E-participation and Enterprise Architecture Frameworks: An Analysis

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Abstract

The success of innovative e-participation solutions depends heavily on the organizational planning and the incorporation of such initiatives into the different stages of the policy life-cycle. E-participation often demands to introduce new participation facilities into the traditional processes of policy formulation and decision making. Accommodating the various requirements from distinct perspectives calls for a holistic engineering approach for e-participation systems analysis and design. Enterprise Architectures (EA) have evolved in information systems research as an approach to give guidance in developing complex socio-technical systems. This paper analyzes the application of EA frameworks in the context of e-participation. E-participation domain and implementation models are investigated to identify crucial tasks and aspects in e-participation project development and implementation. Related to the tasks identified, two EA frameworks are analyzed: the Zachman Framework and TOGAF. We explain how EA frameworks can support the development and implementation of e-participation projects. Finally, the needs for a reference framework for e-participation are argued and a reference framework is presented.

Keywords: E-participation, Enterprise Architecture Frameworks, Reference Framework
1 Introduction

The evolution and wide take-up of technologies, which are grouped under buzzwords such as 'web 2.0' and 'participatory web', promised new possibilities for political participation via electronic means [17]. Nevertheless the emergence of civic participation does in many countries still not reach the expectations affiliated with the hype of e-participation. Possibilities of using ICT in political participation have not yet been sufficiently exploited [15, 3]. Key in this context is to consider Information and Communication Technology (ICT) as an enabler and facilitator. However, technology per se does not impact political decision making and active citizen participation in political processes. Therefore, successful e-participation endeavors require to carefully plan such projects in terms of integration into traditional citizen participation processes (see e.g. [1]), engagement of political actors and citizens, selection of tools, maintenance and update of relevant information, and marketing the endeavor. These organizational and procedural challenges of innovative e-participation solutions demand for:

- The application of a holistic and systematic design approach, which addresses the various challenges in a comprehensive way.
- The adaptation of given participation processes to enable online citizen participation. In some cases, even the introduction of new participation facilities into traditional political processes may be required.
- Proper integration of participation processes into the overall policy making life-cycle to ensure the take-up of outcomes and that outcomes from one policy stage are handed over to the next stage [16, p. 18].
- The integration of e-participation outcomes with the procedures of the offline participation processes and vice versa, as participation activities may occur online and offline [16, p. 10].

In order to meet these challenges, a holistic engineering approach for e-participation systems analysis and design is necessary. On these grounds, the paper at hand analyzes the application of Enterprise Architecture (EA) frameworks in the context of e-participation in order to give guidance in complex socio-technical systems development. In [14, p. 3], an enterprise architecture is defined as “a coherent whole of principles, methods and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure”. Usually, different levels or views of abstraction (e.g. strategy, organization, system) are set in an EA framework, which differ in terms of their proximity to technology [9]. EA frameworks are used in e-business and e-government to provide a holistic approach to coordinate and manage the diversity of tasks in complex system developments (see e.g. [11]). Thereby, EA frameworks guide along three dimensions: (i) phases of systems development (such as TOGAF - The Open Group Architecture Framework), (ii) levels of abstraction in systems design combined with
dedicated stakeholder (or owner) views (Zachman Framework), and (iii) distinct viewpoints on concepts such as data, functions, people, motivation, etc. (Zachman Framework). As EA frameworks recognize different aspects of an enterprise (the Open Group defines an ‘enterprise’ “as any collection of organizations that has a common set of goals” [23, p. 5], which also applies to e-participation projects), they can be supportive to engineer e-participation systems in line with the expectations and objectives of an e-participation project.

The added value of EA frameworks in e-participation lies in the provision of an environment, which helps to optimize e-participation developments to tackle the challenges as raised before. EA frameworks are no guarantee for successful e-participation projects. However, they can serve as a means to support the sustainable implementation of e-participation projects and the integration of e-participation in organizational settings. Even though EAs have a focus on technical aspects, they are scoping organizational issues as well [11], and are therefore useful in e-participation systems design. Based on these propositions, the paper at hand investigates to what extent EA frameworks can support successful implementation of e-participation endeavors, and what needs to be adapted or revised to streamline EA frameworks towards e-participation project implementations to increase their success rate.

