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Author(s): Enrique Sanz, Unai Lopez, Ivan Pretel (DEUSTO), Vincenzo Cartelli, Orazio Tomarchio, Giuseppe Di Modica (BENG)

Reviewer(s): Antonio Filograna (ENG), Gustavo H. Paetzold (USFD)

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Glossary

CKB	Collective Knowledge Base
CPD	Collaborative Procedure Designer
QAE	Question Answering Engine
REST	REpresentational State Transfer
SIT	Stakeholder Incentivization Techniques
UI	User Interface

Executive summary

This document is the deliverable **“D4.2 – Basic methods and tools for human computation”** of the European project **“SIMPATICO - SIMplifying the interaction with Public Administration Through Information technology for Citizens and cOmpanies”** (hereinafter also referred to as **“SIMPATICO”**, project reference: 692819).

SIMPATICO addresses a strategic challenge towards the **innovation and modernization of the public sector**: the need to offer a more efficient and more effective experience to companies and citizens in their daily interaction with Public Administration (PA) by (i) offering a personalized delivery of PA online services; (ii) enabling a better comprehension of the complex processes and documents (forms, regulations, etc.) behind these services; (iii) engaging them to improve the administration processes and services. SIMPATICO's goal is **to improve the experience of citizens and companies in their daily interactions with the public administration** by providing a personalized delivery of **e-services** based on Natural Language Processing techniques and by promoting an active engagement of people for the continuous improvement of the interaction with these services.

This report includes the **results of project tasks T4.2 “Social question answering engine”, T4.3 “Collaborative procedures designer” and T4.4 “Citizenpedia collective knowledge base and API”**. Each of these tasks corresponds to a software module of the Citizenpedia, the **Question & Answer Engine (QAE)**, the **Collaborative Procedure Designer (CPD)** and the **Collective Knowledge Base (CKB)** respectively.

This deliverable details the current implemented functionalities, the interfaces and the next steps for each the mentioned components.

1 Introduction

The Citizenpedia is the human computation framework that leverages the SIMPATICO project with the collaborative knowledge provided by its stakeholders. It will complement the SIMPATICO environment with a place where citizens can find answers to their questions/doubts and interact in an amenable way with the public administration. It will expose mainly two tools to the stakeholders: the first one is a Question Answering Engine (QAE), where citizens will be able to post and solve doubts, and also to look up for terms and definitions. The second one is a Collaborative Procedure Designer (CPD), where civil servants will describe current e-services in the form of flowcharts/diagrams and citizens will be able to comment on them. This way, Citizenpedia will enable an easy way for citizens to take part in the design of bureaucratic procedures.

This deliverables presents the development status of the Citizenpedia up to M12 of the project. The starting point of the development tasks was M4. The design and requirements for the framework had been already defined in the previous deliverable of WP4, the D4.1: “Citizenpedia framework specification and architecture”.

This deliverable is structured as follows: Section 2 provides an overview of the Citizenpedia architecture and defines the interactions between the different modules of the human computation framework. Section 3, 4 and 5 are devoted to the Question & Answering Engine (QAE), the Collaborative Procedure Designer (CPD) and the Collective Knowledge Base (CKB) modules respectively. These sections provide a brief description of the current implementation, a list of the interfaces that the modules provide for the connection with other SIMPATICO components and an overview of the next steps that will be taken in the development of those modules. Finally, we draw some conclusions in Section 6.

2 Citizenpedia Architecture

The Citizenpedia framework is composed of several building blocks, each providing a functionality. Some of them will provide a UI for citizens/civil servants and other will provide support for storage/queries/management. In addition, we consider two main ways of accessing the Citizenpedia: through a web user interface (mostly for citizens/civil servants) or through a REST API (aimed for the communications with other SIMPATICO components or 3rd party applications).

