A Domain Model for eParticipation

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Abstract

The introduction of Information and Communication Technologies (ICTs) in the field of public participation led to the emergence of electronic Participation (eParticipation). The area of eParticipation is currently a rapidly evolving one. Although, a few eParticipation-related frameworks have been developed they actually aimed to address specific purposes. As a result, there is no work aiming to model the whole eParticipation domain. In this paper, a first attempt to model the domain of eParticipation is presented. For this purpose, we identify and describe the most significant aspects that characterize the eParticipation domain according to the relevant literature. In addition, we define a domain model in order to formally describe these aspects and the relationships between them. This model is illustrated using a set of Unified Modeling Language (UML) package and class diagrams.

1. Introduction

Governments across Europe are facing a growing public indifference and inertia toward formal political processes. A decrease in voting activity and the concentration of decision-making power are revealed as common concerns to all European countries [1]. The modern Western democracies suffer from a decline of trust by its citizens and the model of representative democracy is being disputed [2], [3]. In this context, governments seek to encourage participation in order to improve the efficiency, acceptance, and legitimacy of political processes [4].

Public participation is the process by which public concerns, needs and values are incorporated into governmental and corporate decision making [5]. According to Smith [6] public participation encompasses a group of procedures designed to consult, involve, and inform the public to allow those affected by a decision to have an input into that decision.

New Information and Communication Technologies (ICTs) have introduced opportunities to enhance involvement of citizens in decision-making. In this way, the field of electronic Participation (eParticipation) has emerged. Because eParticipation is still in its infancy it is critical to understand how to integrate ICTs with traditional participation methods in order to develop a new model of citizen engagement and involvement in the democratic process.

The objective of this paper is to identify and to formally present the most important aspects and relations characterizing the domain of eParticipation. Because of the complexity of the domain, the model was divided in three sub-domains. The overall model and each of the sub-domains are illustrated by applying the Unified Modeling Language (UML) notation [7]. Specifically, we introduce a UML package diagram to represent the relation of the three sub-domains and a set of UML class diagrams to illustrate each of the sub-domain models and the whole domain model.

The rest of the paper is organized as follows. In section 2 related work in the area of eParticipation and the motivation for our study is presented. In section 3 the domain model is delineated. The conclusion and future work are given in section 4.

2. Motivation and related work

Conceptual modeling is the activity of formally describing some aspects of the physical and social world around us for purposes of understanding and communication [8]. However, the level of abstraction on which this activity is based differentiates the aspects that are conceptualized and the models that are developed. For example, the concepts expressed in a high-level, domain-independent ontology are intended to be universal concepts to ensure generality and

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expressivity for a wide area of domains. On the other hand, a case specific ontology is limited in modeling the application or case under study. Between the former two approaches, can be placed the modeling of a specific domain [9].

A useful domain model captures the essential abstractions and information required to understand the domain in the context of the current requirements, and aids people in understanding the domain its concepts, terminology and relationships [7]. Apparently, the development of a comprehensive domain model is not an easy task. However, all the models introduced for a specific domain are approximations of this domain and consequently it is not accurate to label a domain model as correct or not.

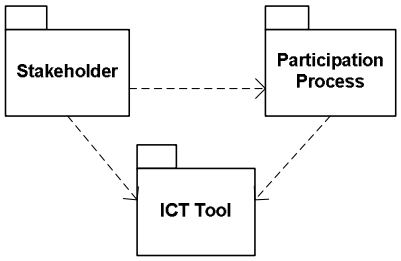

Figure 1. The UML package diagram representing eParticipation domain model

The research field of eParticipation is currently in a phase of quick development and enrichment. The proper understanding of the field requires the research and development integration of a variety of disciplines. This results in a number of different perspectives and approaches that are often difficult to relate to a common framework. During the last years a few frameworks have been developed in order to conceptualize the domain of eParticipation. However, these efforts aimed to address specific tasks like the evaluation of eParticipation-related tools and applications. These works are outlined below.

