#### **IST PROJECT 2001-35399**



## A Governmental Knowledge-based Platform for Public Sector Online Services

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**Abstract:** This Deliverable provides the results of the analysis of user requirements conducted and the system specifications derived from the obtained results. For the collection of user requirements a number of potential services were analysed for both user organisations participating in the consortium and the results were then consolidated into a single requirements database. The documented requirements have been expressed in terms of systems objectives, which were then mapped to a set of system interoperable components and services, comprising thus the SmartGov platform architecture.

Keyword List: SmartGov, e-Forms, public services, knowledge management, user requirements, electronic services, system specifications

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## **Executive Summary**

The SmartGov project, fully entitled as "A Governmental Knowledge-based Platform for Public Sector Online Services", commenced on the 1<sup>st</sup> of February 2002. One of the goals within the project is to capture the users' requirement for this platform, and specify the platform components and supporting services that will enable the formulation of the final outcome.

Cataloguing user requirements for such an environment is a complex task, since its users belong in different groups, having diverse tasks to perform and issues to tackle. To this end, a number of prospective platform users from both participating administration authorities (GSIS and CEC) were interviewed. Their replies were used both for user group identification and, after a consolidation step, for producing a catalogue of requirements, functional and non-functional, for the platform. Barriers to electronic service development have also been investigated and documented into the deliverable. Barrier identification is important both to the formulation of technical solutions and the development of process models, since it pinpoints the issues that must be taken care of in order to deliver a successful platform.

In order to identify the building blocks and operations that must be available to the SmartGov platform users for electronic service development, this phase included the analysis of a number of services that are candidate for electronic implementation. The knowledge required for the various steps of service development and deployment stages was recognised and associated with the respective building blocks.

The documented requirements have been expressed in terms of systems objectives, which were then mapped to a set of system components and services, comprising thus the SmartGov platform architecture. Besides components and services, the SmartGov platform architecture specification includes issues concerning the interoperability between the platform modules and appropriate interfaces; system adaptivity issues are discussed as well Specifications at this stage are stated in a high level of abstraction, and will be further elaborated on in WP5. This deliverable contributes to milestone 4, at which the SmartGov knowledge-based platform, services and applications have been described and specified.

## **1** Introduction

Transactions services (including e-forms) are perceived as the future of e-government, however their full potential has not yet been unleashed [EC2000]. E-forms are central to e-government activities, constituting the basis for realizing most of the public services that governments should provide to their citizens [eEurope2000].

SmartGov aims at delivering a knowledge-based e-services development environment, together with associated process models, that will facilitate development, deployment, management and maintenance of electronic services. For this environment to be successful, it should encompass all functionalities required by the various public administration actors (PA actors) participating in the lifecycle of electronic services. One of the goals of this deliverable is to collect the requirements of these actors and map them to system features, producing thus the high-level functional specifications of the SmartGov platform. End-user requirements (i.e. requirements of citizens/enterprises that will ultimately use the electronic services) are also taken into account. These requirements were mainly collected through structured interviews, whose results were then processed.

Besides cataloguing the requirements from the SmartGov platform users, the requirements emerging from the pilot applications were analysed, to verify and complete the user requirements collected through the interviews, and to provide a more concrete image of the elements that the SmartGov platform must make available to involved actors. These requirements will also provide input to the work packages 6, 8 and 9.

Finally the last section of the deliverable covers the platform and services specifications, providing the architectural layout of the SmartGov platform, its various components, the role each one performs and the means of inter-module communication. An abstract form of the contents of the knowledge base is also provided in the form of transaction service elements (TSEs) and approaches to their codification in XML are discussed.

### 2 User requirements for the SmartGov platform

For capturing the user requirements of the participating public authorities the methodology of structured interviews was applied. Key persons from each of the involved user groups were interviewed. To this end a set of questions was assembled that covered three main areas: user, work and context. This *template* starts with general questions and gradually moves to more specific topics, trying to identify and record user motivations, performance barriers as well as improvement opportunities. The structured interview review template is included in Appendix A. Prior to the interview, respondents were briefed on the interview's purpose and SmartGov's objectives. The collected answers were then processed and the results of the processing are detailed in the following paragraphs.

