Knowledge-based platform for eGovernment agents: A Web-based solution using semantic technologies

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Knowledge-based platform for eGovernment agents: A Web-based solution using semantic technologies

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Keywords: eGovernment, Semantic, SOA

Abstract

Currently eGovernment is clearly gaining momentum in our society. Many solutions and projects are being developed and, among the large amount of used tools, semantics is called to play a paramount role. In order to overcome issues related to cooperation, interoperability and accessibility of services in the domain, semantics can be used to improve in-use solutions and to develop new mechanisms able to support the development of expert and intelligent systems in eGovernment. This paper addresses a semantic based philosophy to tackle a holistic platform for the domain taking into account the knowledge of the administrations. By means of intelligent documents and Life Events, as they are presented in the paper, it is possible to build up a intelligent platform to host eGovernment services, as proved by the successful study case Tecut portal.

1. Introduction

Cooperation among Public Administrations, here after PAs, represents an important element to reach citizens and firms need, efficient organization management, and a higher quality in provided system. In such context, PAs organizational structure needs the introduction of expert, intelligent and dynamic solutions that can reduce time-to-market and cost. Interoperability is the main topic to boost PAs cooperation support. We can find different types of interoperability Pollock and Hodgson (2004), and it may have different meanings depending on the context where it is used. In our case, it is generally understood to mean the ability of disparate IT to exchange and manage data and information in order to work together in a networked environment. If a high interoperability level is reached, different administrations can cooperate sharing resources and developing federated communities. A working paper by Commission of European Community asserts the importance of the interoperability role of the European Communities (2003a). Therefore, we can state that interoperability is not just a technical feature but a fundamental semantic and organizational aspect that has to be properly managed.

As PAs evolve their support for eGovernment solutions, multi-layered solutions are introduced to improve front and back-office interoperability (intra and inter administrations). Nevertheless, an in-depth review of these systems unveil different problems to deal with, i.e., the mismatching among the use terms. As shown on the paper, our proposed solution introduces a semantic representation of reality to support computer based reasoning and to specify in a formal manner tasks. Therefore, a fitting process about business process, PAs knowledge, and software applications is developed. A proper knowledge management is needed to promote strategic innovation in Public Administrations and to guarantee a suitable solutions. In this way, it is easier for machines to automatically process and integrate available information. A semantic description can be a promise for developing knowledge in Public Administrations and at the same time it can be seen as a huge engineering solution. The complexity of e-government domain is properly face considering a mesh of socio, technological and organizational aspects.

This paper intends to show the implementation of a solution offering customer-oriented services in a Web portal developed by Marche Region, the Tecut portal (Tecut, 2007). A semantic-base approach on the so-called “Life Events”. LEs here after, is discussed to face with the complexity of service delivery and to improve the efficiency and reusability of e-government Web-based information management systems. In such context documents, that are the main input-output of public administration operation has to be considered focus on their explicit formalization. Our proposal allows several advantages such as automatic services composition, advanced searching mechanisms, new functionalities as well as a better usability from the point of view of end users. Summing up, our approach provides a more friendly users support for
eGovernment services. Finally, from our experience, we conclude that the introduction of semantic based LE portal based on intelligent documents facilitates the support of eGovernment solutions in a holistic manner.

The rest of the paper is organized as follows. Firstly, we present the current eGovernment state of the art and a brief introduction to the semantic technology. Secondly, we introduce Life Events, LEs, as an artifact to model citizen needs and Intelligent documents as a new and more powerful manner to store and deal with citizen data. Later on, a use case, the Tecut portal, where the proposed ideas are implemented is presented. Finally, conclusions are yielded.

2. eGovernment general overview

Since 2001 eGovernment represents one of the main application domain for Information and Communication Technologies (ICTs). Moreover, it represents a test bed, not just in Europe and the United States but worldwide for challenges and opportunities in a cross-disciplinary area.

In literature we can find a several definitions for eGovernment. Some of them are focused on the role of service, others take care of the point of view of citizens and other are centered in the internal processes of the administrations. We can outline some them.

- “The use of ICT in public administrations combined with organizational changes and new skills in order to improve public services and democratic processes and strengthen support to public policies” European Communities (2003b).
- “The use of communication and information technology (ICT) and its application by the government for the provision of information and basic public services to the people” UN (2004).
- “The use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government” The World Bank’s Information Solutions Group (2007).