The remainder of the paper is as follows: Section 2 presents the research design of the paper. Section 3 analyzes procedural aspects of EA frameworks in e-participation contexts. In section 4, dimensions and viewpoints of EA frameworks for e-participation are examined. Section 5 reflects the application of EA frameworks in the context of e-participation. From the insights gathered along the investigation of EA frameworks for e-participation, section 6 sums up the needs for, and the design of a reference model for e-participation projects. We conclude with a brief summary and outlook on further work.

2 Research design

To analyze EA frameworks in e-participation contexts, the analysis is structured along two aspects the foundational structure of an architectural framework should accommodate [23]: (i) a method for designing a target state of an environment through a set of building blocks and (ii) a common vocabulary to ensure common understanding among the actors. In this regard, first step in the research was to examine the procedural aspects of EA frameworks against the needs for holistic e-participation systems analysis and design. For this purpose, EA frameworks have been identified and a scan of EA frameworks was performed based on literature review. In a parallel effort, procedural aspects of e-participation projects have been identified and examined. Finally, dimensions and viewpoints of EA frameworks relevant for e-participation were assessed, which resulted in the proposal of a reference framework as put forward in section 6. The research design consists of four steps:
(1) **Selection and Investigation of EA Frameworks.** Since 1984, more than twenty EA frameworks have been developed and published [21], which are provided by different parties and serve different purposes. To investigate the appropriateness of EA frameworks in the e-participation domain, a first screening has been performed based on literature review. After initial investigation, the selection has been reduced to the following two EA frameworks:

Zachman Framework [24] is the first EA concept published in 1987 by John Zachman. It describes a collection of perspectives pertinent to systems development and enterprise engineering in order to relate computer systems to the business world. The Zachman Framework provides a conceptual framework for the classification of viewpoints to be considered in streamlining organizations (enterprises) thereby using also (but not only) ICT. The Zachman Framework introduces two dimensions of an EA: The vertical axis of the framework represents the views of different types of stakeholders in systems development (including planner, owner, designer, builder, programmer and user) and the horizontal axis represents different perspectives (viewpoints) of a system environment.

The Zachman Framework supports structuring of a domain in order to ensure that the relevant aspects of a system are considered. It was a reference point for many emerging EA frameworks published later on [21], which focus on structuring viewpoints. As it is still a key reference framework in EA developments, we choose the Zachman Framework as representative of this genre for analysis.


TOGAF provides a holistic view on an enterprise architecture development with a strong procedural method (ADM). It represents an internationally known approach, commonly agreed by many industry players and it nicely complements the Zachman Framework. As TOGAF presents one of the few but comprehensive procedural architecture frameworks, it has been selected as second EA framework for the study.

Further frameworks have not been included in a detailed study, because many of them base on either the Zachman Framework or are similar to TOGAF. Both selected frameworks are common standard and, together, represent the crucial aspects to accommodate in the foundational structure of an architectural framework [23]. The investigation of the frameworks was based on comparison of the main viewpoints, foundational structures and procedural models of the frameworks. It was driven by the insights from the investigation of procedural aspects of e-participation projects, which was performed in parallel.
Examining Procedural Aspects of E-participation projects. Existing procedural models for e-participation have been analyzed (see Section 3). The work based on literature review of existing procedural models for e-participation. The investigated models differ in their objectives and focus, and they consider different aspects of an e-participation project. Put together, they provide a comprehensive view on the implementation of e-participation projects, which forms the basis of a common vocabulary and of common viewpoints of e-participation. A key lesson from the comparison of these models was that procedural aspects are barely addressed to a large extent in existing models. We derived an urgent need for concepts putting forward structured systems analysis and design for e-participation. EA frameworks provide procedural guidelines to overcome the gap identified.