During the requirements collection process, it was discovered that the two PAs emphasised on different aspects of the electronic services lifecycle. For instance, the GSIS was more concerned with the facilities that would be provided to service developers and managers, while the CEC described more active roles for PA employees that benefit from the electronic services or run parts of the e-services back-office. In order to maintain a clear picture of each PAs' requirements, these requirements are recorded in sections 2.1 and 2.2 in the form they were collected, while section 2.3 consolidates the two sets of user requirements, both in the dimension of system functionality and in the dimension of user groups, in order to produce the complete list of user requirements from the SmartGov platform.

#### 2.1 User requirements for the GSIS

#### 2.1.1 Identification of User Groups

In order to obtain all the necessary information at GSIS, a number of interviews have taken place, during which public servants and managerial staff of GSIS have described their role in GSIS. The interviewees have elaborated on the nature of their work, the tasks they carry out, the problems they face regarding their job and the things they would like to alter. Through the analysis of the collected input, five user groups were identified and their needs were documented. These groups are: Managers, Domain Experts, Information Technology Staff (IT staff), Administrators and End Users. The identified groups and their needs are described in detail in the following paragraphs and are presented in Figure 1.

A common goal for the employees of GSIS is the design and implementation of public services. These services could be delivered either in electronic, or in traditional (paper-based) form. In the rest of this document, electronically and traditionally delivered services will not be distinguished, unless explicitly stated.



Figure 1: General view of users groups and their relation to the SmartGov Platform

#### 2.1.1.1 Managers

The managers are responsible for organising and supervising public services. They make decisions about the implementation of new services or the alteration of existing ones. In order to accomplish this task, they need to have a strategic view of the provision of services. They should be able to define high-level managerial statistics and metrics. These metrics will combine both quantitative and qualitative assessments, and they could be for example the number of citizens that access the service, the use ratio of specific elements of a form, error percentage, performance indexes and so on. This information is necessary to evaluate the acceptance of the service by the public, its usefulness and effectiveness, the common errors during its development and operation, possible complaints by the public and to measure its impact and benefits. By taking all these into consideration, managers are able to decide about future changes in the service or the creation of a new one. Usually, there is more than one manager in the same Public Authority, who wishes to have access to the same data and statistics.

#### 2.1.1.2 Domain Experts

The domain experts possess the necessary background knowledge for the design and the implementation of a public service. This knowledge includes the legislation that a service is based on, that is laws, processes, directives, prerequisites and so on. Domain experts play a consultative role to the managers for the design, evaluation and possible alterations of public services. To this end, they need to define and obtain statistics and metrics of similar kind to those of the managers. They design the interface of the service and the structure of the form, which is what service users will fill in. They attach their knowledge about legislation, supporting procedures or required documents to the form elements. They define validation checks, which are not limited to data type constraints, but also include inter–element relations that should be satisfied within the form or even relations that should hold between different forms. Finally, domain experts provide end users with accompanying manuals, instructions and sets of examples, to help them use the service. It is possible that more than one domain expert works for the implementation of the same service, while each domain expert may participate in the lifecycle of more than one service, when his/her expertise is needed.

During the development of an e-service, the domain experts may have to collaborate with the IT staff to communicate to them their domain knowledge. Collaboration has to take place when the tasks to be performed require higher technical skills than the domain experts possess, and when the links to the installed IT systems or third party systems have to be established.

#### 2.1.1.3 IT Staff

The IT Staff possess the necessary technological knowledge for the development of an electronic public service. They design the system from scratch, defining system architecture, database schema, user interface and functionality. They also provide the necessary interfaces for data exchange between the electronic service platform and the back-end systems. During the life cycle of the service they have to collaborate with the domain experts to integrate the domain knowledge, which is of vital importance, to the application. At the same time they play a consultative role to the managers and the domain experts with respect to the technological aspects of the e-service. In addition, they need to define and obtain technical level statistics and metrics to acquire valuable insight about the efficiency of the system. Furthermore, they are responsible of the maintenance of the e-service. They have to handle omissions and problems that may occur in the electronic services, which could be for example programming errors, alterations caused by changes of the supporting legislation, modifications suggested by the managers or the domain experts.

#### 2.1.1.4 Administrators

The administrators support the users of the e-service that could be the employees of the public service and the end users. They help them to familiarize themselves with the environment of the e-service and cope with possible problems that may occur. This support is offered via e-mail or telephone and may produce helpful feedback to the IT staff about the usability of the e-service. They are also responsible for the management of user accounts, the integrity of the data (back up functions etc.) and the security of the system. One of their tasks is also the specification of log files, which contribute not only to the accountability and non-repudiation but also to the observation of the system performance and the production of qualitative measurements such as system usability, identification of common errors made by the users etc.