Services represent a promising abstraction in e-government domain, as matter of fact they are the primary output of government organizations. As recognized by European Commission Communication from the Commission to the Council et al. (2003) digital services in e-government represent the main instrument to make government able to reach citizens, companies and other administration and satisfied their institutional goal. eGovernment digital service encapsulates government processes and informative resources making them available through the Information and Communication Technology. Since they are intangible, it is not possible to split the services from their delivery processes that are influenced by the set of activities and the complex network of partnerships involved in the delivery itself. This scenario drives our discussion and motivate the holistic approach based on the so called LEs.

Dealing with eGovernment requires the identification of the particular areas according to which costumers we are dealing with. These may include individuals, organizations, technical systems, social relations and value systems (Traunmüller, 2003).

Government-to-Citizen (G2C) Services in this category deal with the relationships between government and citizens. They allow citizens to access government information and services instantly, conveniently, from everywhere, and, even, using multi-channels solutions. We can also consider the case of Government-to-Employee (G2E). This area tackles the support for the civil servants themselves with services to manage their carrier, productivity and so on.

Government-to-Business (G2B) It drives eTransactions initiatives between government and the private sector such as eProcurement. It also supports specific tools for paying on-line taxes. The opportunity to conduct online transactions with government reduces red tape and simplifies regulatory processes. It, therefore, helps businesses to become more competitive. Close to this area, we can also refer to Government-to-Nonprofit (G2N). This area deals with the special needs of non-government organizations such access to specific support their initiatives, information about funding and related issues, etc.

Government-to-Government (G2G) This kind of services provides government departments or agencies cooperation and communication and internal exchange of information and commodities. As matter of fact, governments depend on other levels of government to effectively deliver services and allocate responsibilities. The introduction of full interpretability, inside public administrations, facilitate the sharing of data, resource and capabilities, enhancing the efficiency, and effectiveness of processes.

The promotion of eGovernment introduces a lot of advantages related to effectiveness, efficiency, service quality, transparency and accountability of government. It upgrades of government staff skills and facilitates ICT awareness. At the same time, it reduces the cost and improves the access and the delivery of government information and services. In this context, the promotion of social agreement allows the satisfaction of the stakeholders and the diffusion of ICT enabling eGovernment and simplifying government services distribution.

Finally, as addressed by the most recent study provided in the context of e-Europe Benchmarking Program1 76% of the basic e-government services2 are available on-line (Colclough, 2007). The survey shows that on-line public services in the European Union is under improvement respect to the 2006 survey (Wauters & Colclough, 2006). The current situation provides an interesting starting point to exploit the full potential of e-government even if European Union still shows a gap with the 100% objective. A more interesting view refer to the Internet-based interaction between citizens and Public Administrations. According to the data provided by the Eurostat3 only 26% of European citizens use Internet to interact with public authorities. It is clear that something did not go in the right way, citizens do not use Internet in Public Administrations interaction and the efforts spent in e-government development drive administrations in the wrong direction. We assume that our approach can support the services use and push the e-government development.

3. Semantic technology

The “semantic”, as an IT researching field, was born in the earlier 2000’s. In May, 2001, Sir Tim Berners-Lee published the foundational article presenting the semantic to the world (Berners-Lee, Hendler, & Lassila, 2001).

“The Semantic Web will bring structure to the meaningful content of Web pages, creating an environment where software agents roaming from page to page can readily carry out sophisticated tasks for users” Berners-Lee et al. (2001).
The ethos of this idea is to make machines capable of understanding the information within the web. This feature will allow them to make more complex interactions with no need of human support. To accomplish this ambitious goal a long evolution on the technological side has been undertaken during these last years. Currently, the support for these features has been based on the use of OWL (W3C, 2004), a standard from the World Wide Web Consortium. This one allows the IT people to define knowledge about a concrete domain in a formal manner, i.e., to provide an ontology according to Gruber definition (Gruber, 1993).

The use of semantic support in IT-based solutions allows the introduction of “intelligence” in software based systems. Thus, it is possible to perform operations no possible in “raw-data based solutions”. Taking advantage of this semantic support it is possible introduce a computer based reasoning enabling process automatization.

Semantic solutions are also discussed in service modeling in term of business and system allowing software agents to search and to obtain services on behalf of the users. Services are expressed according to a particular languages, Nowadays, the scientific community has reached an agreement around the use of OWL W3C (2004), a W3C, W3C (2005) language to express semantic information.