Examining Dimensions and Viewpoints of EA Frameworks for E-participation. In a third step, dimensions and viewpoints of EA frameworks that are relevant for e-participation were identified. First, two domain models for e-participation were analyzed: Domain Model for E-participation [12] and Framework of ICT Exploitation for E-participation Initiatives [20]. They have been selected because they provide an extensive overview on the e-participation domain. Further, the rows of the Zachman Framework and the TOGAF Core Meta Model were analyzed to see how the domain models can be enriched with concepts from EA frameworks.

Development of a Reference Framework for E-participation Projects. Based on the reflection of EA frameworks in e-participation projects, a reference framework for e-participation projects is developed in section 6. Thereby, the term reference framework is used in relation to the three characteristics of reference models described in [6, p. 4]: best practices, universal applicability and reusability.

3 Examining Procedural Aspects of EA Frameworks for E-participation

Based on desk research five procedural models for e-participation projects have been selected for investigation:

(a) A three-step procedure for e-participation initiative implementation [20]: The concept provides guidance about how to select a participation technique and the appropriate electronic support.

(b) Implementation model for sustainable e-participation [10]: This model provides a theoretical overview on steps which are necessary to implement an e-participation project.

(c) Guideline for online consultation [13]: The contribution provides practical recommendations for the involvement of citizens in online consultations.
(d) Standards for public participation [2]: This document provides practical recommendations for online and offline participation.

(e) Guideline for local e-participation projects [18]: The guideline gives practical recommendations and guidance on the implementation of local e-participation projects considering the back office decision making procedures.

From the investigation of the procedural models for e-participation, five main phases of an e-participation project life-cycle have been identified (see Figure 1).

Phase I: initiation of the project including decision on the implementation of an e-participation project, and formulation of objectives.

Phase II: design of the project including design of participation processes and selection of technical tools.

Phase III: implementation and preparation of the project including implementation of technical components, preparation of documents, and marketing strategy.

Phase IV: participation phase including monitoring of political decision making.

Phase V: evaluation of the project against its objectives and evaluation regarding expectations and impact achieved.

The insights gathered from studying these models further result in the identification of a number of task categories relevant for e-participation projects:

Project Management: managing the implementation of all tasks during the whole project life-cycle.

Expectation Management: analyzing and communicating to all participants beforehand what — if at all — political impact their participation can realistically generate; monitoring of decisions made based on participation results.

Requirements Management: collecting project requirements regarding processes, tools, impact etc.

Participation Process Management: planning and implementing participation activities so that they fit into the political processes; ensuring traceability of participation results.

Systems Design and Implementation: implementing the electronic facilities supporting the e-participation project.

Stakeholder Engagement and Marketing: defining actors and their roles, engaging relevant stakeholders into the project; promoting the project.
Editorial Management: preparing information about the topic, the participation process as well as participation results and moderation activities.

Evaluation: evaluating the project against its objectives and expectations.

Our proposition for further investigation is that to some extent the phases and tasks identified before are embodied in enterprise architecture frameworks. Hence, next investigation focuses on how EA frameworks can be supportive to the implementation of above phases and tasks in e-participation projects. As mentioned in section 2, the analysis focuses on the Zachman Framework and TOGAF.

3.1 Zachman Framework

In order to analyze procedural aspects, the horizontal axis (columns) of the Zachman Framework— representing different perspectives of the architecture — is consulted. Within a column, the model artifacts reflect a particular viewpoint at a given abstraction level depending on who is the target user of the model (rows of the Zachman Framework). In the two-dimensional matrix of the Zachman Framework, within single rows, the models are consistent with one another. The Zachman Framework does not provide a procedural method; Instead, Inmon and Zachman describe the Zachman Framework as a “classification scheme for the deliverables from a methodology” [9, p. 91]. Nonetheless, the consistent implementation of the perspectives delivers important model artifacts for e-participation project implementation and the stakeholders involved.

