

Usability Engineering in eParticipation

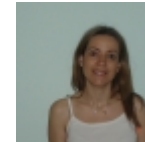
The task of eParticipation is to empower people to be able through Information and Communication Technology to act in bottom-up decision making processes, thus allowing politicians to make informed decisions, while developing social and political responsibility. In this matter, the project VoicE establishes an Internet platform with the objective to promote the dialogue between citizens from Baden Württemberg, Germany and Valencia, Spain and policy makers from the European Parliament, the Assembly of Regions as well as from other EU institutions and regional assemblies.

In order to efficiently support the citizens, the usability of the applications, tools, channels and devices through which eParticipation should take place need to be designed properly. But usability engineering is not one single step in the product development cycle. If anything, it is a set of activities that should take place throughout the lifecycle of the product. The overall objective of the paper is to introduce a usability engineering methodology for eParticipation online platforms and its application in the VoicE project. This methodology is a structured lifecycle, which is based on iterative design process with user involvement. Besides that, it will be shown that user engineering is key in designing eParticipation applications.

The usability engineering methodology has been applied in the design and implementation of two platforms in two different regions of Europe. It was usable to improve the system by detailed analysis of the overall system before the start of any implementation, iterative design of the systems' features, their interaction and the user interface, and involvement of users in the design process.



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“ In eParticipation design processes user involvement plays an important role not only to simplify the user interface and the processes, but also to test the application of certain tools for certain democratic processes. ”

1 Introduction

Citizen participation in democratic processes across Europe has been declining for years, due largely to a lack of trust in policymakers and policy. Citizens increasingly demand to provide them with the means to be informed, the mechanisms to take part in decision-making and the ability to contribute to and influence the policy agenda. Effective information provision is often seen as a corollary of effective engagement and empowerment as declining political interest presents an increasing erosion of legitimisation for traditional, representative politics.

The task of eParticipation is to empower people with Information and Communication Technology (ICT) so as to be able to act in bottom-up decision making processes, thus allowing politicians to make informed decisions, while developing social and political responsibility. Therefore, eParticipation is a means to empower the political, socio-technological, and cultural capabilities of individuals giving the possibility to individuals to involve and organize themselves in the information society. eParticipation offers citizens a greater share in political discourse and the ability to contribute their own ideas, suggestions, and requests; an as yet unrealised potential that – as far as it is supported and accepted – could modify the understanding of democratic participation. The usability of the applications, tools, channels and devices through which eParticipation will take place in virtual space, need to be designed properly to support the citizens in this regard (Fraser *et al.*, 2006).

In this matter, the project VoicE¹ establishes an Internet platform with the objective to promote the dialogue between citizens from Baden Württemberg (BW), Germany and Valencia, Spain and policy makers from the European Parliament, the Assembly of Regions as well as from other EU institutions and regional assemblies. In terms of contents, the project focuses on the policy field of consumer protection in the EU. It is targeted at both the legislation proposal formation stage and the debate on draft legislation.

The overall objective of the paper is to introduce a usability engineering methodology for eParticipation online platforms and its application in the VoicE project. This methodology is a structured lifecycle, which is based on iterative design with user involvement. Beyond that, it will be shown that user engineering is key in designing eParticipation applications.

The next section introduces the VoicE project in more detail. The third section argues the need for usability in eParticipation and shows some related work. Section 4 describes the usability engineering methodology applied. Section 5 describes the results of the investigation: the requirements for VoicE, the results from the stages of the lifecycle and the iterative design process. In section 6, concluding remarks and an outlook are provided.

2 The VoicE Platform

The European Union increasingly influences most fields of regulation, but legislative decision-making within the EU is often criticized as elitist, intransparent and insular. Despite massive efforts undertaken by the European institutions to promote their activities and gain acceptance for their issues, many citizens are simply unaware of legislative affairs in Brussels. At the same time, direct participation of citizens in EU legislative processes tends to be limited. Language barriers, a lack of knowledge about EU decision making and procedures, as well as little information about the impact of EU legislation on their own social, economic and cultural environment, are factors preventing people from actually using available opportunities for political participation, such as online consultations on the central European website.

