

Interoperability Requirements, Recommendations and Standards in E-Participation

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ABSTRACT

E-participation is understood as the use of modern Information and Communication Technologies (ICT) in order to involve all parts of society in political decision-making. The field of e-participation is highly fragmented, mainly due to the large number of different participation areas, stakeholders, levels of engagement, and stages in policy-making involved. A key challenge for overcoming the complexity and current fragmentation of the field is to achieve interoperability between different e-participation systems, i.e. assembling e-participation toolsets dynamically according to respective participation processes and needs, and making use of content from different applications and tools. Unfortunately, e-participation toolboxes that ensure interoperability and make use of standards in order to exchange data with other systems are rare. Interoperation between e-participation systems needs to be investigated first, before it can be ultimately achieved. The chapter addresses these interoperability challenges by a) contributing to a better understanding of interoperability in regard to e-participation systems, b) studying the interoperability needs of e-participation, and c) deriving a set of requirements and guidelines in order to guarantee interoperability among e-participation tools and processes. We present a methodological framework to differentiate interoperability requirements in e-participation solutions in terms of political context, organizational, legal, semantic and technical interoperability.

KEYWORDS

E-Participation, Interoperability, Requirements, Recommendations, Standards, Framework

INTRODUCTION

It is generally acknowledged that the importance of citizen participation is closely linked with the ability to redistribute political power (cf. Arnstein, 1969), regardless of the political system. For

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several years now, the term e-participation is gaining momentum by bridging the dimension of innovative Information and Communication Technologies (ICT) with political participation in order to engage citizens, politicians and other stakeholders in democratic participatory decision-making (Macintosh, 2006).

In research, e-participation is understood as a multidisciplinary field (cf. Macintosh and Coleman, 2006, Macintosh et al., 2009, Wimmer et al., 2007). A large number of diverse participation areas, involved stakeholders, levels of engagement, and stages in policy making characterise the area (Wimmer, 2007). These characteristics are inherent to the e-participation research and practice (Thorleifsdottir and Wimmer, 2006) and as a consequence researchers are often confronted with this high fragmentation of the field.

Relevant studies have recently evidenced an increasing activity in the field of e-participation in Europe (Aichholzer and Allhutter, 2009, Panopoulou et al., 2009, Scherer et al., 2008a, Tambouris et al., 2008, Tambouris et al., 2007b). Due to the breadth of the field, a number of distinct e-participation tools have emerged, which support the different e-participation areas (see for example Tambouris et al., 2007b, Thorleifsdottir and Wimmer, 2006, Wimmer, 2007). These are mainly offered as stand-alone tools or applications. Exchange and reuse of content as well as cross-application participation processes have so far not been investigated widely in the e-participation context. Applications and tools barely make use of standards, and hence jeopardize interoperability. The lack of interoperability can also be attributed to the fact that many small local projects produce results that originate from quite different technical backgrounds (Kubicek and Cimander, 2005). However, there are networked tools that could be used for and assist at enhancing direct and representative democracy (Mambrey, 2004). From the previous arguments, we understand that interoperability in e-participation needs to be investigated first, in order to be ultimately achieved.

Smith et al. (2009) distinguish between lower-level goals (e.g. outcomes of tools, which are usually short-term and measurable), mid-level goals (outcomes of participation) and top-level ones (which create societal impact) of e-participation. This differentiation is crucial for understanding and dealing with interoperability, because the complexity of interoperability is increasing along with the level of the goals. Mid-level and top-level goals are difficult to be captured and are difficult to pass on. Therefore, the focus of this chapter will be mainly on lower-level goals.

This chapter is dedicated to address these aforementioned challenges of interoperability in e-participation. In particular, it aims at:

1. developing a methodological framework (see section "Methodological Framework and Approach for Investigations").
2. contributing to a better understanding of interoperability in regard to e-participation systems. The section "Background" elaborates on the definition of e-participation and also investigates the lack of interoperability in e-participation.
3. studying the interoperability requirements of e-participation tools and processes per e-participation area (see section "Interoperability Requirements for E-Participation Areas").
4. deriving a set of recommendations based on the EIF draft version 2.0 layers (European Commission, 2008) in order to guarantee interoperability between e-participation systems (see section "Interoperability Recommendations").

Based on the requirements and recommendations recorded, existing interoperability standards applicable in e-participation contexts are examined. On the basis of the analysis provided in this contribution, future research directions are summarised in the penultimate section. Finally, concluding remarks are given.

METHODOLOGICAL FRAMEWORK AND APPROACH FOR INVESTIGATIONS

The interoperability framework for e-participation (based on IOP frameworks for e-government (European Commission, 2008, Tambouris et al., 2007a, Wimmer et al., 2006)) consists of the following three dimensions, which need to be addressed in order to achieve interoperability in e-participation:

1. Requirements derived for the different e-participation areas, in which e-participation tools can be used.

2. Recommendations to ensure interoperability in e-participation based on the interoperability levels as proposed in the EIF 2.0 draft version (European Commission, 2008) derived from the interoperability requirements.

3. Standards to achieve interoperable e-participation tools and applications.

Figure 1 depicts the framework, which is intended to guide e-participation initiators and system designers to consider the interoperability of their services. The framework specifically helps in defining interfaces for global usage by applying open standard protocols, by developing common data specifications, common process models and by commonly agreeing on policies in order to interact smoothly in service provision across distinct organizational and political settings.

