Status geographischen Wissens in der Bildung. *Geographische Rundschau* (6), 12-17.
- NANZ, P. & FRITSCH, M. (2012), *Handbuch Bürgerbeteiligung*. <https://www.bpb.de/shop/buecher/schriftenreihe/76038/handbuch-buergerbeteiligung> (11.02.2016).
- OSM (2016), Homepage OSM. <http://www.openstreetmap.de/> (15.12.2016).
- PORTZ, N., LÜBKING, U. & WEINSTOCK, M. (2013), Bürgerbeteiligung bei kommunalen Vorhaben und in der Stadtentwicklung. Winkler & Stenzel GmbH, Burgwedel.
- ROCKMANN, L. & ADLER, S. (2015), Augmented-Reality als Erweiterungs-Tool des partizipativen Austausches in Planungsprozessen zum Ziel einer integrativen städtebaulichen Entwicklung. In: SCHRENK, M. (Ed.), *Plan together – right now – overall*. 5.-7. May, 2015, Ghent, Belgium; 20th International Conference on Urban Planning, Regional Development and Information Society; Tagungsband, Proceedings REAL CORP 2015. Eigenverlag des Vereins CORP – Competence Center of Urban and Regional Planning, Wien, 83-92.
- SELLE, K. (2013), Über Bürgerbeteiligung hinaus: Stadtentwicklung als Gemeinschaftsaufgabe? Analysen und Konzepte. Rohn, Lemgo (Edition Stadtentwicklung).
- SIEBER, R. (2006), Public Participation Geographic Information System: A Literature Review and Framework. *Annals of the American Geographers*, 491-507.
- STADT KÜNIGSLUTTER AM ELM (2016), Interaktiver Landschaftsplan Königslutter. <http://entera-online.com/> (15.12.2016).
- THIELMANN, T., VAN DER VELDEN, L., FISCHER, F. & VOGLER, R. (2012), Dwelling in the Web. Towards a Googlization of Space. In: HIIG Discussion Paper Series (3).
- WHERE GROUP GMBH & CO.KG (2016), Meldemax. <https://meldemax.com/> (20.01.2016).
- ZINK, R., KÜSPERT, S., HASELBERGER, J., MARQUARDT, A. & SCHRÖCK, S. (2016), Interaktives GIS-Framework für partizipative Raumplanungsverfahren. In: STROBL, J., ZAGEL, B., GRIESEBNER, G. & BLASCHKE, T. (Hrsg.), *AGIT 2-2016. Journal für Angewandte Geoinformatik*. Wichmann, Berlin/Offenbach, 488-497.