In the context of designing and implementing an e-participation system, the perspectives of the Zachman Framework can be described as follows (derived from [9]):

Planer’s Perspective (Scope): The planner is concerned with positioning the e-participation project in the context of their political environment, including specifying their scope and positioning the e-participation endeavor in the overall policy life-cycle. This perspective can be supportive in Phase I of an e-participation project. Relevant task categories are Project Management, Expectation Management and Participation Process Management.

Owner’s Perspective (Business Model): The owner is interested in the participation output, how it is achieved and how it will be used, i.e. how impact can be achieved. In addition, the owner is interested in how the additional effort necessary for an e-participation project can be organized. This perspective is related to the initiation of an e-participation project (Phase I) and design of participation (Phase II). In e-participation, the owner can e.g. be the city council for a participatory budget project. Relevant task categories are the same as for the Planer’s Perspective.

Designer’s Perspective (System Model): The designer works with the specifications for the e-participation project to ensure that it will, in fact, fulfill
the owner’s expectations. In this perspective, the electronic support of the participation activities is designed. In e-participation this role might e.g. be fulfilled by a consultancy together with administrations. The perspective supports Phase II and Phase III (implementation and preparation of supporting tools). Relevant task category is *Systems Design and Implementation*.

**Builder’s Perspective (Technical Model):** The builder manages the process of assembling and fabricating the components of the e-participation system. The perspective supports Phase III (implementation and preparation of supporting tools). Relevant task category is *Systems Design and Implementation*.

**Programmer’s Perspective (Detailed Representations):** The programmer codes out-of-context (and hence reusable) components which meet the builder’s specifications. The perspective supports Phase III (implementation and preparation of supporting tools). Relevant task category is *Systems Design and Implementation*.

Figure 2 visualizes the Zachman Framework in the gray-shaded matrix with its views (columns) and perspectives (rows). The white rectangles map the views of the Zachman Framework to the e-participation project implementation phases. Only the first three phases of e-participation project development are covered by the Zachman Framework. Different to other EA frameworks, the Zachman Framework does not aim to provide methodological guidelines in particular for system developers [7]. Persons who are not familiar with information systems are also a target group of the Zachman Framework (ibid.). The individual reader is enabled to view the own position in the wider context. This enables a better communication between the persons involved in the implementation of an e-participation project.

### 3.2 TOGAF

TOGAF sees ADM as a generic procedural method for architecture development, which is designed to deal with complex system and organizational environments [23]. ADM needs to be modified or extended in order to suit specific needs in a complex systems environments [23]. To do this, an evaluation of TOGAF ADM components may be necessary in regards to their applicability to the specific context. This activity may produce an “enterprise-specific” ADM [23]. Subsequently, we exemplify the application of the ADM phases in the context of e-participation systems analysis and design:

- In the Preliminary Phase, the expectations and objectives of the e-participation project are defined.
- The goal of phase A Architecture Vision is to develop a vision for the architecture that enables the (e-)participation goals, responds to the po-
itical and strategic drivers, conforms with the good governance principles, and addresses the stakeholder concerns and objectives.

- In phases B-D, the baseline (Is state) and the target (To-be state) architectures are described. Thereby, the knowledge about the Business Architecture from phase B is a prerequisite to elaborate the Information Systems Architecture (phase C) and Technology Architecture (phase D). For the Is state in e-participation projects, different possibilities exist: (1) so far no participation possibilities exist, (2) offline participation possibilities exist, or (3) electronic participation possibilities have already been designed and need improvements. Depending on this Is state, the difference between the Is state and the To-be state is either big or small.

- In case an existing e-participation solution is to be replaced or the e-participation solution is to be integrated into an existing landscape, migration to the new solution is dealt within the phase F Migration Planning.

- Phase G Implementation Governance needs to be taken care of in e-participation endeavors in order to ensure smooth running of the system implemented.

- Phase H Architecture Change Management is related to e-participation evaluation considerations: the requirements and external effects are collected.

- All phases of the ADM are accompanied by a continuous requirements management, which is often neglected in current e-participation projects.