VoicE provides a platform that serves as an interface between decision-makers in Parliament, Commission, the Committee of Regions and the citizens while using and testing new forms and methods of civic participation in the day-to-day legislative work in the EU. In terms of contents, the project focuses on the policy field of consumer protection in the EU. Citizens are able to share their opinions with political decision-makers on issues which are in the legislative pipeline at that very moment, just before relevant decisions are to be made. This way, citizens are able to really express their opinions on the legislation in the field of consumer protection by delivering real inputs during the legislation proposal formation stage or the debate on draft legislation in this field.²

¹ <http://www.give-your-voice.eu>

² See (Schneider *et al.*, 2008, Holzner & Schneider, 2008)

3 Usability and eParticipation

Usability has multiple components; it is not a one-dimensional property of a user interface. Traditionally it is associated with the following five usability attributes of the system: easy to learn, efficient to use, easy to remember, low error rate, and pleasant to use (Nielsen, 1993).

eParticipation services via electronic channels need to be simple, effective, easy-to-use and functional. Besides this, the look and feel as well as the fun-factor should not be underestimated. Especially in eParticipation contexts, where heterogeneous user groups should actively participate in policy discussions and participatory decision-making by electronic means, Fraser et al. state that further research is needed to develop proper interaction interfaces (Fraser *et al.*, 2006).

To fulfil these usability requirements, the design and implementation of eParticipation platforms should follow well designed processes. Systematic usability engineering is necessary at least to ferret out minor design details that influence usability (Nielsen, 1993). This is of high importance as the usability evaluation plays a crucial role in eParticipation evaluation methodologies (Macintosh & Whyte, 2008, Lippa *et al.*, 2008). Even more important is the fact that the usability and usefulness of the systems (the technical aspects) influence the other eParticipation evaluation perspectives, i.e. the project and democratic perspective. Small changes in the user interface of an eParticipation application could result in completely different evaluation results. Bad usability on local government web sites may even destroy the strategy of the whole website (Esteves, 2007). Therefore all decisions about an eParticipation system should be the result of a systematic process and should be documented.

Usability engineering for eParticipation should involve the real users of such systems. Generally, user involvement plays an important role in participatory design processes of computer systems. Obviously, the involvement of system users in the design process has a number of benefits, but also a number of "pitfalls". The most important factor is that the users should be able to trace the changes in the system influenced through their involvement³ (Damodaran, 1996). In eParticipation design processes user involvement plays an important role not only to simplify the user interface and the processes, but also to test the application of certain tools for certain democratic processes. Thereby different user groups have different agendas in eParticipation, e.g. citizens and politicians in a forum on legislative processes. All these completely different expectations from the system need to be taken into account during the design and implementation process.

4 Usability Engineering Methodology

4.1 Usability Engineering Lifecycle

Usability engineering is not one single step in the product development cycle. It is a set of activities that should take place throughout the lifecycle of the product (Nielsen, 1993). Nielsen proposes the following steps for the user engineering lifecycle (Nielsen, 1993, p. 72f):

1. Know the user: Study of intended users and use of the product, which includes individual user characteristics, task analysis, functional analysis, and evaluation of the user and the job.
2. Competitive analysis: Analysis of existing products as best prototypes that can include comparative analysis of competing products if they exist.
3. Goal setting: Setting levels of performance for usability attributes.
4. Parallel design: Different designers work out preliminary designs in a parallel process.
5. Participatory design: This means the involvement of users in the design process.
6. Coordinated design of the total interface: This step ensures the consistency of the entire user interface.
7. Guidelines and heuristic evaluation: There are general, category specific, and product specific guidelines that can be used as background for heuristic evaluation.
8. Prototyping: Fast produced versions of the system for early usability evaluations.
9. Empirical testing: Evaluation of the interface by user testing.
10. Iterative design: Production of new interfaces based on the usability problems identified in empirical testing.

³ One can say that this is in line with the eParticipation principle according to which users of eParticipation applications should be able to trace the results of their participation.

politicians from BW and Valencia regions. The questionnaires were translated in German and Spanish and were available online in both regions.

The decision to use two different questionnaires for the collection of user requirements was based on the fact that the group of interviewees could be split up into two major groups:

- Group 1: the citizens that will give their input in the legislative process.
- Group 2: the politicians from the two regions, who are the decision-makers and will receive the input by the citizens during the legislative process

Specifically, the objective was to identify end users' requirements raised from existing procedures and applications, to define their involvement in the legislative process and their access to ICT. Moreover, the questionnaires aimed at finding interviewees' opinion on the dialogue between citizens of a region, EU decision-makers and other political stakeholders in a specific policy field.

