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An ontology for next generation e-Participation initiatives

Lukasz Porwol *, Adegboyega Ojo, John G. Breslin

Insight Centre for Data Analytics, National University of Ireland Galway, IDA Business Park, Galway, Ireland

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ABSTRACT

Despite over a decade-long experience of implementing e-Participation initiatives, there have been limited efforts so far to develop a detailed, comprehensive conceptualization for e-Participation considered from three distinct perspectives: as democratic process, a project and a deliberation platform. Current e-Participation literature is replete with fragmented models, which only partially describe aspects of e-Participation with main focus on structuring the "e-Participation" concept as a domain. This has made consistent descriptions and comparative analysis of e-Participation initiatives difficult, thus hindering the overall evolution of e-Participation. Consequently, no comprehensive, formal, executable e-Participation Ontology exists, that could be directly leveraged to facilitate operations of e-Participation initiatives or improving communication and knowledge exchange between similar e-Participation initiatives. In addition, current generation of e-Participation models does not explicitly support the emerging phenomenon of spontaneous, citizen-led e-Participation, in particular hosted on the social media platforms. This work bridges this gap by providing a practical, yet sufficiently detailed, conceptualization along with corresponding formal and executable ontology for next generation e-Participation. These semantic models cover the core facets of e-Participation — as a democratic process, an initiative and a sociotechnical system. The developed models also explicitly support the integrated citizen- and government-led model of e-Participation. For demonstration and validation, we employed the developed e-Participation Formal Ontology as a "design artefact" to describe two e-Participation initiatives at Local Government and European levels.

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1. Introduction

e-Participation, in principle, employs technology-mediated dialogue between citizens and the politics sphere as well as between citizens and administration (Sabo, Rose, & Skiftenesflak, 2008) to enable effective, concurrent public-participation and feedback (Chadwick, 2003) while also introducing new ways of political participation (Dijk, 2000).

e-Participation initiatives have been referred in the literature commonly as e-Consultation, web-based citizen input and online public engagement (Phang & Kankanhalli, 2008).

The domain of e-Participation, in over a decade since its conception, has engendered different reference models as part of the foundations for multiform e-Participation projects and architectures. The predominant conceptualisations of e-Participation include: dimensions of e-Participation framework (Macintosh, 2004), levels of participation model (DESA, 2005), ladder of online participation (Li & Bernoff, 2007), behaviour chain model (Fogg & Eckles, 2007), e-Participation exploitation framework (Phang & Kankanhalli, 2008), and a few other cited works (Aichholzer & Westholm, 2009; Islam, 2008; Preece & Shneiderman, 2009; Sæbø, Flak, & Sein, 2011). However as we elaborated in our previous work (Reference removed for blind review) although these models address one or more aspects of e-Participation, the degree of complementarity of these models and the extent to which they collectively cover the scope of e-Participation are limited. The more elaborated models like e-Participation evaluation framework (Macintosh, 2008) and the domain model for e-Participation by Kalampokis, Tambouris, and Tarabanis (2008), drawing from e-Participation assessment framework (Tambouris, Liotas, & Tarabanis, 2007a) are relatively comprehensive and present general conceptualization and categorization of e-Participation as a domain. Nevertheless, the works do not explicitly tackle the key e-Participation perspectives (initiative, project, platform) nor cover in sufficient detail such important aspects of e-Participation like deliberation, referring only briefly to discussion and political discourse as participation areas and identifying the stakeholders. Moreover existing models put more emphasis on assessment and evaluation

* Corresponding author.
E-mail addresses: lukasz.porwol@insight-centre.org (L. Porwol), adegboyega.ojo@insight-centre.org (A. Ojo), john.breslin@insight-centre.org (J.G. Breslin).

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of e-Participation rather than supporting e-Participation initiatives' operations. Most of the models are represented as textual frameworks with minimalistic, basic structure in a form of tables or simple diagrams and very few models are expressed in more formal or executable form. We argue that natural candidate for formal e-Participation models representation lies in ontologies understood as an explicit specification of a conceptualization, defined as a specification of a representational vocabulary for a domain (Gruber, 1993). In particular the conceptualization can be explained as classes and their relations in the domain of a discourse, which can be represented with a predicate calculus (Genesereth & Nilsson, 1987). The purpose of an ontology is sharing and reuse of knowledge therefore this particular knowledge-representation type aligns perfectly with the identified mission of the e-Participation model. Recent efforts in the World Wide Web Consortium (W3C) to implement Semantic Web (Gruber, 1995), as a response to a need for shift from Web 2.0 to Web 3.0 have spurred interest in the use of ontologies for information modelling and knowledge representation. The main principle of Web 2.0 has been the collective intelligence, collaborative content creation and linking by the user (here citizen) who contributes towards common knowledge (O'reilly, 2007). However Web 2.0 did not specify how the information can be effectively processed and shared. Web 3.0 provides a common framework that allows data to be shared and reused across applications, enterprises, and community boundaries. Its well-defined data semantics enable computer agents and humans to work in cooperation (Tim Berners-Lee, James Hendler, & Lassila, 2001). Ontologies provide a controlled vocabulary of terms that can collectively provide an abstract view of the domain (Schreiber & Swick, 2006; Uschold & Gruninger, 2009). Semantic Web technologies and ontologies are being used to address data discovery, data interoperability, knowledge sharing and collaboration problems. Ontologies can be described in RDF (Resource Description Framework) (Frank & Eric, 2004) which provides a flexible graph based model, used to describe and relate resources.