Figure 3 visualizes how phases identified for e-participation projects can be mapped with phases in ADM. The phases of the ADM cycle are divided into further steps. For detailed descriptions of the phases and steps, the reader is referred to [23]. TOGAF provides an extensive engineering approach with a high focus on monitoring the overall process.

Next section builds on the findings from the analysis of EA frameworks and examines the dimensions and viewpoints of EA frameworks for e-participation projects.

4 Examining Dimensions and Viewpoints of EA Frameworks for E-participation

To base an e-participation domain model on well-defined and proven concepts, those dimensions and viewpoints of EA frameworks that are relevant for e-participation have to be identified. Therefore, domain models for e-participation are analyzed next. Then the levels of abstraction of the Zachman Framework and the TOGAF Core Meta Model are analyzed to assess how the domain models can be enriched with concepts from EA frameworks.
Kalampokis et al. present a Domain Model for E-participation [12]. It is based on an e-participation framework by almost the same authors, which consists of four layers: democratic processes, participation areas, participatory techniques, categories of tools and ICT technologies [22]. The domain model for e-participation aims to represent the most important aspects of e-participation and their interrelations. The authors divide the domain into three sub-domains: stakeholders, participation processes, and information and communication tools. These areas are further detailed in separate models and finally brought together to visualize the key interrelations among aspects of the three areas. Kalampokis et al.’s model demonstrates the complexity of the domain.

Phang and Kankanhalli present a Framework of ICT Exploitation for E-participation Initiatives. They examine the suitability of various information and communication tools for the achievement of e-participation objectives [20]. Their work is based on Glass, who analyzed offline participation techniques regarding the achievement of different objectives of citizen participation programs [8]. Phang and Kankanhalli transmit his results to ICT in order to technically support the participation techniques of Glass. A similar study was performed in the DEMO-net\(^1\) project, where different categories of online tools (e.g. forums, games, and wikis) were investigated to detail their characteristics and to analyze their suitability for e-participation\(^2\).

In the subsections below, we analyze along the EA frameworks selected, if above models consider all aspects put forward in the Zachman Framework and TOGAF. We also investigate, which further aspects need to be considered.

### 4.1 Zachman Framework

The Zachman Framework helps to structure a domain in order to ensure that the relevant aspects of a system are considered. Therefore, the columns of the matrix represent different areas of interest, i.e. the viewpoints to be considered in each perspective. Applied to e-participation, the areas can be described as follows (based on descriptions of Zachman Framework in [24, 9]):

**Data (What):** Addresses understanding of, and dealing with data in the e-participation system. Such data may concern particular topics to be discussed in the e-participation endeavor, the political environment, the legislative procedures, participation procedures, estimated impact etc. The data dimension is not represented in the approaches discussed at the beginning of section 4.

**Function (How):** Describes the process of translating the mission of the e-participation project successively into more detailed definitions of its operations. The legislative procedures are analyzed, possible points for partici-

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\(^1\)DEMO-net: Network of Excellence for E-participation, \url{http://www.demo-net.org/}.

Participation are identified and participation processes are planned. This view is considered as “Participation Process Sub-domain” in the Domain Model for E-participation and as “Participation Initiatives” in the Framework of ICT Exploitation for E-participation Initiatives.

Network (Where): Is concerned with the geographical distribution of the legislative and political processes, participation activities and involved actors and institutions. The network dimension is not represented in the approaches introduced at the beginning of section 4.

People (Who): Identifies and describes the stakeholders involved in the e-participation project, i.e. active or inactive actors. This view is detailed in the “Stakeholder Sub-domain” in the Domain Model for E-participation.

Time (When): Time is an important factor for active involvement of stakeholders in political processes. This aspect of the Zachman Framework requires careful planning of when certain tasks are to be performed, and what dependencies exist (e.g., a consultation should be made at a point where impact on a decision to be made is still possible). The time dimension is considered in both approaches introduced above by referring to the stages of the policy life-cycle.