The questions in both questionnaires are produced in such a way so as to sufficiently cover the entire system functionality. At the same time, they were presented in terms understandable by citizens and politicians. Simultaneously, each questionnaire included a glossary of terms related to eParticipation and ICT that were used in the questions. The questionnaires for the citizens/politicians contained 10/9 questions. The difference between the questionnaires was the formulation of the questions and the questioned data. The citizens have been mainly asked for the features and topics they want to participate, whereby the politicians have been asked for the features they want to exist or topics they are interested to get citizens' opinion. Table 1 shows the structure of the two questionnaires including differences:

Citizens' questionnaire	Politicians' questionnaire
a self categorization of the citizen/politician who answered the questionnaire	
opinions and expectations of the citizens regarding their participation in the legislation process for consumer protection	opinions of the politicians regarding the citizens participation in the legislative process for consumer protection
rating of the features that citizens want to find on the platform in order to facilitate their participation in consumer protection legislative process - description of the features that citizens want from online forums	rating of the features that politicians want on the platforms in order to gather the citizen's input on legislative issues
the limits that citizens have regarding their personal data and what they are ready to disclose, in order to register as members on this platform	opinions of the politicians about the data to be requested for member registration on this platform
	features that should be provided from the politicians' point of view
information that should exist on the VoicE platform in order to facilitate the citizens' participation in the legislation process for consumer protection	information that should exist on the VoicE platform, from the politician's point of view
issues related to consumer protection in which the citizens are interested	issues related to consumer protection in which the politicians are interested to see the citizen's opinion
personal ideas, suggestions, recommendations that the citizens/politicians have for this platform	

Table 1. Structure of the questionnaires

4.3 Design/Testing/Development

Architectural Views

A view defines the architectural context of the solution from the corresponding perspective: business, functional, technical or implementation. Thus, four architectural views provide a complete picture of a solution (The Open Group, 2007):

- Business View –Why

- Functional View – What
- Technical View – How
- Implementation View – With What

The views show the motivation of the VoicE solution and describe when and in what context VoicE is a success from a solution perspective. This is done by pointing out drivers and goals along with principles that underpin the functional, technical and implementation perspectives.

In general a principle describes guidelines for how an organization intends to satisfy the requirements of the drivers. The following terminology is used in the elaboration of principles:

- Statement – should succinctly and unambiguously communicate the fundamental rule
- Rationale – the motivation behind a given principle (that is, the benefits of achieving or the costs or consequences of not achieving the principle). The rationale is often defined simply by referring to the goals and initial requirements, or more-basic principles that motivate the given principle.
- Implications – statements of the consequences of a particular principle. They might reference a principle(s) in a later view.

Storyboards

Storyboards for the VoicE platform are displaying sequences of events, which the users of VoicE platform will experience while using the system. The pictorial visualization is presented through pragmatic use cases. These use cases are part of the Unified Modeling Language (UML) and describe how a user achieves her or his goal. A use case is a technique for capturing functional requirements of a system. The “use case method” helps to represent external system behaviour from the user’s point of view. (Fowler, 2004)

Use cases can refer to other use cases in two ways (Fowler, 2004):

- use case A “uses” (includes) use case B: this means that as part of executing A, use case B is also executed. In diagrams the connection between both use cases is stereotyped with the wording <<uses>>.
- use case B “extends” use case A: depending on conditions, the execution of use case A may require execution of use case B. In diagrams the connection between both use cases is stereotyped with the wording <<extends>>.

A use case describes just one feature of the system. Use cases treat the system as a black box, and the interactions with the system, including system responses, are perceived as from outside the system.

The following use case format used is adapted from Cockburn & Mckenzie (2001):

Name	Unique name for the use case
Purpose	One line description of the purpose, the goal, of the use case
Actors	A listing of all parties, human and machine, involved and interacting in this use case.
Stakeholders and interests:	Categories of people whose interests must be satisfied by the use case
Preconditions	List of conditions that must be met before this use case is allowed to start
Basic flow	Between 3 and 9 steps, each phrased as a goal that succeeds stating the intent of the actor
Success/failure criteria	Assertions that can be checked to see that the use case has succeeded
Scenarios	A scenario is a step-by-step description of the interaction between the user and the system to reach the use case goal.