A framework for assessing eParticipation projects and tools has been proposed [10]. A characterization framework for eParticipation aiming to compare and contrast initiatives has been also introduced [11]. Another eParticipation-related framework is the one that was developed to assess the contextual role of ICTs as a part of electronic democratic practices [12]. Finally, a framework aiming to scope eParticipation and provide its main layers has been introduced [13].

Although, these frameworks have been developed in order to address a specific purpose, there has not been any related work in modeling the eParticipation domain. The Governance Enterprise Architecture (GEA), a top-level, generic model for the overall governance domain, can be referenced as one exception [9]. However, this model could be characterized as very generic to describe the overall eParticipation domain.

At the core of our effort is the understanding of how the organizational and social aspects of democratic processes can be combined with technological tools. For this, a representation of the overall eParticipation domain is required. Currently, as outlined above, there is not any such effort for the domain of eParticipation. The model that is introduced in this paper has as a starting point the framework developed by Tambouris *et al*. [13]. This framework associates the identified aspects in a more transparent manner. For this, it can be used as a basis to describe and identify more explicitly the aspects and the relations characterizing the overall domain.

3. The model

In order to describe our model in a more comprehensive way, the model was divided in three sub-domains. The first comprises these aspects that are relevant to the traditional public participation processes while the second these aspects that are relevant to the ICT tools which can support them. These sub-domains are named *Participation Process* and *ICT Tool*, respectively. A third sub-domain was also included which is relevant to the stakeholders that are involved in the eParticipation process. This sub-domain is named *Stakeholder*. Applying UML notation, the model consisting of the three sub-domains is illustrated with a package diagram. Each of the three packages represents a sub-domain. The package diagram is depicted in Figure 1.

In the rest of this section we elaborate on each of the three sub-domains or UML packages. For each of these, a UML class diagram is developed. The three class diagrams are incorporated in one in order to outline the overall domain model. This final class-diagram is presented in Figure 5, in the Appendix.

3.1. Stakeholder

The first sub-domain of our model should specifically represent the *stakeholders* and their respective *roles*. In order to evaluate eParticipation applications Maintosh and Whyte [14] described a number of stakeholders and their actions. In the DEMO-net project the main stakeholders involving in the eParticipation were identified and described. These are [15]: *elected representatives*, the *government/ executive*, *political parties*, non-governmental organisations (*NGO's*) and civil society organisations (*CSO's*), *citizen groups*, *academia and research*, *industry* and other diverse stakeholders including mass

communication media and quasi nongovernmental organisations (QUANGOs).

From this, it has become apparent that the stakeholders and the roles that they have in the eParticipation are interconnected. Tambouris *et al.* [10] discriminate the stakeholders in these that benefit from using the tool and those who are responsible or moderating/administering the tool. Macintosh [11] identified a number of tasks that the stakeholders can perform like developing precise participation e-content, managing and controlling the participation process and incorporating results into policy.

In our model we included four main types of roles that a stakeholder can acquire during eParticipation. These are the followings:

1) *Input provider* is a stakeholder who provides input in the participation process. Although input is provided either by traditional channels or by ICT tools, in our eParticipation model we emphasize on the use of ICT tools. This role is not allocated only to citizens or citizen's groups. In a discourse for example, elected representatives are also involved as input providers.
2) *Decision Maker* is the stakeholder who is responsible for incorporating the results of the participation process into policy.
3) *Moderator/ Facilitator:* This role was given in the traditional participation methods to the one who has the responsibility to maintain the flow of the proceedings and to keep everyone on time and on track [16]. As in eParticipation emphasis is put on eParticipation tools this role can be given to the stakeholder who is responsible for moderating or administrating an eParticipation tool. This role can be acquired not only by public servants and official but also by private companies.
4) *Owner / Initiator* is the stakeholder who initiates and is responsible for the participation process. Usually the initiator of such a process is a governmental official or an elected representative. It is also possible a group of citizens to initiate a political process by taking advantage of existing processes and tools. Sometimes the roles of the owner and the initiator are separated.

The analytical description of the stakeholder component is delineated in the class-diagram of Figure 2.