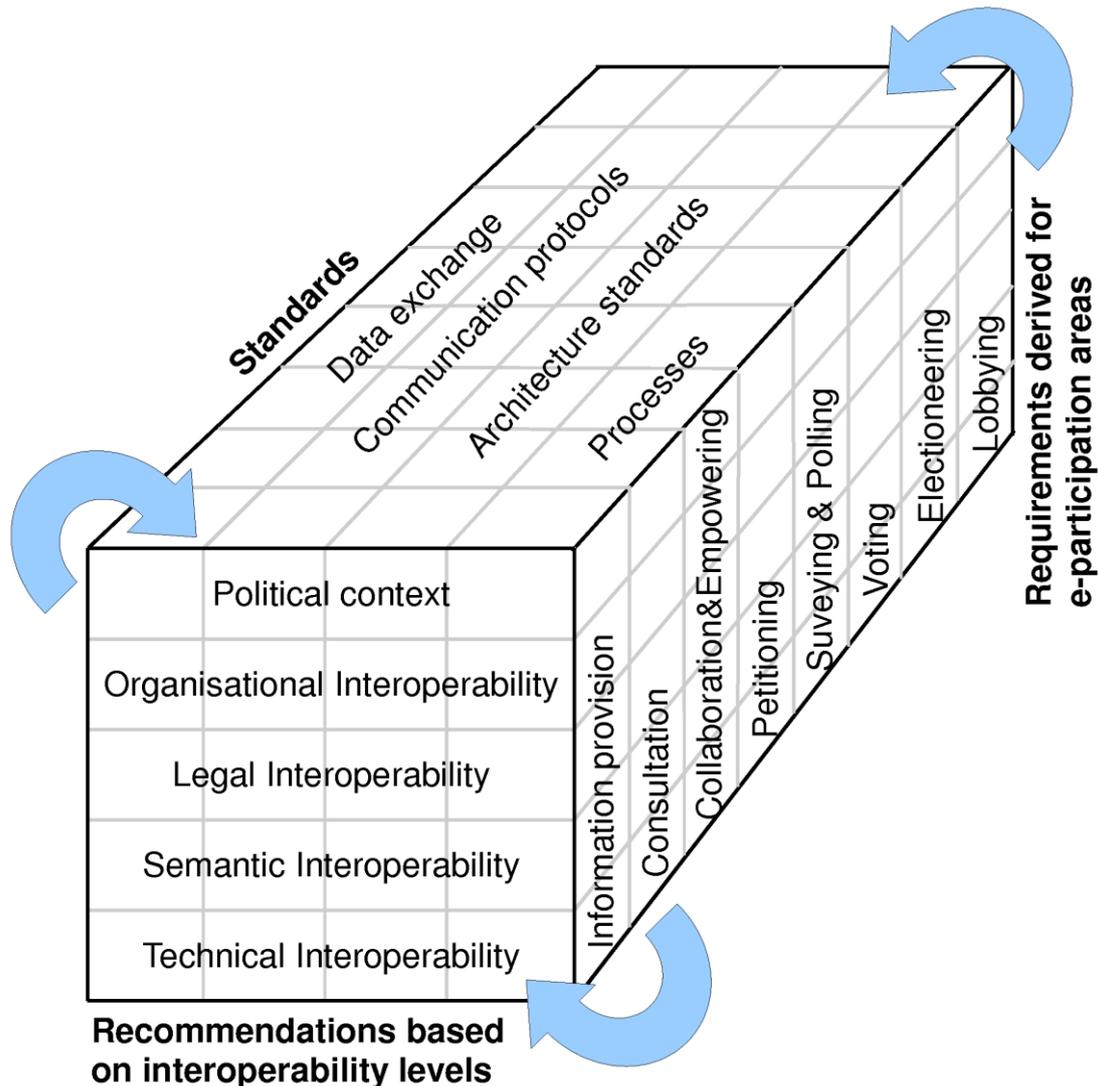


Figure 1: Interoperability framework for e-participation

The arrows visualise that requirements derived for e-participation areas are used to identify the recommendations within the proposed interoperability levels. Both, requirements and recommendations are integrated in the selection of standards for interoperable e-participation services. Applying the framework to generate requirements, recommendations and standards to be used requires a structured way. We herewith present the approach applied in our investigations:

Step 1 - Study into interoperability definitions, types and standards (see section "Background").

Step 2 - Interoperability scenarios: Three interoperable e-participation services have been explored to highlight the central political, organisational, legal, semantic and technical challenges. The first

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scenario describes a simple solution for information services for citizens in e-participation in a one stop EU portal (cf. section "Information Provision"). The second scenario introduces e-petitions at national and European levels (cf. section "E-petitioning"). The last scenario explores participation of citizens and politicians in online discussion forums with the support of other e-participation tools (cf. section "Combined Collaboration").

Step 3 - Interoperability requirements for e-participation areas (see respective section).

Step 4 - Interoperability recommendations: Based on the analysis, recommendations are given to ensure the interoperability of e-participation applications (see respective section).

Step 5 – Interoperability standards: Explore standards which can be used in order to enable communication between different e-participation systems (see section "Interoperability Standards in E-participation").

BACKGROUND

Interoperability for e-participation is investigated based on the definition of interoperability given by the European Commission. This definition focuses on the technological and organisational dimension: *"Interoperability means the ability of information and communication technology (ICT) systems and of the business processes they support to exchange data and to enable the sharing of information and knowledge."* (European Commission, 2004, p. 5)

To elaborate the interoperability aspects of e-participation in this sense, the analytical scheme to characterize e-participation research and application introduced in DEMO-net (Westholm and Wimmer, 2007) has been used. It is based on four dimensions: participation areas, stages in policy making, levels of engagement and stakeholders involved (Westholm and Wimmer, 2007). The first two categories should be investigated in order to identify the interoperability aspects of e-participation. Another framework for scoping e-participation has been proposed by Tambouris et al. (2007a). It presents democratic processes, participation areas, participatory techniques, categories of tools and technologies as the main layers of e-participation (Tambouris et al., 2007a). Both frameworks have been used as the basis for the interoperability framework for e-participation, which has been presented in section "Methodological Framework and Approach for Investigations".

Two aspects play the most important role when investigating interoperability: the policy lifecycle and participation areas. In regard to the policy lifecycle, five stages can be identified: agenda setting, policy formulation/analysis, decision making/creating the policy, policy implementing, and policy evaluation/monitoring (Macintosh, 2004, Westholm and Wimmer, 2007). Passing on the results from one stage to the next one requires interoperability of the content and processes to be handed over. Figure 2 visualises the needs for interoperability among different e-participation areas and processes along two stages in a policy lifecycle (with simplified examples). During one stage of the policy lifecycle different participation processes can be initiated for the different participation areas (e.g. consultation or petitioning). A participation process within a participation area consists of a number of participation activities, which are related to citizen involvement and engagement in the different stages of the broader democratic context. These activities are modelled in Figure 2 with the Business Process Modelling Notation (BPMN)ⁱ. In a participation process, the outcome of each activity should be made accessible to other steps in the process chain and to the appropriate stakeholders, as well as to advance the execution of the next policy stage (Kalampokis et al., 2008). This content interchange is indicated with the dashed arrows in Figure 2.