4. Life events

From the review of current fashion Web site for eGovernment services, some shortcomings and limitation become clear. These limitations are related to the following constraints and cause the limited services use.

- **Locating services is not a simple task.** When looking for a particular service in the web site of a PA, it is not a trivial task to find the proper place where the service is held. This is due to wide variety of classification for services, mechanisms for its invocations, visual interfaces and even problem to know before hand if the administration is the responsible for the wished service.
- **Very few administrations provide information about the evolution of services.** Once the operation is requested no more information or tracking is possible. So, in the case of services that take a lot of time, citizens may not feel involved in the process.
- **Web accessibility is not always a highlight in most Web portals.** Official web sites are often WAI-AA or WAI-AAA compliant W3C (2007) but this is not the general rule. Besides, the classification of the information itself and the interaction mechanisms are not always as simple and easy as we would wish.
- **Little information about the service, execution conditions, or its evolution is provided.** It is not common to find information about the level of security of invoked operation, the maximum life span for service allowed, laws that support and regulate that service and so on.
- **Several administrations can be concerned by the same topic.** In some operation there may be several administrations concerned (i.e., moving to a new home) and that may drive citizens to confusion.
- **Different mechanisms for identification are required in different administrations for the same citizen.** No single and horizontal mechanism to access services is available on most official web sites. Usually, a citizen must authenticate himself using different mechanisms in different administrations: a pair username/password, a digital certification, a smart card, . . .
- **Usually it is not possible to customize the access to services.** It is not possible for citizens, once they are logged in, to access the most likely services to be invoked according to their profiles, their costumed interfaces, and, even in most cases, no profiles are stored. We observe lack of citizen profile managing.

This leads us to propose a new paradigm to model and characterize services in this domain. The use of LEs is proposed. At the same time, we discuss on a proper methodology useful in order to transform common service into a LE expressed under the terms of the provided ontology.

4.1. LE definition and characterization

LEs can be considered as an artifact to model those situations where a citizen needs support or license from a Public Administration to tackle a situation from his own point of view. This would be the case of LE such as moving, losing the wallet or requesting a grant; on contrary situations such as getting a form or a certification or submitting a piece of information to a Public Administration cannot be considerer in the same way. LE can be describing under the following topics.

- **Task.** Title for the considered operation. Folksonomies plays an interesting role as they provide support for semi-automatic enhancements of discovering services.
- **Description.** High level description of the desired operation expressed in natural terms from the point of view of the citizen.
- **Input documents.** As previously stated, all operations carried out by the administration require some input documents. Citizen is requested to provide a signed form in order to invoke the operations. Input document plays a role similar to preconditions in some environments.
- **Output document.** As a result of any performed operation, the PA in charge must provide an output. This output will vary its content from one or more expected documents (i.e., a certification, a license, etc.) to information about the failure.
- **Scope.** We must identify the scope of the operation (local, national, international, etc.) where we want the operation to be recognized.
- **Security conditions.** This is intended to express the conditions for the security mechanism involved during the whole process. This includes the identification of parties, citizen and PAs, and also the way is stored by any involved that could be able to use it.
- **Cost.** This will express the amount you have to pay for the requested operation and/or also the time it will take for the completion of the operation.
- **Steps.** A LE can go through different stages until its fulfilling. A description of them must be provided to be at the disposal of citizen willing to make use it.

4.2. Methodology

In order to transform common services into a LE expressed in the proposed terms, we must follow a simple methodology. For the sake of clarity, we are going to show the former by means of an example: the situation in which a citizen has to move to a new residence. This operation may require the collaboration of several different PAs and several processes the citizen does not have to be aware of. Thus, we propose the following schema (see Fig. 1):

1. Identify the problem and dealing features as PAs involved. Applied to our practical case, the task we are dealing with is the change of address for a citizen. The involved PAs are the cities
Decompose the problem into several different problems that may be solved in a single step, i.e., each step must produce as output a document meaningful for the citizen. The considered operation in the example may involve one single operation and no subprocesses are relevant to the citizen.

3. For each identified subprocess, look for the input documents, scope, and cost. These ones must be expressed in terms of the LE ontology. The input document required in our case is the certification of the current citizen address, the document to prove the new address and the signed request for the change. The scope for the operation is national. No cost is put on the citizen and no limitations are related to it.