The architecture is defined in Figure 1:

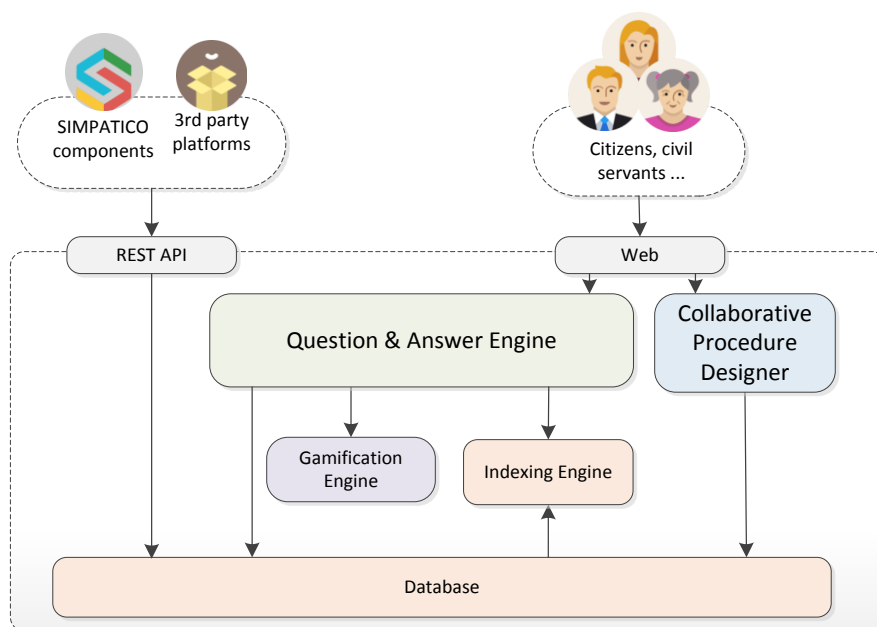


Figure 1 – Citizenpedia Architecture

The Question & Answer Engine (QAE) is the part of the Citizenpedia where citizens can post and resolve doubts regarding e-services and public administration. The main functionality provided by QAE is to create and answer questions in a public manner. We will encourage users to communicate in a public manner, with the aim for all the generated information to persist. A second functionality is to provide a dictionary-like form where legal terms (that can appear in the QAE questions) are defined. The QAE is represented in the Figure 1 as a green block.

The Collaborative Procedure Designer (CPD) is the part of the Citizenpedia that offers graphical tools to the civil servants and stakeholders to collaborate on the design of administrative procedures. It mainly provides users with a shared canvas where procedure responsible can draw the procedures in a graphical language and the stakeholders can provide useful feedback. Also, once the procedure has been finally designed and enacted, the tool will enable citizens to further comment and make questions. In respect to this, citizens' questions will feed the QAE component, and will have to be elaborated by civil servants in the same way as it happens for the questions posted on the e-services; citizens' comments will provide useful hints to procedure owners in order to better refine the design of the procedure. The CPD is represented in the Figure 1 as a blue block.

The orange blocks of the Figure 1 correspond to the Collective Knowledge Base (CKB), the persistence part of the Citizenpedia. It contains the database which stores the data from the QAE and CPD. The CKB also includes the indexing engine, a tool complementary to the database used to provide enhanced results to text-based queries in the QAE.

Finally, the gamification engine (also described as Stakeholder Incentivation Techniques) enables to apply gamification techniques within the Citizenpedia. It allows to define and modify a scoreboard and several badges to the Citizenpedia users. Each time a user performs an action, e.g. answering a question, s/he is registered in the gamification engine, and its reputation skill will be computed.

The indexing engine and the gamification engine are not described in this deliverable, due to the lack of implementation at the time of writing the document (M12). The indexing engine has been left for implementation beyond M12 as its functionality was not found strictly necessary to conduct a core evaluation of the Citizenpedia. Instead, other tasks, such as testing and debugging, were prioritized in the first development period. In the case of the gamification engine, its implementation and deployment is linked to Task 4.5 (Stakeholder incentivization techniques and Citizenpedia deployment), which begins in M13. However, both modules will be included in further versions of the deliverable, as long as they have been developed.