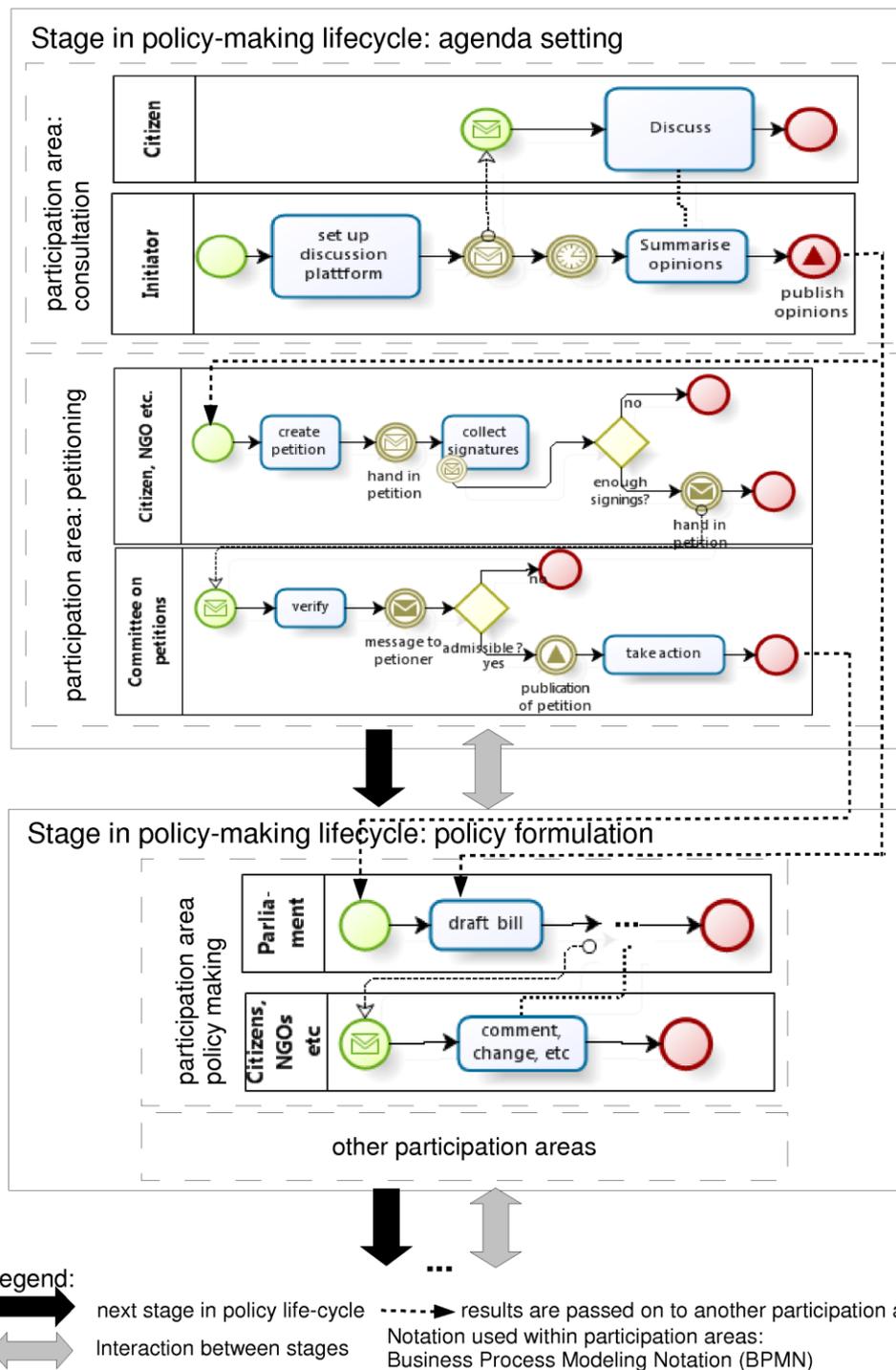


Figure 2. Areas of participation and participation processes in different stages of the policy lifecycle

E-participation areas are specific and distinct sectors of the democratic process, which are defined by the context and the scope of electronic participation. E-participation areas that are investigated in the present chapter are information provision, e-consultation (including policy making, participatory budgeting, spatial planning and other consultation areas), e-petitioning, e-voting, e-surveying and e-polling, community building (including e-electioneering) and e-collaboration & e-empowering (see e.g. Thorleifsdottir and Wimmer, 2006, Westholm and Wimmer, 2007). Each participation area is supported by a number of e-participation tools. Table 1 shows which tool categories are used

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extensively (black cells) or in a supportive way (grey cells) in the different e-participation areas (extending and refining the categorisation presented in Thorleifsdottir and Wimmer (2006)).

Table 1. Different e-participation tools used in e-participation areas ('extensive use' in black, 'supportive use' in grey)

Area \ Tools	Content management systems	Discussion fora	Weblogs	E-petition systems	E-voting systems	E-consultation	E-surveys	E-polls	E-referanda	Online meetings and chats	Serious games	Community systems	GIS and Map based tools	Combined collaboration systems
Information provision	Black		Black								Grey			
E-consultation	Black	Black	Grey			Black	Grey	Grey	Grey	Black			Grey	
E-petitioning		Grey		Black										
E-voting					Black									Grey
E-surveying & E-polling						Grey	Black	Black	Black					
E-lobbying	Black	Grey	Black								Grey			
E-electioneering	Black	Grey	Black			Black	Black	Black	Black			Black		Black
E-collaboration		Black	Grey				Grey	Grey		Black	Grey		Grey	
E-empowering		Black	Grey	Grey					Grey	Black	Grey	Black	Grey	Black

E-participation tools have specific characteristics in respect to their use in democratic processes and/or their technical functions. Since these tools are usually not part of an integrated e-participation platform, a number of limitations and challenges exist, which result in poor e-participation outcomes and which hamper the success of e-participation in general (see e.g. Albrecht et al., 2008, Kubicek and Cimander, 2005, Macintosh, 2004, Scherer et al., 2009a, Thorleifsdottir and Wimmer, 2006):

1. Each e-participation tool is handling data in a heterogeneous manner.
2. E-participation processes have so far not been extensively modelled and standardised. We have identified a lack of reference models for process patterns and process chains describing common processes in e-participation.
3. Participation processes are not properly integrated into the policy lifecycle e.g. the users of a discussion forum often do not know what impact their participation has in the formulation of policies.
4. The lack of interoperability to hand over results from one policy stage to the next one (cf. Figure 2) also hampers the communication of results to citizens in an efficient and transparent way.
5. The vast amount of participation opportunities, which currently generate isolated or fragmented results, is not merged properly to integrated solutions which can produce overall conclusions.
6. In relation to the aforementioned deficiency, current trends of civil society lead to the participation of citizens in a number of social communities and dispersed discussion platforms, where political topics are also deliberated. This presents a new challenge for governments and political bodies which need to a) identify and know about such discussions in order to use them as feedback mechanisms and b) feed the different outcomes of dispersed discussions into policy results which are generated by them.
7. Due to the fact that a participation activity may occur online and offline, it is important that the outcome of e-participation is integrated into the procedures of the offline participation processes and vice versa.