Table 2. Use case format

The use case descriptions also include scenario descriptions. There may be different scenarios within a use case; some with different outcomes, depending on success or failure to achieve the goal. The scenarios indicate the main actors –both human and machine – that play a role in the scripted processes and form the basis for the definition of test cases. As Nielsen (1993, p. 99) states, a scenario is the “ultimate minimalist

prototype". It describes an interaction step without any flexibility for the user. If scenarios are developed in detail, they can be used for user testing (e.g. with mock up drawings) (Nielsen, 1993).

Architectural Design

The architectural design represents the design process for identifying the system components and how the components depend on each other in the overall system solution. The components are implementation mechanisms that support the exposed services (in the service model). There might also be components that do not directly implement a service; instead, they facilitate implementation of some common utility services (for example, logging, events subscription and broadcasting, and so on). Components that do not expose interfaces to be directly consumed externally are used to facilitate a standardized inter-component communication.

Iterative Design and Development Process with Heuristic Evaluation and Empirical Testing

The iterative design process means that the proposed solution will be tested at several levels against the requirements and usability goals considered in the requirements analysis phase of the lifecycle. If the proposed solution does not meet the usability goals, the design will be improved. The iterative design and development process starts with the design of the architectural views, then goes beyond the pilot implementation, and ends with the launch of the platform.

Guidelines contain conclusions of common user interface design principles that should be taken into consideration when developing a project. There are different types of principles – general guidelines, category-specific guidelines (e.g. depending on the interface), and product-specific guidelines. These guidelines can be used as background for heuristic evaluation (Nielsen, 1993).

Heuristic evaluation means a “systematic inspection of a user interface design for usability ... to find the usability problems in a user interface design so that they can be attended to as part of an iterative design process” (Nielsen, 1993, p. 155). It is accomplished by only a small number of usability experts, who judge the compliance of the user interface with recognised usability principles. Heuristic evaluation is a cost-saving method to identify usability problems before the real users see the system. In VoicE the experts from the project partners played the role of the evaluators.

Empirical testing helps to identify usability problems and opportunities in the system and the interface in order to improve them. Testing methods are thinking aloud, log files, etc. One problem with iterative design is that changes in the user interface to solve one usability problem can bring new usability problems. Therefore iterative design and evaluation should be combined. (Nielsen, 1993) In VoicE empirical testing was performed on the pilot versions of the both platforms. The users have been asked to work with the platform and answer a questionnaire afterwards. Additionally some interviews and thinking aloud sessions have been performed with the users. The questionnaire was rather short and aimed at the identification of usability problems before the official launch of the platform. It was structured as following:

1. Personal details
2. Interest in EU politics and consumer protection
3. Questions about the extent to which the user enjoyed using the site and what would make him or her return to this site.
4. Questions regarding the best and the worst platform feature as well as elements that caused confusion. Additionally, the visibility, usefulness and usability of each feature have been tested.
5. Questions about the navigation structure and the layout of the platform.
6. Awareness of the information contained in the portal.
7. Any other ideas, suggestions, and/or recommendations which could be provided.

4.4 Installation and Collecting Feedback

The installation phase includes partly the pilot implementation and empirical testing stages, because the tested pilot is available online.

Usability work after the release of a platform means to gather data for the next or a new version of the product (Nielsen, 1993). That means that the current VoicE platform is the prototype for the next generation of the platform. The installed platform will be further evaluated and improved. As during the iterative design process,

all implemented steps need to be well considered, documented, and evaluated. In order to gather the necessary usability data and collect feedback, usability statistics, user questionnaires and interviews with the users will be used.

5 Results of User Involvement in VoicE

5.1 User Requirements

The evaluation of the questionnaires (cf. section 4.2) resulted in a list of requirements and usability goals.

Functional Requirements

Understanding user requirements is an integral part of the VoicE solution design and is important to the success of the project. A characteristic of the user requirements process is that users' opinions of what they might want from a system will evolve. Potential users cannot express definite, current requirements. By demonstrating prototypes and simulations, and obtaining feedback, the system will become more real and requirements become more realistic in tandem. Once the real users understand the implications of a potential solution, their requirements may change.