3.2. Participation process

Democracy itself can be thought as a process [12]. Although the very act of decision-making has been given priority as the core element of a democratic process, other elements of this process are also vitally important. Thus, in a generic model, all the phases from agenda setting, planning and preparation, decision-making, implementation (including service provision), and control and evaluation of collective action have their roles. Creighton [5] suggests that decision-making is also a process in which a sequence of stages leads to a decision. In addition, in the conceptual model for participatory decision making, introduced by Renn *et al.* [17], decision making is deemed as a sequential procedure comprises three steps. The simplest and most generic decision-making process has the following steps [5]: define the problem, establish evaluation criteria, identify alternatives, evaluate alternatives and select a preferred alternative.

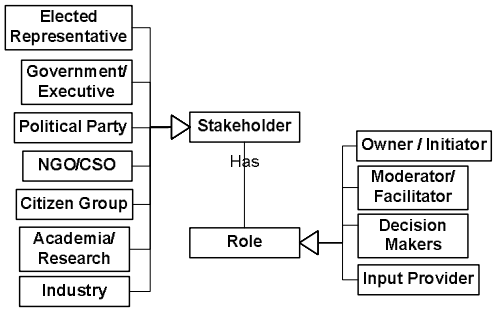

Figure 2. The *Stakeholder* sub-domain.

Based on these approaches, we adopted a process view of public participation. A *participation process* comprises a number of *participation activities* which have to do with the specific activity of citizen engagement and involvement in the democratic process. In this context, each activity aims at specific stage of the process. It goes without saying that in some cases a participation process includes only one activity.

A participation process is conducted aiming a specific group of people. Processes with a national scope or a macro-regional scope have different requirements and characteristics than these with a local scope. So, each participation process has a *scope*.

As mentioned above, a participation activity aims at a specific *stage* of the democratic process. OECD [18] has described these stages as five high-level stages on the policy-life cycle including a*genda setting, analysis, creating the policy, implementing the policy* and *monitoring the policy*.

Participation areas have to do with the specific area or areas of citizen engagement and involvement in the democratic process. So, each participation activity belongs to a *participation area*. The early studies about citizen participation and the new opportunities that ICT provides focused on three main aspects [19]: access to public life information, public discussions about political themes and support to electronic vote (e-vote). New aspects were injected into this approach and new

areas of eParticipation emerged. The DEMO-net project concluded in a list of eleven areas [20]: *information provision, community building/ collaborative environments, consultation, campaigning, electioneering, deliberation, discourse, mediation, spatial planning, polling* and *voting*.

A participation activity may involve a traditional *participation technique*. A technique is a specific method used to engage citizens. An indicative list of participatory techniques includes [16]: charrette, citizens' jury, consensus conference, deliberative polling, Delphi, focus group and expert panel. Rowe and Frewer [21] discriminate the participation techniques in those that elicit input in the form of opinions (e.g., public opinion surveys and focus group) and those that elicit judgments and decisions from which actual policy might be derived (e.g., consensus conferences and citizens' juries).

A participation activity has an *outcome*. One of the most common problems relevant to eParticipation processes is that governments fail to integrate outcomes into the policy process or respond to them effectively [22]. So, the outcome of the process should feed the participation process in order to facilitate the execution of the next stages of the process. It also should be provided to the decision maker who is relevant for the content of the participation process.

Arnstein claims, that the involvement of the public in decision-making represents a redistribution of power from the authority to the citizens [23]. She described the public participation by an analytical scheme described by a ladder with eight rungs each representing a level of citizen participation. So, it could be inferred that a participation activity has a *level of participation*. Since the earlier mentioned scheme, many other classifications have been developed in order to describe the participation level. In our model the framework proposed by Tambouris *et. al* [10] is adopted. This framework consists of five levels: *e-informing, e-consulting, e-involving, e-collaborating* and *e-empowerment*.

The class diagram of Fig. 3 illustrates the aspects that are incorporated in the participation process component of the eParticipation model.