These challenges indicate a lack of awareness and absence of interoperability in current e-participation applications. We therefore investigate interoperability requirements, recommendations and the use of standards to ensure interoperability in future e-participation implementations.

INTEROPERABILITY REQUIREMENTS FOR E-PARTICIPATION AREAS

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Following, the e-participation areas information provision, e-consultation, e-petitioning, e-voting, e-surveying and e-polling, community building, and combined collaboration are examined in order to find interoperability requirements.

Information Provision

A crucial problem of participation and democracy is the disengagement of citizens in political debates. It is often argued that disengagement is a result of disappointment from political decisions and of the lack of transparency in such processes. People want to be informed regarding what politicians are doing and thinking, so information provision presents an immediate added value for e-government and e-participation.

One scenario elaborated in this context is the one stop EU portal. Nowadays, most government organizations (be they from local, regional, national or European level) have already established their web presence (mostly based on a portal), where relevant information and offers for targeted stakeholders such as citizens, businesses, etc. are being provided (e.g. see the website of the Austrian Parliament, which provides all resulting documents from draft legislation processes (www.parlament.gv.at)). But stakeholders often do not know which responsible authority provides the information they are looking for. One way to facilitate information provision is one portal per country which helps the user to easily detect relevant information and can be easily adapted to integrate e-participation tools. Such ideas have already been developed e.g. in the eGOV project (Tambouris and Wimmer, 2004), the Austrian portal (www.help.gv.at) and a German regional portal (www.service-bw.de). This kind of portals would benefit from additional intelligent capabilities compared to simple portals in order to make the information flood manageable.

The central interoperability requirements are the following:

- Syndication of content across different government bodies requires common agreements and policies between them.
- Information provided at the different levels of governments should be structured on common standards and be commonly agreed.
- Providing content syndication facilities requires that the information is stored in the proper formats and is tagged properly, so that machines can retrieve and compute the information for syndication in the users' preferred portals.
- Another important point is the multilingualism of the content and features provided.

E-consultation

E-consultations are implemented with (web) applications, which allow stakeholders to provide information and opinions on an issue, answer specific questions and/or submit open comments. E-consultations are usually put in place by governing bodies or other stakeholders. When the initiator is a governing body, they are mainly used in the analysis stage of the policy life-cycle where representatives raise an issue and then start a discussion with citizens to capture their opinions. The analysis of e-consultation results in the following interoperability requirements:

- Outcome should be forwarded to the appropriate government department. This would allow the elected representatives to take public opinions into consideration before they proceed to the next policy stage and to provide feedback to stakeholders. The decision-makers can argue how the input has been used thus enhancing transparency.
- Outcome and data is fed to other e-participation tools that are used to support the next stages of the policy life-cycle.
- In many cases systems allow input from other e-participation tools to provide background information which will help stakeholders formulate their opinion. This input includes links or even content from other related sites.
- Interoperability creates possibilities for users to take part in discussions of topics from other regions. It is only logical that during discussions, which involve both local residents of a region and residents of other regions, weights in expressions of opinion should differ, i.e. governments and local residents should have a higher weight of opinions than users not directly affected by decisions under discussion. Means for ensuring user rights that are

associated to locality issues will be required to be set in place in order to avoid biases and disturbances that stem from a different geographical context.

E-petitioning

E-petitioning refers to the use of the internet to launch a petition on a topic of general interest along with the facility of sending out invitations to support it (Forcella, 2006). E-petition systems host online petitions and allow citizens to start their own petitions on various issues as well as to sign a petition online. Typically, they contain information about the subject of the petitions, details of signatures (names and addresses), petition status and a summary of the discussion forum (if this facility exists). Systems that are included in this tool category are owned and usually moderated by governing bodies (i.e. local authorities, parliaments) and are used particularly for allowing people to voice problems and complaints and request changes and adaptations which may then be used in agenda setting.

In the European context, the following scenario is conceivable: Citizens often do not distinguish local, regional, national and European issues. They submit petitions pertinent to national law to European Parliamentⁱⁱ and vice versa. Petitions on matters that are outside the jurisdiction of an authority could be forwarded to the responsible public body - always with the explicit consent of the petitioner. This would lead to an exchange of online petitions between different authorities, systems, and countries within the EU. A standardized way of representing data of e-petition systems is required to overcome the technical barriers in the exchange of petitions. Even more difficult to resolve are the organisational and legal barriers that exist.

Based on the aforementioned scenario, the following main interoperability requirements in e-petitioning can be identified:

- There are different legislative frameworks and procedures for petitions on local, regional, national and European level, which need to be analysed thoroughly to provide proper interoperable services. The exchange of petitions requires relevant agreements to be made between the responsible bodies that might handle such requests. Furthermore it has to be assured that petitions are not only forwarded from one authority to another but also acted upon in a transparent way.
- The organisation of e-petitions in existing workflow and document management systems of Parliaments should be simplified using common standards. This also ensures that e-petition data can be retrieved by any e-participation system.
- Complex and interoperable e-petition systems need further information and knowledge management facilities. Otherwise the additional information flood will not be manageable by the responsible authorities and interoperability would remain unattained.ⁱⁱⁱ
- Process automation should be supported for the e-petition process. For example, petitions could stay for a period of time in the status of "collecting signatures" where citizens can sign the petition. After the expiration of that period, petitions are automatically forwarded to the corresponding governmental department. Government officials examine the petition and relevant procedures are commenced. In the course of the overall process, citizens stay informed about the status of the petition.
- In the case that a petition is further acted upon, it is fed to next stages of the policy life cycle (i.e. analysis stage (Macintosh, 2004)). Therefore, data of petitions should be transferred to other e-participation systems that are used to support the stage of analysis (i.e. e-consultation or e-polling systems).
- Finally, as people provide their names and their addresses to sign a petition, data protection and privacy issues need to be properly handled.

E-voting

E-voting systems are used to enable people to elect representatives or to vote on a specific issue with the support of electronic means. Voting initiatives commence by governing bodies and their results are used for taking a decision. Because of their effects on democracy, e-voting systems require a high level of security. The level and type of security of e-voting systems depends on the type/importance of

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the specific voting initiative. The following interoperability requirements can be identified for e-voting in the context of e-participation:

- The outcome of the e-voting activity is transferred to a central repository for the appropriate governmental department to process it. E-voting data include the voting subject and the relevant results. To ease the exchange of voting results between different systems and media a common standard could be developed.
- After the end of electronic votes, related processes could be started automatically in other systems (e.g. presentation of statistics or publication of the voting results).