3 Question & Answer Engine

3.1 Short summary of key functionality

The current development of the QAE provides the following functionalities. Some of them fulfill several requirements defined in deliverable D4.1 (section 4.1):

1. **Question, answer and comment management:** a user logged in the Citizenpedia can post a question or write an answer/comment to an existing answer/comment. It also enables to add an *upvote* (represented as a star in the current implementation) to a question or answer. These functionalities fulfill the requirements QAE.1, QAE.2, QAE.3 and QAE.4.
2. **Category management:** each question will belong a given category in the QAE. These categories will be defined by the pilot sites (or the one who manages Citizenpedia), and should be generic enough to hold every question in a reduced set of categories, e.g.: health, transport or education. This way, the questions are ordered by category and they are easier to search by the end user.
3. **Tag management:** different tags can be added to each question. These tags are words more concrete than the categories, and shall enable an easier search of questions in conjunction to the categories.
4. **Term management:** the QAE contains a Wikipedia-like section that contains a list of terms with their corresponding definitions. The aim is to provide a place that holds the explanation of difficult words or expressions that might be subject of question. This functionality fulfills the requirement QAE.6.
5. **User management:** the QAE contains a module to register and manage the log-in process of the users, in order to control who posts contents. This log-in module is provided by another component of the SIMPATICO platform, as the project offers a unified log-in solution. This functionality fulfills the requirement QAE.8.

The QAE has been implemented as a web application, amenable to use from any modern web browser. The user interface is responsive, i.e., it is automatically adapted to the screen that is being used, whether is a mobile phone, tablet or standard PC screen. This functionality fulfills the requirement QAE.9.

3.2 Interfaces

This section describes the REST methods related to the QAE information exposed to other SIMPATICO components and 3rd party applications. Each method is described in a separate table.

Method	/stats/questions/{eservice}
Type	GET

Description	Returns the number of questions related to the e-service provided as parameter. It is commonly used by the Interactive Front-End and Enrichment Engine.
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Method	/stats/questions/{eservice}/{paragraph}
Type	GET
Description	Returns the number of questions related to a specific paragraph of the e-service provided as parameter. It is commonly used by the Interactive Front-End and Enrichment Engine.

Method	/qae/questions/{eservice}
Type	GET
Description	Returns all the questions (and their corresponding answers and comments) related to the e-service provided as parameter. It is commonly used by the Interactive Front-End.

Method	/qae/questions/{eservice}/{paragraph}
Type	GET
Description	Returns all the questions (and their corresponding answers and comments) related to a specific paragraph of the e-service provided as parameter. It is commonly used by the Interactive Front-End.

Method	/qae/term
Type	GET
Description	Returns the definition of the provided term.

3.3 Next steps

This list compiles the next features to be implemented in the QAE:

- Integration with the gamification engine, in order to fulfil all the SIT requirements.
- Implementation of a spam management module, which would prevent the users from posting low quality questions, answers or comments. This will fulfill the requirement QAE.7.
- Implementation of the full role-based user management system, which will enable to have moderator users which have full access the content. This will fulfil requirements QAE.5 and QAE.8.

3.4 Links

This section provides the links to the source code and online demo of the component.

- Source code: <https://github.com/SIMPATICOProject/Citizenpedia>
- Demo: <https://simpatico.morelab.deusto.es/citizenpedia/>

4 Collaborative Procedure Designer

4.1 Short summary of key functionality

The current development of the CPD provides the following functionalities, which mainly respond to the CPD.3 requirement and put the basis to meet the rest of requirements defined in deliverable D4.1 (section 4.2):

1. **Graphical design of administrative procedures.** Tools are provided to draw procedures and the relative phases (or “procedure steps”) in the form of a value-chain diagram. The procedure owner may provide textual description of the overall procedure and phases. Finally, s/he may also specify whether a given phase involves the use of an e-service from the citizen.
2. **Stakeholders’ comments management.** Stakeholders may participate in the design of the procedure by posting their comments (suggestions) on the procedure diagram’s elements. The procedure owner, as well as all stakeholders, are allowed to look up any comment provided on any diagram element.
3. **Citizens’ questions management.** Citizens may post questions on the diagram. Question may be posted on the procedure itself or on any of the element that the diagram is composed of. To pose a question, a citizen is re-directed to the QAE, which offers typical tools for posting questions. Likely, civil servants will respond to citizens’ questions on the QAE. When a new procedure diagram is loaded, every diagram element will display (if any) the number of questions citizens have already posted on it. By clicking on that number, the citizen will be redirected to the QAE where they are presented with the questions list.
4. **User management:** the CPD contains a module to register and manage the log-in process of the users, in order to control who posts content. This log-in module is provided by another component of the SIMPATICO platform, as the project offers a unified log-in solution.

The CPD has been implemented as a web application, amenable to use from any modern web browser. The user interface is responsive, i.e., it is automatically adapted to the screen that is being used, whether it is a mobile phone, tablet or standard PC screen.