#### 2.1.1.5 End User

The end users are the citizens or enterprises that make use of the service. Currently, their physical presence in the public authorities is required in order to make use of the provided service and they often have to meet various prerequisites, such as documents, certificates etc. for bureaucratic reasons. Sometimes they have to repeatedly visit the public authority in order to obtain what they need. This is a time

consuming process and especially difficult for people with special needs and the elderly. End users usually do not have any technical skills.

# 2.1.2 Identification of User Needs, Requirements, Functional Specifications

#### 2.1.2.1 Managers

Currently, there is not an easy way to produce all the statistical data used at a strategic managerial level. The managers have to go through a time consuming process in order to obtain the statistics they need, asking the IT staff or the domain experts to produce these data. A more straightforward method for managerial-level statistics collection is to provide managers with an automated tool, which would facilitate statistics definition and viewing in an intuitive and user-friendly way, without the intervention of the other staff. This is necessary since they usually do not have any special technical skills. So, it would be useful to have a kind of help to use when they encounter a problem during their tasks. The defined statistics are important and confidential information, thus back up procedures and security schemas are required to prevent data loss and unauthorized access. An important factor is the use of native language of the manager for the interface of the application. In order to control the service development and the performed tasks, there is a need for auditing facilities.

The general requirements of the managers are:

- Managers must be provided with a user-friendly interface to the system.
- The managers should be able to overcome various problems with the use of the system without the intervention of the other staff.
- The managers must be able to interact with the system using their native language.
- More than one manager must be able to have access to the system at the same time.
- The managers must be assured about the security of their data.
- The managers must be able to recover their data in case of system failure.
- The managers should be able to assess the progress made regarding the development and maintenance of services.
- The managers must be able to define, edit and view high-level managerial statistics and metrics.

All the previously described requirements are listed in the following table in correspondence with functional specifications. The specifications are summarized in the use case diagram of figure 2.

Managers' Requirements	Functional Specifications
------------------------	---------------------------

Managers' Requirements	Functional Specifications	
Managers MUST be provided with a user-friendly interface to the system.	The system will have an intuitive and user-friendly interface, which will facilitate its operation.	
The managers SHOULD be able to overcome various problems with the use of the system without the intervention of the other staff.	The system will provide various forms of help to assist the managers whenever they encounter problems with its operation.	
The managers MUST be able to operate the system using their native language.	The system will provide multilingual interface and content.	
More than one manager MUST be able to have access to the system at the same time.	The system will allow the access of more than one manager with distinct rights. The system will also be designed to support concurrent user access.	
The managers MUST be ensured about the security of their data.	The system will provide authentication and access control mechanisms.	
The managers MUST be able to recover their data in case of system failure.	The system will provide back up facilities to prevent data loss.	
The managers SHOULD be able to assess the progress made regarding the development and maintenance of services	The system will provide automated reports including the overall progress and the actions taken by the various users.	
The managers MUST be able to define, edit and view high-level managerial statistics and metrics.	The system will provide a set of tools for the management of the statistics and metrics. There will be a predefined set of statistics and the capability of creating new ones. The system will also support editing and viewing and reporting for the defined statistics.	



Figure 2: Use case diagram for the managers

#### 2.1.2.2 Domain Experts

Currently, the main role of the domain expert during the implementation of a service is not only the design of the service, but also the communication of their domain knowledge to the IT staff. This is a time and effort-consuming task and is error-prone because of misinterpretations and misunderstandings between the domain experts and the IT staff. This impediment may be overcome by enabling domain experts to directly encapsulate their domain expertise in the e-forms, through appropriate tools. These tools would be used to design the form, define the validation checks and attach the associated knowledge easily and quickly. All these functionalities should be provided in an intuitive and user-friendly way. Thus, the domain experts will be able to perform their tasks easily and with minimum intervention of the IT staff, even though they usually posses little or no technical skills. Concerning the definition and viewing of the statistics and metrics, they have a similar need to that of managers for an automated tool to produce them without the intervention of IT staff. It is necessary that all their work is well protected not only from the risk of system failure, but also from unauthorized access, since it is critical for the implementation of an e-service. An important factor is the use of native language of the domain experts for the interface of the application.

The general requirements of the domain experts are:

• Domain experts must be provided with a user-friendly interface to the system.