E-surveying and E-polling

E-polling and e-surveying are based upon web-based instant surveys. Appropriate stages in policy cycle for utilizing e-polls and e-surveys are particularly the analysis and the monitoring of the policy life-cycle from Macintosh (Macintosh, 2004). They can be provided by various stakeholders (government, politicians, political parties, NGOs, CSOs) and can be accessed via different media. The outcome mainly includes the topic of the polling and the relevant results. The following interoperability requirements can be identified in the surveying and polling area:

- Results are forwarded to the appropriate public authority so that elected representatives are able to evaluate them before proceeding into the next stage of the policy cycle.
- The outcome can be imported to other e-participation tools either within or outside the policy cycle, i.e. e-consultation systems, for providing background information.
- Results of previous polls may be archived and accessed at a later date by any user.

Community Building (supporting e-electioneering)

Community building enables groups of people with common interests to work together to influence or ignite change (Soria and Thorleifsdottir, 2007). Community systems usually involve content management systems and discussion forums or wikis and often include quick polls, and use email lists (Soria and Thorleifsdottir, 2007) as well as chats. The purpose of community systems is to discuss issues, to solve problems and influence government and local organisations. In conjunction with other features, community systems also enable lobbying and electioneering. The following interoperability requirements can be identified:

- The outcome should be forwarded to the appropriate public authority. Officials from the public authority may interact with specific communities providing feedback on a specific issue.
- Systems should import data from other e-participation tools to provide background information such as links or content from issue-related sites.
- Legal constraints and privacy issues exist regarding the handling of personal information and should be taken into account^{iv}.
- Meetings and chats should be archived to be available to citizens and politicians at a later time.

Combined Collaboration

Combined collaboration areas are supported by combinations of tools that support a group to complete tasks together. They serve various purposes i.e. involving citizens in budget or in long-range planning, collaborative drafting of policy or legislation etc. Processes and data that are involved in this category depend on the tool that is used each time and the purpose of its use.

Forums and discussion boards provided by governments, NGOs, parties etc. are already common practice. Each forum/discussion board needs its own log-in and can have its own infrastructure although similar discussions can take place. The scenario is to have one portal to join different e-participation discussion forums and boards and other participation possibilities. Such a portal (which could be implemented at a national level) would have enhanced capabilities regarding e-participation through easier finding of relevant and interesting threads, comparison of discussions in different thematic forums and special focus on regional discussions.

Regarding the collaboration of systems, the outcome of a specific e-participation tool can usually be used as input for other e-participation tools e.g. as supporting information for another tool that deals

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with a similar topic, to start discussions, consultations or deliberations or to start any other initiative depending from the integrated tool.

The central interoperability requirements that require further attention are the following:

- Once more, the syndication of content across different government bodies and the private sector requires common agreements and policies between them.
- Measures to ensure that different e-participation tools can communicate with each other are necessary. This should be done in such a way that citizens' experience is uniform without unavailability intervals owing to technological reasons.
- Interoperability creates the basis for tracking user opinions over long periods of time and over different discussion areas. Non-interoperability is a natural way of overcoming barriers created by the need for privacy of data. Advanced emerging technologies might help to overcome such barriers by being both interoperable and private. With the present situation, certain decisions have to be taken to ensure both the interoperability of the system along with the privacy of the user.
- Single-sign-on functionality provides access to all forums and services available. However, a user may have different user roles in different forums. Access rights and user rights management will be very demanding to provide the right balance of access. Interoperability of these data is certainly affected by security and privacy issues.

INTEROPERABILITY RECOMMENDATIONS

In this section, interoperability recommendations are examined in the context of e-participation based on the aforementioned requirements and on considerations about the political context, organisational, legal, semantic and technical interoperability. The recommendations described below extend the recommendations of the EIF (that already provides an elaborate set) as described in European Commission (2004) (cf. recommendations 2 - 17).

Political Context

As in e-government, the political support for interoperability efforts is an absolute necessity (European Commission, 2008) for e-participation, as well. We go beyond the recommendations of EIF 1.0, which focuses on a pan-European dimension initiated by administrations, and extend the focus on the interoperability of e-participation applications initiated by any interested party (see e.g. Thorleifsdottir and Wimmer, 2006, Westholm and Wimmer, 2007): non-governmental organisations (NGOs), governmental officials / executives, elected representatives, political parties, politicians and citizen groups.

The large number of interested stakeholders and their diverse needs result in additional difficulties for the introduction of a systematic approach to the governance of interoperability at EU-level as requested in the draft version for EIF 2.0 (European Commission, 2008). In the document, it is stated that "... a European Interoperability Strategy (EIS) will be established to provide the basis for defining the organisational, financial and operational framework necessary to support cross-border and cross-sector interoperability as well as the exchange of information between European public administrations. This should ultimately enable the more efficient delivery of improved public services (PEGS)." (European Commission, 2008, p. 3) It will not be possible to transfer the EIS over into an e-participation context as it is, because there are also non-governmental organisations (which can additionally be totally independent from any other authorities).

Beyond, the first recommendation of the EIF: "Member State administrations and EU Institutions and Agencies should use the guidance provided by this European framework to introduce a pan-European dimension..." (European Commission, 2004, p. 6) has not been taken over because the following recommendations need still further investigations and discussions before they can be seen as a general guideline.

Organisational Interoperability Recommendations

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Organisational interoperability considers modelling business processes, aligning information architectures with organisational goals and helping processes to co-operate (using services or data from another process).

The recommendations four to six of EIF version 1.0^v are also applicable for e-participation but need to be extended for other stakeholders as described above. It should be also taken into account that the diversity of stakeholders is far greater than that of "simple" e-government service provision.

Integrating E-participation Outcomes

The outcome produced by an e-participation activity needs to be forwarded to governing bodies or other relevant organisations to be processed and to be fed to the next stages of the policy life. Organisations should ensure that they have the capability to integrate e-participation outcomes into their systems.

For example, in the case of European e-petition solutions, petitions need to be forwarded to one or more governmental departments that are responsible for the process of the specific petition (see section "E-petitioning"). To generalise this example, organisations should be ready to alter their "entry" and "exit" points (inputs/outputs) in a way that will make the communication between a variety of e-participation platforms and between different organisations possible. As a significant number of different organizations may be involved, each interoperating partner should adopt a common set of agreements (use of multilateral solutions) regarding data formats, data exchange and communication protocols that will be used for ensuring interoperability among them as proposed by the European Commission (2004).