Motivation (Why): Targets the translation of e-participation goals and strategies into specific ends and means. This can be expanded to include the entire set of constraints that apply to the effort. Principles of participation are defined, too. In an e-participation project, all other activities should start from this point. In the Framework of ICT Exploitation for E-participation Initiatives, this dimension is related to the identification of e-participation objectives. The Domain Model for E-participation describes the motivation with the “Scope”.

Zachman states that each of the six viewpoints is necessary to define a perspective of the product — and all viewpoints have the same importance [9]. Tasks identified in e-participation projects are to be considered in different dimensions and different viewpoints of the Zachman Framework. No particular order is recommended by Zachman to go through the viewpoints of the Zachman Framework. An extension of e-participation domain model to consider all viewpoints proposed by Zachman should help to consider the relevant aspects for an e-participation project. In addition, the Zachman Framework can provide a means to manage a library with good practices by supporting the identification of common entities.

4.2 TOGAF

TOGAF describes a Content Metamodel that “defines a formal structure for [...] terms to ensure consistency within the ADM and also to provide guidance for organizations that wish to provide guidance for organizations that wish to implement their architecture within an architecture tool” [23, p. 367]. The core
content metamodel provides “a basic model with the minimum feature set and then support the inclusion of optional extensions” [23, p. 368]. In e-participation contexts, the TOGAF core content metamodel can be extended with entities relevant for e-participation. Figure 4 visualizes entities of the TOGAF core content metamodel (light-colored) with specializations for e-participation (dark-colored) in an UML (Unified Modeling Language) diagram. This supports the stakeholders in an e-participation project in the definition of a common vocabulary and in structuring the domain.

5 Reflecting EA Frameworks in E-participation Projects

The analyzed EA frameworks structure the development of an EA in phases, which build on each other. Thereby, when following the approaches, the results of one phase usually delimit the next phase [4]. EA frameworks consider strategic, organizational, application and information technology related aspects of an enterprise [4]. The analysis shows that these characteristics of EAs support the procedures and objectives of e-participation projects and thereby are meeting the challenges mentioned in the introduction. Starting with the strategic decisions, subsequent decisions in the e-participation project such as e.g. the selection of ICT are based on considerations before.

The analysis shows that EA frameworks can guide the implementation of e-participation projects. In particular, they support tasks related to expectation and requirements management, participation process management, e-participation systems analysis and design, and to evaluation. Specific tasks as e.g. related to stakeholder engagement, marketing and editorial management are not considered in the EA frameworks because of their generality. A procedural approach as proposed in TOGAF, which combines aforementioned dimensions of the Zachman Framework, can support e-participation project implementation. Such an EA framework needs, however, to be extended with tasks as just mentioned.

In order to address relevant aspects in Phase I: Initiation and Phase II: Design, the use of the perspectives of the Zachman Framework is recommended. Thereby the planner’s perspective is appropriate to analyze the constraints and objectives of an e-participation project. We recommend to start the analysis of the viewpoint starting with the motivation (“why”) and formulate it based on the vision of the e-participation project. The other viewpoints, i.e. time (“when”), network (“where”), people (“who”), function (“how”) and data (“what”), are influenced by the motivation. Starting an e-participation project as described in Zachman Framework with lists describing the relevant entities is an intuitive task. The Zachman Framework does not recommend a particular procedure in the different perspectives.

In the tasks related to management of participation processes, the focus lays on the function (“how”) analyzed from owner’s perspective of the Zachman
Framework. In order to fit the participation processes to the legislative and/or political processes and thereof to have the best possible impact of participation, a detailed analysis of political and legislative processes is to be conducted. Thereby possible points of participation can be figured out. The analysis can be supported with process models. Based on the participation area, models of reference participation processes can be reviewed and analyzed. Suitable processes can then be adapted to the particular case of the e-participation project. Modeling the To-be participation processes can help to explain and jointly agree upon the processes within the project team.