- The domain experts should be able to overcome various problems with the use of the system without the intervention of the IT staff.
- The domain experts must be able to operate the system using their native language.
- More than one domain experts must be able to have access to the system at the same time.
- The domain experts must be assured about the security of their data.
- The domain experts must be able to reuse and adapt previous work to enable rapid development of services.
- The domain experts must be able to recover their data in case of system failure.
- The domain experts must be able to design and build forms using basic form elements provided by the system.
- The domain experts must be able to create new form elements according to their needs.
- The domain experts must be able to define constraints and validation checks on the content of a form element.
- The domain experts must be able to define inter-element or inter-service relations.
- The domain experts must be able to attach their domain knowledge to form elements, such as supporting legislation, directives, prerequisites, examples etc.
- The domain experts must be able to compose accompanying manuals and instructions for the end user easily and quickly.
- The domain experts must be able to compose documentation about the implemented service in a semi-automated way.
- The domain experts must be able to define, edit and view statistics and metrics.

All the previously described requirements are listed in the following table in correspondence with functional specifications. The specifications are summarized in the use case diagram of figure 3.

Domain Experts' Requirements	Functional Specifications
Domain experts MUST be provided with a user-friendly interface to the system.	The system will have an intuitive and user-friendly interface, which will facilitate its operation. A visual environment supporting various functions, such as drag-and-drop, for the placement of the elements in the form layout will be used.

Domain Experts' Requirements	Functional Specifications
The domain experts SHOULD be able to overcome various problems with the use of the system without the intervention of the IT staff.	The system will provide various forms of help to assist the domain experts whenever they have problems with its operation.
The domain experts MUST be able to operate the system using their native language.	The system will provide multilingual interface and content.
More than one domain expert MUST be able to have access to the system at the same time.	The system will allow the access of more than one domain expert with distinct rights. The system will also be designed to support concurrent user access.
The domain experts MUST be assured of the security of their data.	The system will provide authentication and access control mechanisms.
The domain experts MUST be able to reuse and adapt previous work to enable rapid development of services.	Work will be stored in a central repository, and appropriate tools will be provided to facilitate searching and retrieval of relevant pieces.
The domain experts MUST be able to recover their data in case of system failure.	The system will provide back up facilities to prevent data loss.
The domain experts MUST be able to design and build forms using basic form elements provided by the system.	The system will provide a set of Transaction Service Elements (TSEs), which will be used as building blocks for forms. This functionality will be accessed through appropriate tools.
The domain experts MUST be able to create new form elements according to their needs.	The system will support the creation of new form elements with the desired attributes based on existing templates or from scratch.
The domain experts MUST be able to define constraints and validation checks on the content of a form element.	The system will provide the means for the definition of constraints and validation checks in a visual, intuitive and user-friendly way.
The domain experts MUST be able to define inter-element relations.	The system will provide a tool to model inter-element relations.

Domain Experts' Requirements	Functional Specifications
The domain experts MUST be able to attach their domain knowledge on form elements, such as supporting legislation, directives, prerequisites, examples etc.	The system will support the attachment of various types of domain knowledge on form elements, form element groups and forms.
The domain experts MUST be able to compose accompanying manuals and instructions for the end user easily and quickly.	The system will facilitate the creation of manuals and instructions for the end users.
The domain experts MUST be able to compose documentation about the implemented service in a semi- automated way.	The system will facilitate the creation of the documentation of the developed e-service.
The domain experts MUST be able to define, edit and view statistics and metrics.	The system will provide a set of tools for the management of the statistics and metrics. There will be a predefined set of statistics and the capability of creating new ones. The system will also support their editing and viewing.



Figure 3: Use case diagram for the domain experts

#### 2.1.2.3 IT Staff

Currently, the IT Staff is fully responsible for the development and maintenance of an electronic public service, since they possess all the necessary technological knowledge for these tasks. They collaborate with the domain experts during the life cycle of the service in order to obtain and attach all the domain knowledge to the eforms. This is a time and effort-consuming task and is error-prone because of misinterpretations and misunderstandings between the domain experts and them. As previously noted, the domain experts would be able to design e-forms and attach their domain knowledge to them without the intervention of the IT Staff. This would facilitate the work of the IT Staff offering better means of collaboration between them and the domain experts. The role of IT Staff would become mostly consultative, supporting the domain experts and the managers in case of problems they encounter during their work. Complex definitions of form elements, constraints and validation checks would still require the involvement of IT staff. All tasks concerning system architecture, database schema, necessary interfaces for data exchange between the electronic service platform and the back-end systems would remain their responsibility. In addition, they should be able to define and obtain technical level statistics and metrics to acquire valuable insight on the efficiency of the system. They would be able to handle omissions and problems that may occur in the electronic services, such as programming errors, alterations caused by changes of the supporting legislation, modifications suggested by the managers or the domain experts, easily and effectively. It is necessary that all their work is well protected not only from the risk of system failure, but also from unauthorized access, since it is critical for the implementation of an e-service. An important factor is the use of their native language for the interface of the application.