Alignment with Governmental Processes

Governing bodies need to align their internal procedures so as to process the outcomes of e-participation activities efficiently. For example, in the case of e-consultation systems, data needs to be collated and sorted. Therefore, there is a need for human presence to forward the outcome in a proper way. A group of official representatives should be authorized to receive the outcome, to process it and provide feedback to citizens. Considering e-petition systems, a governing body should organise its procedures in a way that will incorporate the submissions to its normal workflow. Data and process modelling is an essential task that will help organizations to align business processes with e-participation information.

Legal Interoperability Recommendations

To fulfil the organizational requirements, legal barriers need to be overcome. Therefore it is important to synchronize the legislation between the cooperating organizations/governments so that electronic data is in accordance with proper legal weight and recognition wherever it needs to be used in (European Commission, 2008). Interoperable systems, which support e-participation processes, need to be adaptable to different legislative systems (see e.g. e-petitioning for different petition processes).

The following recommendation goes beyond the EIF and affects the legal side: In some circumstances, it should be examined whether laws and regulations need to and could be modified to enable or simplify the exchange of data or the concurrence or combination of processes (e.g. for e-petition systems between countries as described in the e-petitioning scenario) or to actively involve all relevant stakeholders in political processes.

Semantic Interoperability Recommendations

Semantic interoperability refers to giving meaning to the exchanged data in order to be understandable by any other system not designed originally for the purpose of handling these data. The semantic recommendations from the EIF (cf. European Commission, 2004, Rec. 7 - Rec. 9) provide a suitable foundation for interoperable e-participation services. In the following paragraphs some key aspects are highlighted in respect to e-participation.

Exchange of Semantic Data

To ensure the comprehensibility of data within e-participation systems, an agreement on the use of specific standards for discovering, representing and giving meaning to data is required. Ultimately, achieving semantic interoperability leads to improved capabilities with respect to search, connectivity, browsing and data exchange and content process (Möller et al., 2006). The use of semantic technologies will solve the problem of handling data from heterogeneous systems by creating common vocabularies. The use of common standards should also be preferred, since existing applications (developed for other purposes) could be adapted for their special use in e-participation. In this way, information that has been created from different systems will be ready for automatic integration and processing by any system.

Categorization, Searching and Filtering

By producing interpretable metadata, more efficient ways of both querying and navigating information become possible (Möller et al., 2006). Software and technology should use the advantages of semantic descriptions and support information and knowledge management facilities as e.g. categorisation, searching and filtering. In e-participation systems, there is a need for enhanced techniques which will allow the categorization of data, especially in cases where such data may be ambiguous. For example, in different e-participation systems, and regardless of the tool category they may belong to, an amount of the included information, such as subject and locality, is common. Marking up such related information in a common way may result in easier detection of activities relating to similar issues. Present consultation sites tend to avoid such issues by using simple summation and aggregation technologies, leaving the analysis and synthesis to off-line analysts. Synthesis will always rely on the knowledge of policy analysts and communication experts; nevertheless, online consultation technologies should be set up to capture and tag qualitative data intelligently (Telecommunications and Service, 2003).

Technical Interoperability Recommendations

Technical interoperability considers technical issues of linking up computer systems and services. Key aspects that need to be considered in order to achieve technical interoperability are open interfaces, interconnection services, data integration and middleware, data presentation and exchange, accessibility and security services. E-participation systems can achieve a high degree of technical interoperability by simply respecting protocols and standards that are already widely used. Moreover, they should adopt common look and feel and common interfaces as well as common accessibility guidelines and interface design principles. This means that the recommendations 10 to 17 of EIF (cf. European Commission, 2004) are also valid for e-participation without major rewritings or additions. As far as the system and data are concerned, technical interoperability aspects should be considered for the front office, back office and security (cf. European Commission, 2004, Rec. 11).

Accessibility

E-participation systems should respect accessibility guidelines that generally apply to e-government systems. Accessibility refers to the need to ensure that systems would provide equal opportunities for all through open, inclusive electronic services that are publicly accessible without discrimination (European Commission, 2004). More specifically, the main accessibility requirements include:

1. Allow service provision through different channels (i.e. voting via mobile and PDA) to ensure the highest possible citizen inclusion.
2. Use of generally accepted design principles for interfaces to ensure access for disabled persons.
3. Keep language simple (registration mechanisms and generally the use of systems) to be understandable by all.
4. Ensure easy identification of e-participation content. This can be achieved by categorizing content by subject, location, author etc.

Multilingualism

In cases where e-participation has contributors from different countries or of different lingual background (even within the same country); there is a need for multilingual support. There are examples of machine translation software that offer a rough translation of website contents. However, these tools are too simple to deal with ambiguous or complex terms. Therefore, one major challenge is to enable citizens to overcome language barriers so that they can follow an e-participation activity and actively participate in formulating their own opinion and policy proposals (Macintosh, 2004). This is of particular importance in the European context as described in Commission (2004).

Security and Privacy

Administrations need to come to an agreement on a common security and privacy policy and to ensure the agreed level of security and personal data protection. Functions that are associated with security (e.g. identification, authentication, confidentiality) should have a maximum level of transparency and require minimum effort from the user. Also, users should have the choice of whether their personal data may be disclosed for purposes other than those for which they were originally supplied. In this regard, e-participation projects have a high degree of responsibility because any statement ever given in the Internet will be there for an unforeseeable amount of time (Scherer et al., 2009b). For example, the outcomes of e-petition systems include names and addresses of citizens that have signed a petition. In terms of security, public administrations should ensure the validity of these data. In terms of privacy, citizens should be aware that their data are visible for the public or should get the possibility to hide these personal data from the public. Moreover, online voting systems should ensure that citizens vote with security and transparency, and should provide identification and authentication mechanisms that will allow only eligible persons to vote and will eliminate any phenomena of vote fraud (Oravec, 2005).

INTEROPERABILITY STANDARDS IN E-PARTICIPATION

The EIF recommends the use of open standards (European Commission, 2004, European Commission, 2008). They are instrumental parts, procedures, processes or products used to ensure that interrelated systems can work together.

Denardis and Tam affirm that standards may have political implications for democratic processes and that processes of standard-settings can be viewed politically. They distinguish the democratic implications of standards between "Effects of Standards on Formal Democratic Processes" and "Impact of Standards on Conditions Relevant to Democracy" (see Denardis and Tam, 2007, p. 9). This implies that standards have an additional effect on participation processes and not only from the technical side.

We distinguish among general standards and protocols, and specific standards related to e-participation. It is recommended that common standards are deployed wherever possible. The benefit in this case is that existing applications do not have to be adapted for the special use in e-participation.