Considering the formal ontologies for e-Participation, as a step towards more applied, executable e-Participation models, the domain has had very few contributions. This is a great disadvantage to the e-Participation platform developers, managers and administration, as e-Participation platforms, which currently largely rely on capabilities delivered by tools implementing standard Web 2.0 technologies, need specific standards and well-defined protocols for effective information management and interoperability. Many e-Participation projects such as HUWY,[1] WAVE,[2] VOICES,[3] OCOPOMO,[4] PADGETS,[5] SPACES,[6] NOMAD[7] or Puzzled by Policy[8] employed Web 2.0 tools such as digital forums, blogs, wiki's and live-chat to provide dedicated e-Participation environment where citizens can express and discuss their needs and concerns. However, due to limitations of Web 2.0 the solutions fall short at addressing the problem of interoperability and miss standardized initiative descriptions backed by relevant ontologies. Moreover, the e-Participation platforms offered face significant problems with information overload, without capabilities to structure, cluster or summarize content, available for ontology-powered commercial solutions (Fensel et al., 2002; Spies, 2010; Sureephong, Chakpitak, Ouzrout, & Bouras, 2008). The scarce ontological works for e-Participation include the ontology for an e-Participation virtual resource centre by Wimmer (2007) and much less popular e-Participation Ontology by Belák and Svátek (2010). The ontology by Wimmer (2007) considers e-Participation as a domain and focuses on structuring e-Participation research rather than facilitating the design and operation of e-Participation initiatives. In contrast, the ontology by Belák and Svátek (2010) is of a very applied nature; though it focuses mainly on deliberation and political debate and does not consider other pivotal aspects of e-Participation. Finally, a more recent work by Slaviero et al. (2011) builds upon models by Kalampokis et al. (2008), Tambouris, Liotas, and Tarabanis (2007b), Wimmer (2007) and delivers an ontology to support the deployment of e-Participation environments. However, the model, in principle, does not explicitly support the machine-processable descriptions (for instance by leveraging existing standards and frameworks like RDF[9]) of e-Participation initiatives; the descriptions of models lack of detail on particular implementation or direct applicability of the ontologies to describing the e-Participation initiatives. Instead the ontologies intend to be used again for describing e-Participation as research domain or for describing e-Participation initiatives at more abstract level as tool supposedly to facilitate high level management and deployments of e-Participation environments. Consistent with the observation by Macintosh, Coleman, and Schneeberger (2009), we argue that e-Participation demands formal, inclusive methodology and more comprehensive models. These next generation e-Participation models are increasingly required to support constant automatic monitoring and engagement of citizens on Web 2.0 platforms as well as the explicit inclusion of spontaneous discussion on social media as integral part of the e-Participation process — duality of e-Participation. This has not been explicitly addressed by any of the models presented. Therefore, in our work on Integrated Model for e-Participation (Reference removed for blind review) we drawn from Giddens' Structuration Theory (Giddens, 1984) together with the complementary Dynamic Capabilities Theory (Teece, Pisano, Shuen, & Shuen, 1997; Wang, 2007) to develop a conceptualisation of the duality of e-Participation and linked it to the classical models for e-Participation. Therefore, the presented model structures the citizen-to-decision-maker communication and identifies the key e-Participation process capabilities required to implement both government-led and citizen-led e-Participation. From this model we have elicited a comprehensive matrix of e-Participation requirements and made a recommendation for the state-of-the art tools to satisfy e-Participation needs.

Building upon the Integrated Model as a solid theoretical base, this paper provides a comprehensive conceptualization and ontology for e-Participation. The model presented enables a detailed specification of e-Participation processes, facilitates collaboration and interoperability between various e-Participation initiatives as well as ensures better understanding of the needs of e-Participation stakeholders. Our major contribution is not limited to providing a comprehensive conceptualization and ontology for e-Participation, but also in providing a design artefact to support the integration of traditional government-led e-participation and spontaneous citizen-led e-Participation.

In next section of this document we elaborate more on the related work — the existing ontologies for e-Participation, highlighting the strong points of the works and the research gaps. In Section 3, we present our approach to constructing an ontology for e-Participation with relevant extensions to support the duality of e-Participation. In Section 4, we discuss the relevant e-Participation conceptualisation based on the Integrated Model for e-Participation. In Section 5, we present and elaborate on the model designed. In Section 6, we briefly validate the model. We discuss the results in Section 7 and present final conclusions in Section 8.

2. Related work

In this section, we examine in more detail the related works on existing e-Participation models to determine the research gaps to be tackled by our model. We focus on most prominent and elaborated models to ensure that selected models are largely representative of

[1] http://www.huwy.eu/vi.
[2] http://www.wave-project.eu/.
[3] http://www.give-your-voice.eu/.
[4] http://www.ocopomo.eu/.
[5] http://www.padgets.eu/.
[6] http://www.positivespaces.eu/.
[7] http://www.nomad-project.eu/.
[8] http://join.puzzledbypolicy.eu/.
[9] http://www.w3.org/RDF/.

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