The responses gathered showed small variations in the expectations of the end-users from each region. It would have been desirable to write different scenarios for each region, to illustrate how the VoicE solution matches their expectations. But it would have been difficult to retain a coherent view of what the VoicE solution needs to do, if the 'requirements' for two different solutions had been taken into account. For this reason, it was decided that a single scenario is needed at the beginning, which means a single solution adaptable to both pilot sites is needed at the same time. That is why, after the ranking of the features had been compared according to the answers of the end-users from both regions, it was decided that the VoicE system should have the following information and participation features:

- Online discussion forums where users can express their views on consumer protection issues and exchange views with other users.
- Blog to publish public journals of upcoming events on the site, keeping the citizens aware and involved. These blog posts will be published by the editorial management team. At the same time the blog authors could be VoicE registered users too. They can write about consumer protection issues that concern them.
- “Question of the week”/ opinion polls have also been provided: users have the possibility to give their vote on issues that are put for discussion by the administrators. Input for questions in this section will come from the Baden-Württemberg Ministry for Nutrition and Rural Areas, thus ensuring that recent political topics from the area of consumer protection are raised.
- Online petitions function: Citizens can contact the administrator if they have a certain point they would like to put as a petition. The administrator will open the petition and define a time period in which signatures can be collected. After a certain time, the petition will be closed and the result be sent to the Members of the European Parliament.
- “Letter to Brussels” which allows citizens to write a letter directly to the Members of the European Parliament from their region.
- Calendar of events to upload events related to the participative processes from the VoicE platform and to consumer protection events taking place on regional and EU level.

The debate on each key legislative issue represents a participative process, which will have associated documents, links, forums, questionnaires. The forum and survey sections of VoicE are the principal components relating to citizen participation in the debates on specific legislative issues, where site members are able to provide direct input to the discussion of featured topics, either through deliberation in the forums or by answering/voting in surveys/polls.

Non-Functional Requirements

Non-functional requirements are not really requirements, but also constraints on implementing the functional requirements defined above. In the VoicE case, non-functional requirements define the need for easy-to-use interfaces and are available for both regions. These requirements consider the look and feel of the application, usability and accessibility, performance, reliability and availability, and document capacity. Additionally, there are security, maintainability, help and operational requirements that need to be considered.

5.2 Storyboards

The VoicE storyboards differentiate administrative cases (user registration, login/logout, user profile self-maintenance and retrieve password), information gathering, and develop opinion/collaborating storyboards. These storyboards show the use cases for the special VoicE system features. Each use case describes at least one scenario where each use case potentially is a GUI screen. The story boards helped to identify the gaps in the task analysis and usability problems resulting from the process.

5.3 Architectural Design and Installation

At the beginning of the VoicE project, it was considered more useful/ important to define requirements in terms of what is needed, but no final decision was taken as to the look and feel of the user interface. Nevertheless, each region follows different look and feel styles (Figure 2 shows the Spanish platform and Figure 3 the German one) and it should be noted that the VoicE user interface will be finalized following the user comments after completion of the alpha and beta versions of the pilot phase.

VoicE is a system usable by users with limited experience of internet or ICT. With regard to accessibility issues, the websites follow the WAI (Web Accessibility Initiative⁴) compliance accessibility standard. The VoicE solution can be used by both fully capable and handicapped users. Because most of the VoicE components are readily available open source components, the solution's WAI compliancy for the most part depends on the WAI compliance of these components as well as the built-in WAI features available on the client platforms (Windows and Linux Accessibility Features). The architecture aims to comply with level AA. The use of VoicE from a user point of view has been detailed in the storyboards. Besides the functional views the whole architectural design also comprises the technical views and security provision of the VoicE solution.

The GUI interface of the installed platforms is web-based. The VoicE GUI is shown as a display composed of three frames (see Figure 2 and Figure 3): navigation frame and VoicE "side bar", VoicE functionality delivered through adopted tools, and VoicE additional information related to the main section.