Diagrams, diagram elements, textual descriptions and comments provided by stakeholders are stored in the Citizenpedia database. This database is part of the Collective Knowledge base of the Citizenpedia. Those contents are exposed through a REST API for their consumption from other SIMPATICO components. These functionalities fulfill the requirement CKB.1.

4.2 Interfaces

This section describes the REST methods related to the CPD information exposed to other SIMPATICO components and 3rd party applications. Each method is described in a separate table.

Method	/cpd/diagram/eService/{eServiceId}/summary
Type	GET
Description	Returns information on the procedure diagram that a given eService is part of. Among others, an <i>svg</i> image of the diagram and the URL of the diagram's web page are returned. They are commonly used by the Interactive Front-End.

Method	/stats/diagram/{diagramId}/eServiceCount
Type	GET
Description	Returns the number of eServices involved in a given procedure diagram. It is commonly used by the Enrichment Engine.

4.3 Next steps

This list compiles the next features to be implemented in the CPD:

- Integration with the gamification engine, in order to fulfil all the SIT requirements;
- Implementation of the drawing functionality that will enable civil servants to represent user-PA interactions within an administrative procedure diagram. These feature will finalize the fulfillment of requirement CPD.3;
- Implementation of the collaboration workflow. This will fulfill requirements CPD.1, CPD.2, CPD.4 and CPD.5;
- Implementation of the full role-based user management system, which would enable to have users with differentiated access the CPD functionalities. This will fulfill requirements CPD.6 and CKB.5.

4.4 Links

This section provides the links to the source code and online demo of the component.

- Source code: <https://github.com/SIMPATICOProject/Citizenpedia/cpd>
- Demo: <https://simpatico.business-engineering.it:8901>

5 Collective Knowledge Base

5.1 Short summary of key functionality

The current development of the CKB provides the following functionalities. Some of them fulfill several requirements defined in deliverable D4.1, section 4.3:

- **Data storage:** The CKB stores the questions, answers, comments and terms of the QAE, and the diagrams and user-feedback of CPD. This functionality fulfills the requirement CKB.1.
- **RESTful interfaces:** The information contained in the CKB can be accessed through a set of REST queries, as well as the main functionalities and statistics of the usage of Citizenpedia. This functionality fulfills the requirement CKB.4

5.2 Interfaces

The interfaces that expose the data of the Citizenpedia have been already described in the previous 3.2 and 4.2 sections. This way, the methods have been ordered according to the information they provide access to, QAE and CPD respectively.

5.3 Next steps

This list compiles the next features to be implemented in the CKB:

- Integration of the indexing engine, in order to provide better search capabilities. This will fulfill requirements CKB.2 and CKB.3.
- Implementation the full role-based user management system, which will enable to better control the access to the data. This will fulfill requirements CKB.5.

5.4 Links

The CKB implementation is mostly based on 3rd party components, such as an open source database for the storage of the Citizenpedia content. Thus, no significant portion of source code has been released as a standalone CKB.

6 Conclusion

The Citizenpedia is the human computation framework within the SIMPATICO platform. It provides a framework where citizens can post and solve doubts related to e-services, and also to interact with the public administration. This deliverable describes the functional and technical aspects of the Citizenpedia, and the activities developed until M12.

The Citizenpedia is formed by several components: a Question & Answer Engine (QAE) where the SIMPATICO stakeholders can post, answer and comment on doubts related to e-services and bureaucratic forms, a Collaborative Procedure Designer (CPD) that enables the stakeholders to interact with the administration in the process of defining new administrative processes, and a Collective Knowledge Base (CKB) that holds and exposes the information for the QAE and CPD. The architecture of the Citizenpedia (i.e., the way that these components interact among each other) has been described in Section 2.

Each of the components has reached a state of development in the M12 of the project that has been described in Sections 3, 4 and 5 of this deliverable for the QAE, CPD and CKB respectively. For each component a summary of the implemented functionalities, a description of the interfaces that the component provides and a list of the next steps to the implemented is provided.

During the upcoming months, the next activities for WP4 will be: (1) collect the feedback from citizens and civil servants in the first phase of experimentation in order to improve all the components, (2) implement missing features, such as the indexing engine and the gamification techniques and (3) test and bug fixing for a better user experience.