3.3. ICT tool

In this section we elaborate on the sub-domain of the proposed model for eParticipation which is relevant

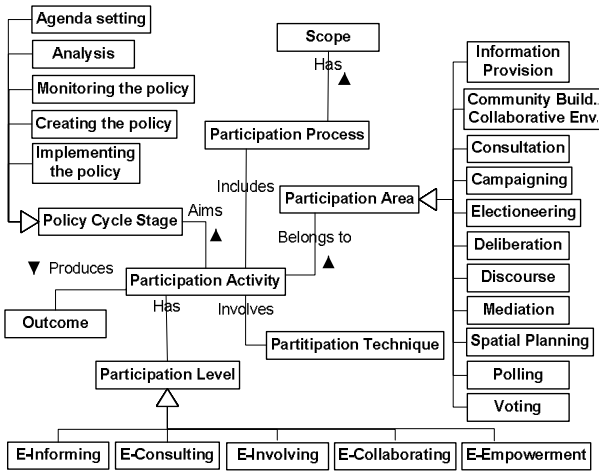

Figure 3. The *Participation Process* sub-domain

to ICT tools. The introduction of these tools in the domain of public participation leads to eParticipation. In Fig. 4 the class-diagram of this component is presented.

The participation activity is supported by one or more *eParticipation tools*. These range from weblogs and web portals to the more sophisticated consultation platforms, e-Petitioning systems and virtual communities [10], [24]. An *eParticipation tool* belongs to a *tool category*. According to the DEMO-net project the tools that are used in eParticipation can be grouped in the following categories [15]: *ePetitions systems, eVoting and eReferenda, eConsultation systems, ePolling, community systems, GIS and Map-based tools, online surgeries and chat rooms,* and *combined collaborative systems.*

The interdependency of the eParticipation tools and ICT technologies is obvious. So, it could be inferred that an eParticipation tool is based on one or more *technologies*. To discuss the potential of new and emerging technologies to eParticipation is no easy task. There is a myriad of interesting innovation and development taking place in the ICT world all of which could and can have an impact on eParticipation [25]. Some of the technologies that underpin typical eParticipation applications and tools are the following: digital signature, mobile and wireless technologies, geographical information systems, ontologies, streaming media, security protocols, web services, natural language processing and data mining.

In a recent report of the DEMO-net project five technologies were characterized as already emerging technologies in the field of eParticipation [25]. These are *collaborative environments*, *argumentation support systems*, *ontologies*, *semantic web services* and k*nowledge management*.

Many of the technologies that have been used in various projects and applications in the field of eParticipation intend to provide different channels to the users. In our model we deem that a stakeholder uses an eParticipation tool through one or more *channels* that the tool provides. In these channels we

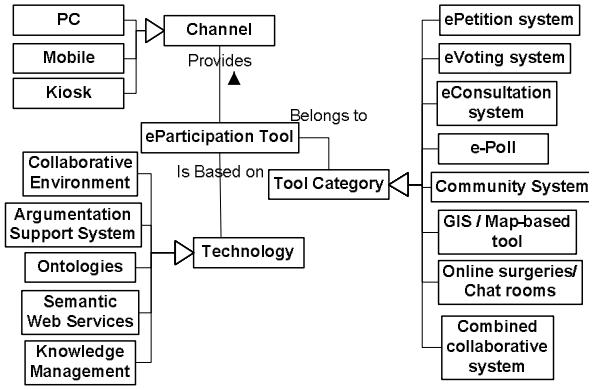

Figure 4. The *ICT Tool* sub-domain

do not incorporate the traditional channels (face to face, papers etc.) which can be used. These channels are encompassed in the traditional participation techniques.

In the model presented in this paper, three types of channels are explicitly presented as particularly important. The conventional internet channel for use by *PC*, the m*obile* channel supporting the use of the tool through mobile phones, palmtops etc., and the public *kiosks* providing the eParticipation tool which may facilitate use by disabled people.

4. Conclusion and future work

Although, a few eParticipation-related frameworks have been developed during the last years in order to address a specific purpose, there has not been considerable work in modeling the eParticipation domain. In this paper, a model for the domain of eParticipation is proposed. In Figure 5 the full model is presented using a UML class diagram.

The proposed model contributes to the formal structure of the complex domain of eParticipation. It provides a complete view of the eParticipation domain regarding concepts and relationships. So, it contributes to the proper understanding of the domain with an easily to understand albeit formal manner.