Figure 2. VoicE platform for Valencia (Spain)

⁴ <http://www.w3.org/WAI/>

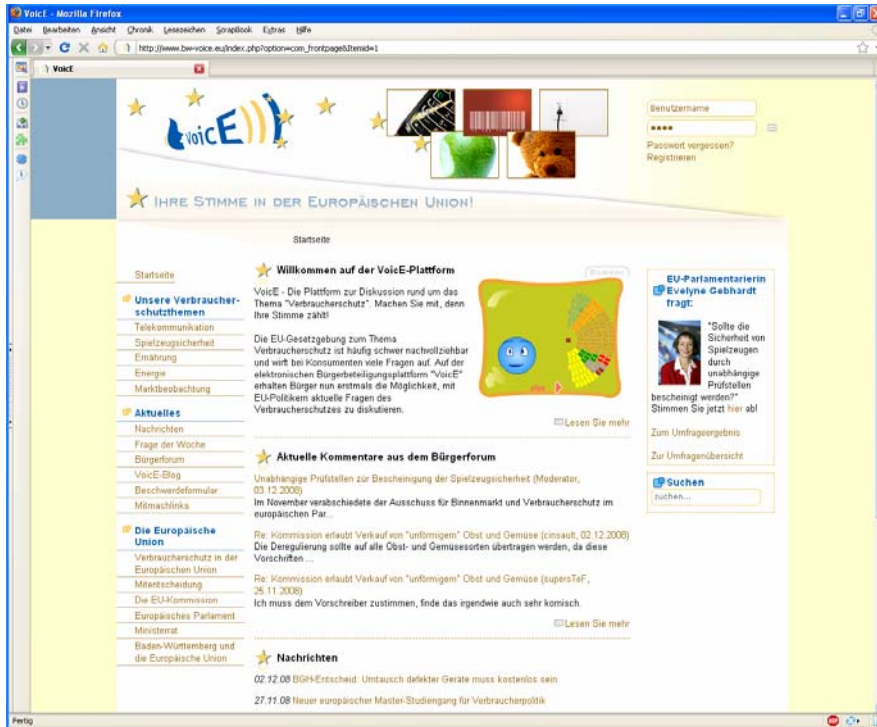


Figure 3. VoicE platform for Baden-Württemberg (Germany)

5.4 Iterative Design of the VoicE Portal with Empirical Testing

The design process of the VoicE portal was an iterative process. It was influenced by the heuristic analysis performed by project partners and the empirical testing with pilot users. While the heuristic analysis has been performed some stages earlier than the empirical testing, it mainly influenced the base system and the base user interface.

The empirical testing was performed on a pilot version of the system. After the empirical testing phase all user data have been removed from the platform. The empirical testing phase had a considerable influence on the installed system. The questionnaires for the pilot tests were answered by 37 pilot users; 17 for the German pilot and 20 for the Spanish pilot. Interviews have been conducted with two pilot users from Germany. The pilot users have been asked to first use the system and then fill out the questionnaires. The opinions about both VoicE platforms have been positive on the whole: about 67% of the users indicated a high enjoyment (65% from BW, and 70% from Valencia). Additionally the information contained on the platform were estimated as very useful. However, more detailed questions revealed usability problems on both websites, such as unclear navigation structure etc.

One of the main issues of both platforms was to make the participation features more prominent. The BW pilot website was structured as it is shown in Figure 4. The participation features were placed on the bottom of the navigation bars ("Participate", "Question of the week", and "From the forum"). The main section showed a general description of the project and the platform as well as the news.