The general requirements of the IT Staff are:

- IT Staff must be provided with a user-friendly interface to the system.
- The IT Staff should be able to overcome various problems with the use of the system.
- The IT Staff must be able to operate the system using their native language.
- More than one member of the IT Staff must be able to have access to the system at the same time.
- The IT Staff must be assured of the security of their data.
- The IT Staff must be able to recover their data in case of system failure.
- The IT Staff must be able to aid the domain experts during the building of the forms.
- The IT Staff must be able to create new basic form elements, which will be used by the domain experts.
- The IT Staff must be able to define constraints and validation checks on the content of a form element, when these are too difficult for the domain experts to express.
- The IT Staff must be able to define complex inter-element relations.

- The IT Staff must be able to aid the domain experts during the attachment of the domain knowledge on form elements.
- The IT Staff must be able to implement the necessary interfaces for data exchange between the electronic service platform and the back-end systems.
- The IT Staff must be able to compose accompanying manuals and instructions for the end user easily and quickly.
- The IT Staff must be able to compose documentation about the implemented service in a semi-automated way.
- The IT Staff must be able to define, edit and view technical level statistics and metrics.

All the previously described requirements are listed in the following table in correspondence with functional specifications. The specifications are summarized in the use case diagram of figure 4.

IT Staff's Requirements	Functional Specifications
The IT Staff SHOULD be provided with a user-friendly interface to the system	The system will have an intuitive and user-friendly interface, which will facilitate its operation.
The IT Staff SHOULD be able to overcome various problems with the use of the system.	The system will provide various forms of help to assist the IT Staff whenever they have problems with its operation.
The IT Staff MUST be able to operate the system using their native language.	The system will provide multilingual interface and content.
More than one member of the IT Staff MUST be able to have access to the system at the same time.	The system will allow the access of more than one member of the IT Staff with distinct rights. The system will also be designed to support concurrent user access.
The IT Staff MUST be assured of the security of their data.	The system will provide authentication and authorisation mechanisms.
The IT Staff MUST be able to recover their data in case of system failure.	The system will provide back up facilities to prevent data loss.
The IT Staff MUST be able to aid the domain experts during the building of the forms.	The system will provide the form elements as a set of Transaction Service Elements (TSEs), which will be available through appropriate tools.

IT Staff's Requirements	Functional Specifications
The IT Staff MUST be able to create new basic form elements, which will be used by the domain experts.	The system will support the creation of new form elements with the desired attributes based on existing templates or from scratch.
The IT Staff MUST be able to define complex constraints and validation checks on the content of a form element.	The system will provide a way for the definition of complex constraints and validation checks.
The IT Staff MUST be able to define complex inter-element relations.	The system will provide a way to model inter-element relations.
The IT Staff MUST be able to aid the domain experts during the attachment of the domain knowledge on form elements.	The system will support the attachment of various types of domain knowledge on form elements.
The IT Staff MUST be able to implement the necessary connections with third party systems.	The system will support the implementation of interfaces for data exchange between the electronic service platform and the back-end systems.
The IT Staff MUST be able to compose accompanying manuals and instructions for the end user easily and quickly.	The system will facilitate the creation of manuals and instructions for the end users.
The IT Staff MUST be able to compose documentation about the implemented service in a semi-automated way.	The system will facilitate the creation of the documentation of the developed e- service.
The IT Staff MUST be able to define, edit and view technical level statistics and metrics	The system will provide a set of tools for the management of the technical level statistics and metrics. There will be a predefined set of statistics and the capability of creating new ones. The system will also support their editing and viewing.



Figure 4: Use case diagram for the IT staff

#### 2.1.2.4 Administrators

The administrators need, in order to perform their tasks, a set of tools, which would facilitate their work. They need a tool to manage user accounts effortlessly, to ensure data integrity by offering back up utilities and authentication and authorisation mechanisms, to audit the user actions performed within the system. They should be able to define and obtain technical level statistics and metrics to acquire valuable insight on the efficiency of the system. An important factor is the use of their native language for the interface of the application.