With its ADM, TOGAF provides an extensive engineering approach with a high focus on monitoring the overall process. ADM is seen as an appropriate approach to support project implementation in exploiting possibilities of using ICT for political participation through all phases of an e-participation project. Requirements management in ADM supports the evaluation of e-participation projects as recommended in [19].

The use of EA frameworks in order to establish e-participation in an organization might be immoderate because of the big complexity. Best practices in the form of reference models can be a solution to support e-participation projects. TOGAF recommends the introduction of repositories containing reference models and artifacts. Until now, no comprehensive libraries of this kind exist for e-participation. The resulting need for a reference framework for e-participation to structure the access to reference models is argued in the next section, together with the introduction of the reference framework.

6 Reference Framework for E-participation

To support e-participation projects development and implementation with customized good practice examples, a sophisticated and holistic engineering approach for e-participation may be defined as a reference framework. The main purpose of a reference framework for e-participation is to facilitate the understanding of what is required to implement an e-participation project. It shall provide a lightweight approach by offering solutions for different kinds of e-participation projects and various types of organizations, which build up e-participation projects. The reference framework for e-participation aims to support different target groups to communicate with other project actors, e.g. politicians, system developers, moderators — i.e. persons with different technical and political background and having a different perspective on an e-participation project. The reference framework consists of different concepts supporting each other (see Figure 5):

**Reference procedural model** provides guidance to manage steps and tasks, which are necessary for implementing an e-participation project. It consists of the five main phases of an e-participation project as identified in Section 2. The phases are tightly following TOGAF ADM, whereby it is necessary to reduce complexity by providing guidance in the form of
reference models and building blocks for the domain e-participation (see Library). In each phase, e-participation project implementation steps are detailed using the following scheme: (a) description of the step, (b) relevant literature, (c) activities, and (d) results.

**Viewpoints** build the scope of an e-participation project. They are based upon the viewpoints introduced in the Zachman Framework [24]: Motivation (why), time (when), people (who), data (what), network (where), and function (how). The viewpoints control the access to the other parts of the reference framework during the implementation of a particular e-participation project.

**Library with requirements, reference models and building blocks** for e-participation supports an e-participation project with recommended practices for e-participation processes and tools.

**Domain meta model** defines a formal structure of terms used in the reference framework to ensure consistency and provide guidance for users of the reference framework (see Figure 4). A requirements library contains requirements, assumptions, constraints and gaps relevant to implement an e-participation project. Reference participation process models serve as a guidance how to implement the participation activities based on a particular objective or goal and they support the reference procedural model for e-participation. Suitable process models are selected from the library based on the selected viewpoints of the reference framework for the particular e-participation project.

The big arrows in Figure 5 indicate that from one part of the reference framework the results of another part of the reference framework are accessed.

### 7 Conclusions

The paper analyzes EA frameworks in the context of e-participation. After identifying the main implementation phases and activities of e-participation projects, EA frameworks are analyzed and similarities between building an EA and implementing an e-participation system are identified. Based on this, we analyze how well EA frameworks can guide e-participation projects and where the limitations are.

The investigation of procedural models for e-participation unveils that there is no solution that takes into account all relevant tasks for an e-participation project. The integration of different tasks and existing technical systems is under-represented in particular. EA frameworks may be a solution to overcome these challenges of e-participation projects. But the complexity of EA frameworks hinders their application in e-participation contexts. A sophisticated and holistic engineering approach is needed in form of a reference framework for e-participation. The development of a reference framework for e-participation
is argued as a means to support the organizational planning of e-participation projects and the incorporation of such initiatives into the daily routines of the different stages in the policy life-cycle. This does not automatically enhance citizen participation in e-participation projects, but can make an important step towards the flawless implementation of e-participation projects. A first version of such a reference framework has been introduced in this contribution.

Software projects — also in e-participation — often have to cope with constantly changing demands of stakeholders. Classical project management tries to react to these demands with complicated change management processes and a high-priority and time-consuming phase of requirements analysis [5]. Agile processes promise to integrate rapidly changing requirements and prioritizing them better in the process (ibid.). The reference framework facilitates more agile response to emerging change requests. It provides a stable framework within which to evolve the e-participation system. Particular agile project management is to be further investigated for enriching the reference framework.