Throughout our investigations, we categorised standards for e-participation (general and specific ones) along the following dimensions, which will be further detailed in the subsequent subsections:

1. Data Exchange Standards: Brief look at Semantically Interlinked Online Communities (SIOC), legislative standards and semantic descriptions of data.
2. Common standards and protocols for communication and message exchange: Focus on authentication, web services standards and e-voting protocols
3. Architecture Standards: Discussion of Service Oriented Architecture (SOA) and its benefits for e-participation
4. Process standards: Description of necessity of process standards for e-Participation.

Data Exchange Standards

Data exchange usually requires transforming the data structured under a schema (the source schema), into data structured under another schema (the target schema). Data integration, on the other hand, refers to the synthesis from data of different source schemas into one virtual source schema (Kolaitis, 2005). Following Tambouris and Tarabanis, mappings between schemata may be used in the public sector for the discovery and retrieval of information (Tambouris and Tarabanis, 2004).

To give context to data, the use of languages that enable the description of data by the use of commonly agreed semantics is desirable (for example by using a mark-up language). Taking into account existing technologies, Extensible Mark-up Language (XML) can be used as the basis on which common semantics will be developed (European Commission, 2004). The development of common semantics should be performed in cooperation with e-participation bodies. Data formats are principally useful for all participation areas analysed in section "Interoperability Requirements for E-participation Areas". Generally, they facilitate the exchange of data between systems of the same category (e.g. different e-petition systems) as well as between systems of different categories (e.g. discussion in e-consultation systems on petitions of a certain e-petition system). The e-participation interoperability requirements that can be met with data exchange standards, as described above, are the following:

1. Integration of e-participation outcomes is fulfilled in the definition of data exchange standards (cf. section "Integrating E-participation Outcomes").
2. Automated process of content (cf. section "Categorization, Searching and Filtering"): Data standards may serve as an interface between different workflow and process engines.
3. Categorization and searching (cf. section "Categorization, Searching and Filtering") are supported by standardized documents, because patterns can be recognised better and data mining mechanisms work more effectively.

In the following sections, data exchange standards, which are usable for e-participation systems are introduced and discussed shortly.

Legislative Standards

A number of standards for legislative documents has been developed in the last years that aim to describe norms (e.g. Norme in Rete (Biagioli et al., 2003), CEN Metalex (Palmirani et al., 2009)). Such standards ensure the reusability and exchange of annotated documents in different legislative applications. They are therefore important for the deployment of legislative e-participation applications as they give e.g. the possibility to link specific paragraphs of a norm with discussions, polls etc. But standards for other legislative documents e.g. petitions should also be favoured by responsible authorities i.e. the European Commission.

Semantic Descriptions of Data

One technology supporting the standardization of data and services (cf. section "Semantic Interoperability Recommendations") is the Semantic Web. Its principles are implemented in the layers of Web technologies and standards (Berners-Lee, 1998). Important layers regarding data exchange are the following:

- The Unicode and Uniform Resource Identifier (URI) layers, which provide means for identifying the objects in the Web,
- The XML layer with namespace and schema definitions ensure the integration of definitions with other XML based standards,
- The RDF (Resource Description Framework) and RDFS (RDF Schema), which make it possible to give types to resources and links.

It is possible to make statements about objects with URIs and define vocabularies that can be referred to by URIs. The ontology layer supports the evolution of vocabularies as relations between the different concepts can be described. This layer can be supported as an example by the Web

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Ontology Language (OWL) (Koivunen and Miller, 2001). Beyond data exchange, ontologies are usable in order to implement advanced argument visualisation functionalities with the semantic representation of interdependencies, interrelations, arguments built atop of others, etc. (see e.g. Cestnik et al., 2008).

Semantically Interlinked Online Communities (SIOC)

The goal of SIOC is to make the information contained in the sites of online communities accessible in an efficient manner. Its usage for e-participation can be seen in community systems where it provides the possibility to interlink community contents from different websites (cf. section "Combined Collaboration"). Blogs and posts can support all participation areas except voting (Thorleifsdottir and Wimmer, 2006) and are therefore more and more important for e-participation. Nowadays there are different ways of interconnecting blogs and posts (i.e. blog rolls and trackbacks), but the mechanisms for these are not consistent within the blogosphere and have not been transferred to other discussion methods so far (Bojars et al., 2006). Moreover, application and interface differences between discussion platforms result in the existence of parallel discussions on the web that users may be unaware of (Breslin et al., 2005).

Common Standards and Protocols for Communication and Message Exchange

In general, standard protocols for communication and message exchange play an important role to ensure technical interoperability. Besides being an important factor for achieving interoperability, they are also crucial in enabling automated content processing and – maybe more future oriented - intelligent service execution in the field of e-participation. Also, a direct alignment with government and legislative processes becomes more feasible. In the following subsections, some standards for communication and message exchange in e-participation tools are introduced.

Web Service Standards and Protocols

Recently, application to application communication via web services (Gottschalk et al., 2002) was revolutionising the Internet. The program-to-program communication model of web services is built on existing and emerging standards such as Hyper Text Transfer Protocol (HTTP), XML, Simple Object Access Protocol (SOAP) (Fensel et al., 2007), Web Services Description Language (WSDL) (Akkiraju et al., 2005), the Universal Description, Discovery, and Integration (UDDI) (Fensel et al., 2007) project and Web Service Semantics (WSDL-S)^{vi} to link semantic annotations with web services. The usage of web service standards can be seen in the interplay of these protocols because the use of one single protocol does not make sense (Gottschalk et al., 2002). They are basic elements for a SOA (cf. section "Architecture Standards") realized with web services. As most e-participation tools and applications are web-based, web services bear a large potential for the interoperability of e-participation systems.

Authentication Standards

As stated in section "Combined Collaboration", single-sign-on is one method to make the use of different tools easier and the tools themselves friendlier for the users. Authentication services must be based on open standards and standard protocols. These are used by many applications, however the possibility of anonymity should also be provided.

There are different approaches, which can build the base for single-sign-on services. A standard widely supported by industry is for example the protocol for authentication services OpenID (<http://openid.net>), which is supported by Yahoo, Google, Microsoft, IBM and others. However, the identification of participating stakeholders plays a crucial role in e-participation. This is important in order to strengthen trust in the results of participation and enhance transparency. For this reason, e-participation solutions can be based on standards which are connected with a real identity. One example is the Stork (www.eid-stork.eu) project, where an EU wide interoperable system for

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recognition of eID and authentication will be implemented. This will enable businesses, citizens and government employees to use their national electronic identities in any Member State (Dean, 2009).