4. Identify internal partial aims for citizens and PAs. These steps usually involve internal documents. They can be meaningless for the citizen but relevant for the administrations. In our example, several steps can be identified: check for the correctness about the former address data, look for pending payments, update internal data, notify related PAs, and, finally, generate the certification for the new address.

5. Identify possible documents as possible final steps of the operation. In our case, the target document is the certification for the new address. Nevertheless, if problems arise, mainly related to some internal step, documents to notify those errors may be generated. Those documents will inform about problems due to pending payments, problems with legal constraints, etc. These documents must be included in the ontology.

6. Update all services and agents that may be aware of the new service.

4.3. Applying semantics

So far, no technological binding has been established. This approach can be used in different frameworks or using several technologies. Nevertheless, in our work we take advantage of semantic support to unleash all possibilities within this technology.

The proposed approach takes advantage of the power of OWL to express the information relevant for the system. Nevertheless, we must keep in mind that OWL is just a tool to express knowledge with all its potentialities and limitations. Some OWL limitations related to its expressiveness have been faced. In particular, OWL does not support relations that involve properties whose range is a class itself. Only an individual from a particular class is a possible range for properties. This leads us into shortcomings in the definition of some relations (for example, we would like to establish a relation between an individual from the class LE and a subclass of “document”, not an individual from that class). This situation was overcome using a higher level of abstraction implicit in a single individual (the use of individual document belonging to the class document as a generic one with no information by itself).

Additionally and for the sake of consistency of current and future information in the system, some rules have been defined (see Fig 2): all LEs generate some Document (Rule 1), all LEs are supported by some PA (Rule 2), all Documents are issued by some PA, etc. Of course, lower level details about the conformance to local or national laws regarding documents and legal procedures are not considered at this point and further implementations of the system should take care of it.

5. Document management

In literature, a document can be described simply as recorded information structured for human consumption. A document can be also defined as an information set pertaining to a topic, represented by a variety of symbols, stored and handled as a unit (Ralph and Sprague 1995). A more detailed definition accommodates technology somewhat more. A document is a snapshot of some information set that can Meier and Sprague (1996):

- incorporate many complex information types;
- exist in multiple places across a network;
- depend on other documents for information;
- change on the fly (as subordinate documents are updated);
- have an intricate structure, or complex data types such as full-motion video and voice annotations; and
- be accessed and modified by many people simultaneously (if they have permission to do so).

In democratic administration, documents are the most common input/output for services delivery and they represent the only prove that an operation has to been done and must be supported. In this sense we mean document as the input and output of an orchestration process offered by the community of PAs and citizens that participate in its creation.

In this context, the emergence of eGovernment has resulted in the creation of e-documents and the information they contain is indeed a valuable asset that must be carefully managed. In this manner the intra and inter organization structural dependencies are removed and the introduction of efficient on-line services is promoted. Moreover, an accurate and reliable electronic document definition and an effective system to manage them, governments can hold accountable for their decisions and actions and the rights and obligations of citizens and corporate bodies can be upheld.

Starting from the document definition and the importance of document inside PAs, we propose the introduction of the intelligent document – using an ontology-based approach – to maximize PAs functionalities and quality. The intelligent document is not only a modular form, but it is produced by services coordination.

Following we introduce the main characteristic regard intelligent document (Corradini, Polzonetti, Pruno, & Forastieri, 2006).
MultiComposed – The user can take advantage from the participatory design approach.

MultiVersion – The tracking of the document is guaranteed by the persistence of the different document’s versions.

MultiDatatype – Different types of data compose structure of the intelligent document, if not otherwise specified by the file schema.

5.1. Document definition and characterization

Within our proposal, a syntactic and semantic document representation and a standard for electronic documents are provided. We make use of Structured Document Architecture (SDA) exchange. It is expressed by means of an ontology and it is intended to promote interoperability among services and related Public Administrations. This technology is part of the Dodibox project (Neta, 2005).

In the frame of this initiative, SDA documents are wrapper that address a certain level of quality information. In particular, SDA takes into consideration information related data and metadata. The final aim is to define the semantic representation of the document. SDA is based on Health Level 7 (Level Seven, 2008). It is a standards for electronic interchange of clinical, financial, and administrative information among health care oriented computer systems and it defines Clinical Document Architecture base on an object model.