The reference framework has emerged as a result of study and of lessons from involvement in different e-participation design projects. In a next step, we plan to apply the framework in different contexts for developing and implementing e-participation endeavors. Artifacts for the library are already being collected (e.g. process models for particular participation and e-participation procedures). Already with the experiences from the projects, the added value of EA frameworks in e-participation could be recognized. With the experiences in trial projects, evidence for the added value will be collected.

References


### Phases and Steps of Guidelines for E-Participation

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
<th>Phase V</th>
</tr>
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<tbody>
<tr>
<td>(a) 3-step procedure for e-participation initiatives</td>
<td>Identification of the objective</td>
<td>Choosing best participation techniques</td>
<td>Choosing electronic tools</td>
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<td>(b) Implementation model for sustainable e-participation</td>
<td>Policy and capacity building</td>
<td>Planning and goal setting</td>
<td>Programs and content development</td>
<td>Process and Tools</td>
</tr>
<tr>
<td>(c) Guideline for online consultation</td>
<td>Identification of the objectives and conditions</td>
<td>Design of the procedure</td>
<td>Consultation</td>
<td>Evaluation and conclusion</td>
</tr>
<tr>
<td>(d) Standards for public participation</td>
<td>Decision about public participation</td>
<td>Preparation</td>
<td>Participation</td>
<td>Monitoring and evaluation</td>
</tr>
<tr>
<td>(e) Guideline for local e-participation projects</td>
<td>Project</td>
<td>Review by e-participation advisory board and council</td>
<td>Participation</td>
<td>Evaluation and accountability</td>
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**Fig. 1:** Scoping the phases and steps of the procedural models into the main e-participation project phases identified.

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**Table:**

<table>
<thead>
<tr>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Phase IV</th>
<th>Phase V</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) 3-step procedure for e-participation initiatives</td>
<td>Identification of the objective</td>
<td>Choosing best participation techniques</td>
<td>Choosing electronic tools</td>
<td></td>
</tr>
<tr>
<td>(b) Implementation model for sustainable e-participation</td>
<td>Policy and capacity building</td>
<td>Planning and goal setting</td>
<td>Programs and content development</td>
<td>Process and Tools</td>
</tr>
<tr>
<td>(c) Guideline for online consultation</td>
<td>Identification of the objectives and conditions</td>
<td>Design of the procedure</td>
<td>Consultation</td>
<td>Evaluation and conclusion</td>
</tr>
<tr>
<td>(d) Standards for public participation</td>
<td>Decision about public participation</td>
<td>Preparation</td>
<td>Participation</td>
<td>Monitoring and evaluation</td>
</tr>
<tr>
<td>(e) Guideline for local e-participation projects</td>
<td>Project</td>
<td>Review by e-participation advisory board and council</td>
<td>Participation</td>
<td>Evaluation and accountability</td>
</tr>
</tbody>
</table>

**Figure 1:** Scoping the phases and steps of the procedural models into the main e-participation project phases identified.
Fig. 2: Perspectives and dimensions of the Zachman Framework (derived from [9]) mapped with the phases identified in e-participation projects
Fig. 3: TOGAF ADM [23] mapped with the phases identified for an e-participation project
Fig. 4: Entities of TOGAF Core Content Metamodel (derived from [23]) with specializations for e-participation
Fig. 5: Reference framework for e-participation
**Figure Captions**

Fig. 1 Scoping the phases and steps of the procedural models into the main e-participation project phases identified

Fig. 2 Perspectives and viewpoints of the Zachman Framework (derived from [9]) mapped with the phases identified in e-participation projects

Fig. 3 TOGAF ADM [23] mapped with the phases identified for an e-participation project

Fig. 4 Entities of TOGAF Core Content Metamodel (derived from [23]) with specializations for e-participation

Fig. 5 Reference framework for e-participation