Future work includes the use of the proposed model in order to analyze existing and planned eParticipation projects, applications and tools. This way, it can provide valuable insights into the interdependencies of specific concepts of the domain.

Furthermore, the proposed model can be used as the starting point in order to develop a reference ontology for the eParticipation domain. The development of an ontology for the domain could be used in various information system scenarios [26]. Firstly, the ontology can be used to enable multiple applications to have access to heterogeneous sources of information. Benefits of this approach include interoperability, and more effective use and reuse of knowledge resources. In addition, following the ideas of the Model Driven Architecture [27], a reference model can be used as a basis for specification and development of eParticipation related software applications. Finally, an eParticipation ontology can be used for searching an information repository for eParticipation related resources. The motivation in this scenario is to improve the precision and reduce the time of searching.

Acknowledgments

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5. References

[1] J. Matilla, "Participatory e-governance — A new solution to an old problem?," in *Governing Networks*, A. Salminan, Ed. Amsterdam: IOS Press, 2003, pp. 161-170.

[2] J. K. Kampen and K. Snijkers, "E-Democracy: A Critical Evaluation of the Ultimate E-Dream," *Social Science Computer Review,* vol. 21, no. 4, pp. 491-496, 2003.

[3] J. S. Nye, P. D. Zelikow, and D. C. King, *Why people don't trust government*. Cambridge, MA: Harvard University Press, 1997.

[4] C. Sanford and J. Rose, "Characterizing eParticipation," *Int. J. of Inform. Manage.*, vol. 27, pp. 406-421, 2007.

[5] J. L. Creighton, *The Public Participation Handbook: Making Better Decissions Through Citizen Involvement*. San Francisco: Jossey-Bass, 2005.

[6] L. G. Smith and C. Y. Nell, "FORUM: The Converging Dynamics of Interest Representation in Resources," *Environmental Management,* vol. 21, pp. 139-146, 1997.

[7] C. Laman, *Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development*. Addison Wesley, 2004.

[8] J. Mylopoulos, L. Chung, and E. Yu, "From object-oriented to goal-oriented requirements analysis," *Communications of the ACM,* vol. 42, pp. 31-37, 1999.

[9] V. Peristeras, "Governance Enterprise Architecture - GEA - for Reengineering Public Administration," Ph.D. dissertation, University of Macedonia, Thessaloniki, 2006.
[10] E. Tambouris, N. Liotas, and K. Tarabanis, "A Framework for Assessing eParticipation Projects and Tools," in *Proc. 40th Int. Conf. on System Sciences*, Hawaii, 2007, p.90a.
[11] A. Macintosh, "Characterizing E-Participation in Policy-Making," in *Proc. 37th Int. Conf. on System Science*, Hawaii, 2004.
[12] A. V. Anttiroiko, "Building strong E-democracy - The role of technology in developing democracy for the information age," *Communications of the ACM,* vol. 46, pp. 121-128, Sep 2003.
[13] E. Tambouris, N. Liotas, D. Kaliviotis, and K. Tarabanis, "A Framework for Scoping eParticipation," in *Proc. 8th Annu. Int. Conf. on Digital Government Research.*, Philadelfia, 2007.
[14] A. Macintosh and A. Whyte, "Evaluating how eParticipation changes local democracy," in *Proc. eGovernment Workshop 2006: eGov06*, Edinburg, 2006.
[15] DEMO-net Consortium (2006, May). Introducing eParticipation. DEMO-net Booklet Series. vol. 1. [Online]. Available: http://www.demo-net.org
[16] J. Elliot, A. Heesterbeek, C. J. Lukensmeyer, and N. Slocum. (2005, Sep.). Participatory Methods Toolkit: A practitioner's manual. King Baudouing Found. and The Flemish Inst. for Sci. and Technology. [Online]. Available: http://www.viwta.be/files/30890_ToolkitENGdef.pdf
[17] O. Renn, T. Webler, H. Rakel, P. Dienel and B. Johnson, "Public participation in decision making: A three-step procedure," *Policy Sciences*, vol. 26, pp. 189-214, 1993
[18] OECD. (2003). Promise and Problems of E-Democracy: Challenges of online citizen engagement. [Online]. Available: http://www.oecd.org/dataoecd/9/11/35176328.pdf
[19] T. Gross, "Technological support for e-democracy: history and perspectives," in *Proc. 11th Int. Workshop on Database and Expert Syst. Applicat.*, London, UK, 2000, pp. 391-395.
[20] DEMO-net Consortium (2006, Sep.). D 5.1 Report on current ICTs to enable Participation. [Online]. Available: http://www.demo-net.org
[21] G. Rowe and L. J. Frewer, "Public Participation Methods: A Framework for Evaluation," *Science, Technology, & Human Values,* vol. 25, pp. 3-29, 2000.
[22] S. Roeder, A. Poppenborg, S. Michaelis, O. Marker, and S. R. Salz, ""Public budget dialogue" - An innovative approach to E-participation," in *E-Government: Towards Electronic Democracy,* Springer, 2005, pp. 48-56.
[23] S. R. Arnstein, "A ladder of citizen participation," *American Inst. of Planners J.,* vol. 35, no. 4, pp. 216-224, 1969.
[24] A. Macintosh, S. Coleman, and M. Lalljee. (2005). E-Methods for Public Engagement: Helping Local Authorities communicate with citizens. Bristol City Council. [Online]. Available: http://146.176.2.70/ITC/Documents/eMethods_guide2005.pdf
[25] DEMO-net Consortium. (2007, Feb.). D 5.2 eParticipation: The potential of new and emerging technologies. [Online]. Available: http://www.demo-net.org
[26] R. Jasper, and M. Uschold, (1999). "A framework for understanding and classifying ontology applications," in *Proc. 12th Workshop on Knowledge Acquisition, Modeling and Management* (KAW-99).
[27] OMG Model Drivel Architecture Website. [Online]. Available: http://www.omg.org/mda/