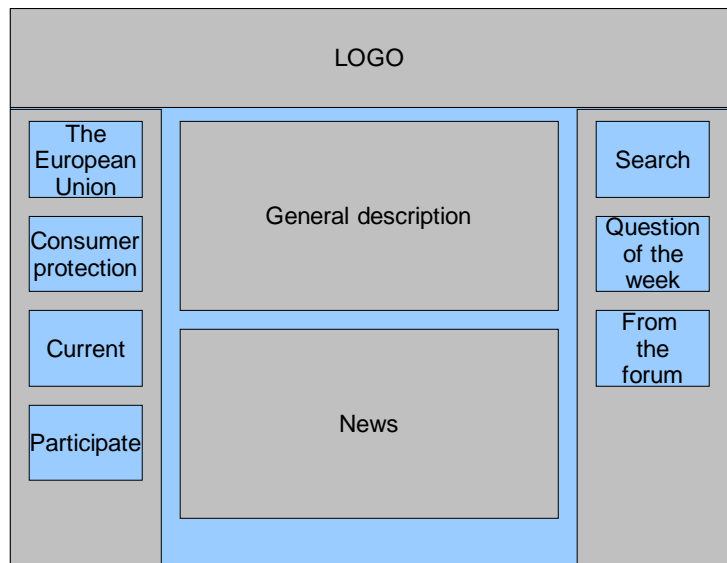


Figure 4: Pilot structure of the BW platform

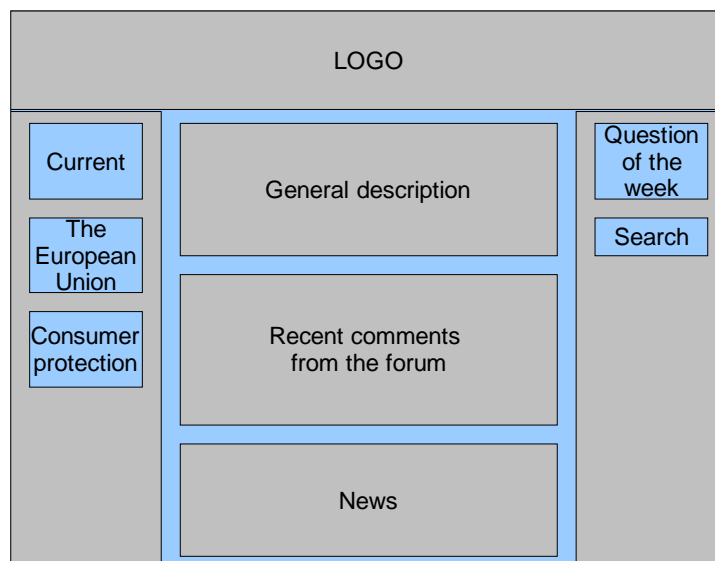


Figure 5: Current structure of the BW platform

After the revisions resulting from the testing phase, the structure as shown in Figure 5 has been implemented. The participation possibilities have been given a more prominent place in the centre of the website.

A further decision on both platforms was to reduce the provided participation features. The pilot version provided all available features (as they are described in section 5.1). The participation features have been reduced for two reasons. First, fewer features simplify the user interface. Second, participation features should only be provided if the voice of the participants will be really heard. This could not be ensured from the beginning onwards with regards to the official letter and petition feature. The current remaining features are online discussion forums, blogs, calendar of events, newsletter, comment form, frequently asked questions, user registration, and search engine.

Another decision was the personalisation of the question of the week and the linkage with specific related forum topics. If possible, the question of the week will be asked by an MEP in order to present MEPs and their fields of activities to the citizens. For example, in calendar week 49 the question of the week on the BW platform has been asked in the name of Evelyne Gebhardt⁵ (MEP) and she answered some citizens' questions in the forum.

The VoicE project is currently in the first phase of installation (the official launch took place on September 29th, 2008). The improvement of the platform will continue in the installation phase with the "collect feedback" stage, which will start in January 2009. By that time not only the usability of the features and information provided on the website will be evaluated, but also the impact of the participation on the users.

6 Conclusion and Outlook

The introduced usability engineering lifecycle helps to ensure the usability of eParticipation applications by providing a structured and comprehensive methodology to design and implement such system types. Special attention is paid to user involvement in the overall process.

The lifecycle consists of a number of stages that have been applied in the VoicE project to ensure the usability and usefulness of the platform. It is not a complete implementation of Nielsen's proposed solution, but it extends his "Discount Usability Engineering" approach to budget constraints or time pressures to optimise the lifecycle for the eParticipation context (Nielsen, 1993, p. 112).

The usability engineering methodology has been applied in the design and implementation of two platforms in two different regions of Europe. It turned out useful to improve the system by:

⁵ See http://www.bw-voice.eu/index.php?option=com_surveys&Itemid=50&act=view_survey&survey=EU-Parlamentarierin+Evelyne+Gebhardt+fragt

- detailed analysis of the overall system before the start of any implementation,
- iterative design of the systems' features, their interaction and the user interface, and
- involvement of users in the design process.

Next steps in the proposed usability engineering lifecycle involve the collect feed back stage. This also includes the evaluation of the eParticipation process in order to improve iteratively the platform till the end of the project.

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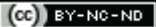
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