In particular, SDA documents are constituted by the following parts (see Fig. 3). A header, SDA Metadata Header, is composed of metadata describing the document in line with metadata standard (see Table 1 for a complete list of them). More in general the header contains information useful to define meaning and semantic context of the document. A further header, the SDA Application Header, concerns Application dedicate tasks. It contains the service description related to the specific form. A body or SDA Body is divided into sections concerning the document’s data. The structure of the data must respect specific schemas (related to forms). One or more attachment, SDA Attachment, the first represents the printable version of the SDA document, the others include the signed version of the document or simple binary flow related to the document.

As already mentioned, the document definition and managing has a great impact on the methodology introduced, as shown on previous section. In steps third and fifth of the already presented methodology, this considerations are taken into account. In par-

<table>
<thead>
<tr>
<th>Rule</th>
<th>Definition</th>
</tr>
</thead>
</table>

Rule 1: \( R_1 = \forall LE \exists Doc, \text{ generates}(LE) = Doc \) 

<table>
<thead>
<tr>
<th>Rule</th>
<th>Definition</th>
</tr>
</thead>
</table>
|      | ```xml<owl:Class rdf:about="#LifeEvent"/><rdfs:subClassOf><owl:Restriction><owl:someValuesFrom rdf:resource="#PA"/></owl:someValuesFrom></owl:Restriction>

Rule 2: \( R_2 = \forall LE \exists PA, \text{ isSupportedBy}(LE) = PA \) 

<table>
<thead>
<tr>
<th>Rule</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>```xml<a href="">owl:onProperty</a>&lt;owl:InverseFunctionalProperty rdf:ID=&quot;#isSupportedBy&quot;/&gt;&lt;/owl:onProperty&gt;&lt;/owl:Restriction&gt;<a href="">rdfs:subClassOf</a></td>
</tr>
</tbody>
</table>

Fig. 2. Rules defined in the system.
5.2. Applying semantics

We use a document ontology capable of enriching the meaning of static electronic document. Thus, we introduce an extension of the current document concept in which information is given well-defined meaning, better enabling computers and people to work in cooperation. Following we propose an OWL screenshot about our ontology.

![Fig. 3. Structured document architecture.](image)

<table>
<thead>
<tr>
<th>Metadata</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Title</td>
<td>It represents the identification of the document</td>
</tr>
<tr>
<td>Creators</td>
<td>It refers to the first user involved in the document compilation</td>
</tr>
<tr>
<td>Contributor</td>
<td>It refers to the list of users involved in the document compilation</td>
</tr>
<tr>
<td>Language</td>
<td>It refers to the list of language introduced in the document or in which the document is available</td>
</tr>
<tr>
<td>Date</td>
<td>It refers to the creation and last updating of the document</td>
</tr>
<tr>
<td>Version</td>
<td>Document can be modified and changes from one version to another one must be tracked</td>
</tr>
<tr>
<td>Commodification</td>
<td>When document is considered as a commodity, its price or cost is an important factor in relation to the creators</td>
</tr>
</tbody>
</table>

Table 1

Document metadata header.
On this code it is shown how it is possible to, taking advantage of semantics, define properties and conditions using just OWL to keep all the system under concrete rules.

Bearing all these concepts in mind, we can conclude that the introduction of this intelligent document overcomes several PAs problems related to document processing. In particular, quite positive results were granted regarding to scalability and dynamic specialization according to the real needs of the PA and involved citizens. Semantics can be considered the booster for these enhancements as it supports intelligent management of services and documents managing, knowledge access and sharing, and integration with the existing technologies.

Also, we explore the possibility of taking advantage of microformats microformat.org (2009). By means of this semantic technology, it is possible to provide extra information for browsers and other software agents checking on the correspondent web page. To achieve this goal, the described ontology was taken as a basis and a data model was derived. Thus, a data model to present information about LE is provided in a convenient manner as show in following lines:

BEGIN:LE
VERSION:1.0Local
Name:Becoming18
DL:SocialCareOffice
RequiredDocument:ID,RequestBecome18
GeneratedDocument:Certiﬁcation, ElectoralData
END:LE

6. The Tecut experience

Web portals are playing an important role in the provision of digital services for citizens and PAs. The evolution from the old-fashion Web sites to the current Web portals has allowed the development of new ways of accessing public services, etc. The emerging of Web portals as significant tools enabling eGovernment, provide an effective gateways to interact with citizens. Of course, the introduction of Web portals make possible time and cost reduction in Public Administration and citizens.