The general requirements of the administrators are:

- Administrators SHOULD be provided with a user-friendly interface to the system.
- The administrators should be able to overcome various problems with the use of the system.
- The administrators must be able to operate the system using their native language.
- More than one administrator must be able to have access to the system at the same time.
- The administrators must be able to ensure the security of the data.
- The administrators must be able to recover the data in case of system failure.
- The administrators must be able to manage user accounts.

- The administrators must be able to specify the information to be recorded in the log files.
- The administrators must be able to define, edit and view technical level statistics and metrics.

All the previously described requirements are listed in the following table in correspondence with functional specifications. The specifications are summarized in the use case diagram of figure 5.

Administrators' Requirements	Functional Specifications
Administrators SHOULD be provided with a user-friendly interface to the system	The system will have an intuitive and user-friendly interface, which will facilitate its operation.
The administrators SHOULD be able to overcome various problems with the use of the system.	The system will provide various forms of help to assist the administrators whenever they have problems with its operation.
The administrators MUST be able to operate the system using their native language.	The system will provide multilingual interface and content.
More than one administrator MUST be able to have access to the system at the same time.	The system will allow the access of more than one administrator with distinct rights. The system will also be designed to support concurrent user access.
The administrators MUST be able to ensure the security of the data.	The system will provide authentication and authorisation mechanisms.
The administrators MUST be able to recover the data in case of system failure.	The system will provide back up facilities to prevent data loss.
The administrators MUST be able to manage user accounts.	The system will provide a tool for the management of the user accounts.
The administrators MUST be able to specify the information to be recorded in the log files.	The system will provide an automated tool to specify the information in the log files.

Administrators' Requirements	Functional Specifications
The administrators MUST be able to define, edit and view technical level statistics and metrics.	The system will provide a set of tools for the management of the technical level statistics and metrics. There will be a predefined set of statistics and the capability of creating new ones. The system will also support their editing and viewing.





#### 2.1.2.5 End users

The end users should be taken into consideration during the development of an eservice, so as to create a service that would be useful and accepted by them. There is a great need for the implementation of various e-services in order to facilitate the communication and the transactions between the public authorities and themselves. Since they possess little or no technical skills, they need an intuitive, user-friendly graphical interface.

The general requirements of the end users are:

- The end users should be able to access the e-service easily and any time.
- End-users should be provided with a user-friendly interface to the system that assumes no or little technical skills.
- Users should be able to register to the e-service, when this is required.
- The end users should be able to overcome various problems with the use of the e-service.
- The end users must be able to operate the e-service using their native language.
- More than one end user must be able to have access to the e-service at the same time.
- The end users must be assured of the security of their personal data.
- The end users should be able to access the service either as registered users, gaining access to the full functionality, or as or guest users, in which case they will only be able to access the informational content (help texts, procedural information etc).

All the previously described requirements are listed in the following table in correspondence with functional specifications.

End Users' Requirements	Functional Specifications
The end users SHOULD be able to access the e-service easily and any time.	The system will create an e-service based on widely used technologies, such as the WWW.
End-users SHOULD be provided with a user-friendly interface to the system way that assumes no or little technical skills.	The e-service will have an intuitive and user-friendly interface, which will facilitate its operation.
Users SHOULD be able to register to the e-service, when this is required.	The system will provide schemes for user registration and identification credential generation.
The end users SHOULD be able to overcome various problems with the use of the e-service.	The e-service will provide various forms of help to assist the end users whenever they have problems with its operation.
The end users MUST be able to operate the e-service using their native language.	The e-service will provide multilingual interface and content.
More than one end user MUST be able to have access to the e-service at the same time.	The e-service will allow the access of more than one end user at the same time.

End Users' Requirements	Functional Specifications
The end users MUST be assured of the security of their personal data.	The e-service will provide secure data transactions.
The end users should be able to access the service either as registered users, gaining access to the full functionality, or as or guest users, in which case they will only be able to access the informational content	The e-service will encompass public information, which will be available to everyone, and will allow its use only by registered users. Authentication mechanisms and content structure and will ensure its accessibility by the appropriate user groups.

#### 2.1.2.6 Overview of functional specifications for each user group

The following table summarizes the functional specifications for each user group. The end users are not included in the table, as they are not users of the SmartGov platform, but of its outcome.