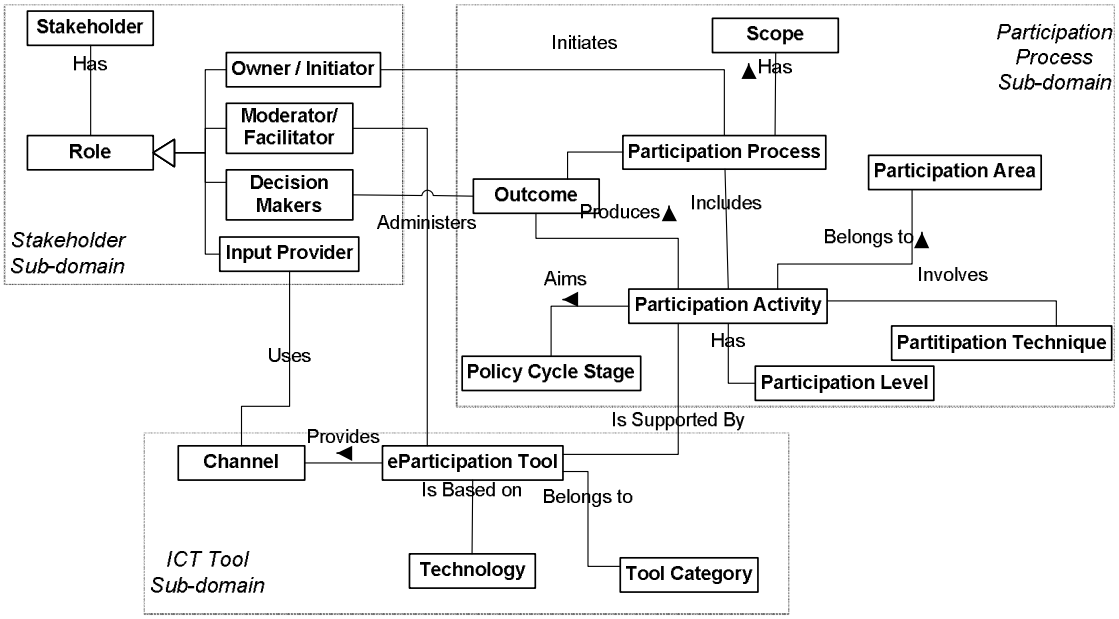

Figure 5. The UML class diagram representing the domain model for eParticipation