A number of eGovernment portals have been already developed even though, in several cases, shortcomings related to interoperability and usability limit their usage and potentiality. Due to the unavoidable need for service integration, interoperability concerns must be solved. This issue involves concerns at administrative, operational, technical, semantical, legal and cultural level (Bekkers, 2005). Thus, PAs must perform a long-term study to evaluate how to deploy their solutions. Theses ones must guarantee the highest possible level of citizens satisfaction to really increase the service usage.

In this context, the introduction of LEs and intelligent documents bring us a new sort of eGovernment platforms. Thus, a system capable of presenting a standard representation for eGovernment documents and services distribution is developed.

6.1. Motivation

Several Italian Regions were suggested to develop eGovernment solutions aimed at increasing interactions between Public Administrations and citizen by means of ICTs infrastructures. In order to
accomplish this high level goal, several issues related to key aspects in the eGovern ment domain have to be taken into account, such as authentication and authorization, services publishing and discovery as well as composition. As results of these considerations and according to a study about skills for the case Corradini, Angelis, discovery as well as composition. As results of these considerations and according to a study about skills for the case Corradini, Angelis, Ercoli, Polzonetti, and Re (2006), it was developed the Tecut portal (Tecut, 2007) (see Fig. 4), a fully integrated eGovernment portal for shared and standardized services. Tecut is developed in collaboration with one of the Italian local administration – the Marche Region. Taking into account the former considerations, LifeEvent and intelligent document based approach was applied to deliver services in a more suitable manner to support service usability.

6.2. Features

The portal implements services delivery as they are requested by citizens into new LEs expressed in terms of the semantic definition (as previously mentioned). This approach is suitable for eGovernment field, or at least more suitable than in other environments, due to several reasons: all operations require some input document, the most common output in the service is a new document, there is no need (opportunity) for bargaining about services, there are limits and conditions very explicit about the data managing, terms of trustability and security (non-repudiation, privacy, integrity and confidentiality) and operations does not have real time constrains.

A global vision of the Marche Region, the scenario of this successful use case, involves financial entities, big enterprises, SMEs and a large and highly distributed population. This environment is quite convenient in order to test the system.

Even a lot of issues deserve a special attention, we would like to outline some of them of special relevance at this point. In the next subsection we focus on the authentication, documents management, and discovery and composition.

6.2.1. Authentication

The authentication process plays the main role in Tecut as in any eGovernment portal. It represents the instant when the system determines the association between the digital identity and the user. The recent proliferation of digital services has raised concerns about a lot of authentication mechanisms.

Marche Region supports the realization of a central authentication solution through Cohesion (Corradini, Forastieri, Polzonetti, Riganelli, & Sergiacomi, 2005). It is an infrastructure that provides solutions for complex technical problems and a set of common standard services predisposed to realize applicative cooperation as the Italian eGovernment plan states. Authentication services for centralized management access in private areas are provided by Single Sign On (SSO) Clercq (2002) and Profiling system.

- The SSO’s tasks are predisposed for the transfer of credentials between authenticated users and access portal. In particular, the authentication on the framework is possible with different levels: via weak registration using username and password and via strong registration using services regional cards “Raffaello” (Regione Marche, 2003). Furthermore, SSO allows a transparent access to the portal’s reserved areas without further authentications. Indeed, the user authentication check is delegated to the service. It uses a regional services register to validate the profile in respect to the access roles.

- The profiling system is dedicated to the coordinated management of credentials information, logically divided in a static subsystem and in a dynamic one, containing a series of attributes able to indicate the user’s preferences when accessing the services. Part of user base profile will be requested during the registration phase, and another part is communicated after explicit request, during the use of the service. The goodness of this approach is a semantic based representation of the profile to guarantee a proper users management.

In users profiles we have reused data representation already defined. For example, for the definition of the citizen, one main class in the system, FOAF (2005) has been reused, and, to mark documents in the system, metadata in CEN (2004) has been taken into consideration. This is part of a general philosophy leading toward the maximum possible agreement and reusability both of ontologies and software derived.