E-voting Protocols

E-voting is a recent topic in research and practice. Although electronic elections have already been performed in some EU countries (e.g. Estonia), there is still a conflict in the discussions on the security level. In the literature, a number of e-voting protocols have been published (see e.g. Cetinkaya and Cetinkaya, 2007) for an overview and evaluation). Further security factors as e.g. the hardware need also to be recognised (Volkamer, 2008). It needs to be analysed as the case arises, which standards are sufficient for the participation system to achieve a good cost-benefit ratio.

Architecture Standards

Software architectures describe the basic organisation of a system with its components, their relationships to each other and to the environment as well as the principles for system design and evaluation (Hasselbring, 2006). Hence, they are a key instrument to successfully design interoperable systems and solutions. Consequently, they play a key role to fulfil the technological requirements of e-participation.

The concept of SOA has emerged as a way to enable services working together from dispersed places. According to Hasselbring, a SOA defines the use of loosely coupled and interoperable software services, thereby generating a comprehensive view of the independent software components. Furthermore, the concept of SOA is used to quickly adapt and adjust business processes through business process orchestration and service invocation (Hasselbring, 2006). Fensel et al point out that SOA enables the reuse and combination of software elements via standardized interfaces, within or even across organisational boundaries (Fensel et al., 2007). SOA has the potential of being an effective solution of designing interoperable e-participation applications and systems by connecting and interrelating (independent) interoperable e-participation (and non e-participation) tools and applications. An example of a SOA for a global deliberation system is drafted in Scherer et al. (2008b). The architecture consists of different independent services, which can be combined with each other. For example the clustering services could be used by argument visualisation services to cluster the discussions and visualise the results.

Process Standards

Standardisation of participation processes has the potential of sticking together different e-participation processes or activities supported by different tools and to link them within the policy life-cycle. This will help to fulfil the recommendation for the alignment with governmental processes (cf. section "Alignment with Governmental Processes") and is therefore an important issue towards interoperability. Process ontologies, as the starting point for the orchestration of shared web services, have the potential to support the use of such standards. OWL-S (semantic mark-up for web services) is an important emerging standard in this context. It aims to "enable users and software agents to automatically discover, invoke, compose, and monitor web resources offering services, under specified constraints" (see www.w3.org/Submission/OWL-S).

FUTURE RESEARCH DIRECTIONS

In this section, future research directions to ensure interoperable e-participation services and applications are examined. These findings result from the identified research needs on interoperability in e-participation.

It is important to note that as Peristeras and Tarabanis (2006) point out, a common feature identified in most interoperability typologies is an explicit or implicit evolutionary perspective, which means that types of interoperability follow a scale of advancement. According to the C4IF Framework introduced by the same authors, connection, communication, consolidation and collaboration are the

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four levels of interoperability that need to be ultimately achieved between systems (i.e. systems need to exchange signals, exchange data, understand data and finally, systems need to act together). All these levels of interoperability have to be reached (Peristeras and Tarabanis, 2006). Towards this goal, the identification and study of interoperability problems in real e-participation environments is essential.

The design and establishment of necessary standards for e-participation is also a significant need for interoperable services. The majority of e-participation tools still lag behind in the use of standards. Meanwhile a number of e-participation tools that are extensively used in - but not specific to - e-participation, profit from the design of standards for other applications. Until now, there is e.g. no standardized format for petitions, which could provide the way for exchanging e-petitions.

There is still a lack in actual e-participation research to overcome challenges of interoperable systems from a technical point of view as well: Combining advanced technologies of argument structuring, retrieval and visualization to make content more comprehensible and easier accessible. Data mining of large, unstructured content for the purpose of delivering the right information at the right time for specific deliberation topics is still to be seen. A toolbox of interoperable e-participation tools is necessary as a means to support the identified needs for e-participation.

An important issue is securing the privacy of citizens. In this regard, what needs to be further investigated is how users can profit from interoperable services and at the same time ensuring that their data and opinions will not be traced across authorities, countries, or in any other way.

It is essential for future research directions to focus on organisational aspects of interoperability to ensure the appropriate collaboration of systems and use of e-participation results. This can only be achieved if the use of technologies is properly planned in advance by taking into account the organisational barriers that exist. In this light, the careful modelling and visualisation of participation processes can help towards this direction.

CONCLUSION

In this chapter we have provided evidence for the need for interoperability between e-participation tools, applications, and systems. Requirements and recommendations have been studied along political, legal, organisational, semantic and technical dimensions. While elaborating these requirements and recommendations, it has become evident that interoperability in many cases requires the adjustment of processes, especially where organisational interoperability is to be ensured. Hence interoperability influences the way traditional participation is performed.

As in other fields, interoperability requires strong co-operation and commitment from many different stakeholders. This requirement is intensified in the particular application domain under discussion, because the majority of e-participation applications is heterogeneous and so far developed more as stand-alone applications rather than as tools which can be embedded in a larger environment of democratic and governmental activities. For e-participation initiatives and applications, this means that there should be cooperation between public agencies and the private sector beyond the much desired cooperation between different public agencies.

As many e-participation tools and applications use systems developed in other contexts, the use of common standards is essential. But there are also areas, as e.g. legislative e-participation and e-petition, which need the development of specific standards. A number of open standards for data exchange, communication protocols as well as software architectures have been introduced in this chapter. A sensible and coordinated use of such standards is a challenge for interoperability in the context of e-participation.

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ⁱ See (OMG, 2008, OMG, 2009)

ⁱⁱ

<http://www.europarl.europa.eu/parliament/public/staticDisplay.do;jsessionid=B604B2A3986169A63DF8CE317A155013.node2?language=EN&pageRank=3&id=49>

ⁱⁱⁱ One option here is the classification of different petitions e.g. by topic relevance. The classification can be achieved at least semi-automatically using intelligent text and data mining as well as clustering and classification mechanisms. On a European level e.g., this could help the responsible authorities to detect similar petitions from individuals spread across Europe although possibly the residents of different countries. Data on petitions should be further analyzed, collated and categorized to be forwarded properly to other systems.

^{iv} See Directive 95/46/EC of the European Parliament and the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data (European Parliament and the Council, 1995).

^v “requirements (...) should be jointly determined by the participating governments via a demand-driven approach”, “public administrations (...) should analyse the related business processes and actors to be involved”, “where the provision of a service requires contribution from several public administrations across Europe, the respective expectations should be formalised” (cf. European Commission, 2004).

^{vi} <http://www.w3c.org/Submission/WSDL-S>