6.2.2. Discovery and composition

Processes related to discovery and composition of services were specially taken into account. The conditions to execute a particular LE can be checked in a automatic manner by a semantic engine. As LE are expressed in OWL, a semantic software was developed to discover if a particular LE can or can not be invoked. These conditions for the execution of a LE are based on the profile of the citizen and the document he/she is in possession at the time of invoking the LE.

The output of the operation is defined also in terms of the same ontology and, in this case, involves also the documents addressed in the LE. Thus, it is quite simple to make compositions using a semantic reasoner as it only will have to link outputs and inputs expressed in the same terms from the same ontology.

6.2.3. Intelligent document management

Tecut document management is based on Dodibox Corradini et al. (2006) (see Fig. 5 for a general overview). The framework presents different subsystems considering the design time and run time functionalities. The first one, design time subsystem manages documents repository through document ontology. On the other hand, the run time subsystem proposes a component based approach. A front-end component manages the users filling in form fields (using a tracing system), and processes the digital signature. A coordination component processes the submitted forms and the documents storage. At the same time it forwards the forms toward the right back-end capable of manage the documents. An extra component supports the system during the protocol and updating steps. The point of collaboration between the two subsystems is a Web Service, it is able to convert the submitted form into compiler instance for run time management.

![Fig. 5. Document management system.](image-url)
The core of Dodibox system is based on the coordination, it represents an unique applicative gateway dedicate to SDA documents. The gateway is able to manage an intelligent routing verso back-end systems strongly heterogeneity. We underline the role of the semantic of SDA header, it plays a fundamental role during the coordination. Beside SDA header component previously mention, it transports the application gateway type with the aim to active the proper standard adapter (one for each applicative gateway type). At this time the expected gateway are:

- HTTP Post – to forward the SDA document via HTTP;
- FTP – to forward the SDA document via FTP;
- EMAIL – to forward the SDA document via e-mail;
- Certified Electronic Mail – to forward the SDA document via certified electronic email managing the go back receipt;
- PROTOCOL – to forward the document to Web Service dedicate for the documents protocol;
- Web Service – to forward the document to a back-end Web Service on the base on WSDL defined at orchestration time;
- Message Queuing Services – to forward the SDA document in a message queue allowing the asynchronous and asymmetric interaction with related back-end systems.

More than one application gateway related a single SDA document can be activated. A coordination engine provides autonomously a re-synchronization of parallel process. The engine manages also the exception rising during the interaction with system outdoors. After document storage the engine produces a log message allowing users feedback about document process.

6.3. Discussion

This new approach brings several advantages in the design, develop and implementation and planning of a semantic based solutions for government web portals focusing on their main functionalities. Our approach supports the cooperation in an environment – as Marche Region – characterized by a lot of small municipality. At the same time, this study case is aimed at supporting activities of small and medium enterprises. The introduction of LE and intelligent document promotes stakeholders cooperation and promoting the maturity of eGovernment.

7. Conclusion

Public Administration mechanisms and procedures have experimented little evolution during the last decades. The use of potential within the ICTs has not been seriously applied to the scope of public management until these last years. Nevertheless, in the current moment, it is clear that eGovernment is an era where a large amount of resources has been devoted to.

The use of ICTs is currently providing undeniable advantages and quality features on services. The most clear outcomes of this eTechnology are related to high availability, no chance for fraud, automatization of operations by computer based system, scalability on system, etc.

Regrettfully, the approach undertaken in several administration is a mere replacement of “paper-based” interfaces with digital interfaces but the aim of the services is the same. This represent one of the main reason because of services are not used. To accomplish the transit to the new era of public services, this paper proposes a new approach to fulfill services. The gist of the proposal lays in supporting in a holistic manner the concept of one-stop service when ever it is possible. In this approach, the use of Life Event and intelligent documents plays a main role to prove the status of performed operations and guarantee the conditions imposed by service execution. We suggests an organization model to support services from different PAs taking advantage of semantics. Under this approach, it is possible to orchestrate services in a automatic manner. A remarkable feature is related to back-office interoperability (intra and inter administrations). Every back-office system must be structured to promote interoperability and cooperation inside different administrations.

At the same time, the introduction of a knowledge-based solution supports a shared knowledge repository of document thanks to the document ontology. This kind of approach is useful to support the scalability of the system and services loosely couple as they are linked just by a relation based on documents. These features have been tested in an on-working platform, the Tecut portal. And, from the obtained feedback, results turn out to be quite appealing.

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