User Groups Functional Specifications	Managers	Domain Experts	IT Staff	Administrators
User-friendly interface	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Help functionality	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Multilingual interface and content	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Multiple access	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Authentication and access control mechanism	1	1	√	1
Back up facilities	$\checkmark$	$\checkmark$	$\checkmark$	√
View automated reports	$\checkmark$			$\checkmark$
Management of statistics	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$
Management of predefined TSEs		$\checkmark$	$\checkmark$	
Reuse and adaptation of previous work		$\checkmark$		
Creation of new TSEs		$\checkmark$	$\checkmark$	
Definition of constraints and validation checks		$\checkmark$	$\checkmark$	

User Groups Functional Specifications	Managers	Domain Experts	IT Staff	Administrators
Modelling of inter- element relations		$\checkmark$	$\checkmark$	
Attachment of domain knowledge on form elements		$\checkmark$	V	
Composition of manual and instructions for the end users		$\checkmark$	V	
Composition of documentation about the implemented service		$\checkmark$	$\checkmark$	
Connections with third party systems			$\checkmark$	
Management of user accounts				$\checkmark$
Definition of the information to be recorded in the log files				V

#### **2.2** User requirements for the CEC

This section considers requirements that we derived as a result of broad investigation in CEC, and are not related to any specific application. They are likely to apply across a range of different applications of SmartGov. Some are general and some are specific. In the interviews at CEC, people were free to refer either to their work in general or to specific services.

In section 4.2 we consider the requirements for a specific proposed application at CEC.

#### 2.2.1 Method

#### 2.2.1.1 Overview

Figure 6 is an overview of the method that we used to capture broad requirements at CEC. All of the processes were carried out by Napier staff: where people outside Napier were involved, they are shown in the figure as a resource.



#### Figure 6: overview of method for capture of broad user requirements

CEC is organised in 8 departments:

- City Development
- Environmental & Consumer Services
- Corporate Services
  Finance
- Culture & Leisure
  F
- Education

- Housing
- Social Work

At the start of the project, CEC was unclear which department(s) would benefit most from the SmartGov initiative. Therefore, in the initial stages of the requirements gathering exercise we had several **informal discussions** with staff in the Corporate Services department, who provide many support functions to the other departments. The objectives of these discussions were to identify:

- potential pilot applications for experimentation and evaluation later in the project
- criteria by which the potential pilot applications could be assessed

Several potential pilot applications have been considered. They are discussed in section 4.2 on page 102, in which we describe how we derived specific user requirements for a particular application.

Corporate Services then helped us to identify **key individuals** in various departments (all except City Development), with whom we conducted **structured interviews** from a set of **prepared questions**. The objective was to identify the needs of a wide range of stakeholders in the delivery and receipt of council services.

Many of the interviewees were members of CEC's Corporate Customer Services team, a group of managers drawn from across the Council to support and advise on the Corporate Customer Services Model project. This is a wide-ranging and ambitious project that will create a Council contact centre, one-stop shops and internet developments to enable customers to do business with the Council online. It is part of a council-wide programme called Smart City, which will result in a fundamental change to the way that services are delivered. Smart City is described in more detail in deliverable D31 of the SmartGov project.

Other interviewees were recommended because of their extensive knowledge of service delivery within CEC.

Figure 7 is an expansion of the *analyse interviews and reports* process of Figure 6. It shows how we derived the user requirements and, from them, functional requirements.



#### Figure 7: method for analysing interviews and reports

We examined the results of the interviews and:

- identified several **stakeholder roles**, *i.e.* roles of people who have some interest in the delivery of services
- extracted statements that might be considered **a need of one or more of the stakeholder roles**. Note that these needs are related to the provision of services in general, not just those supported or delivered electronically.

We then took each of the extracted stakeholder needs in turn and asked the question, "If this need were to be met by SmartGov, who would be using SmartGov and what would their **requirement of SmartGov** be?" We differentiated between the use of the SmartGov **development environment** (in which services are designed) and the SmartGov **runtime environment** (in which services are delivered and received).

Finally, to help with the functional specification of SmartGov in the future, we took each user requirement and suggested a **functional requirement** of SmartGov that

would help to meet the user requirement. We expect that each functional requirement will be elaborated in the functional specification of the SmartGov platform.

#### 2.2.1.2 Questions

Working with the University of Athens, we devised a set of questions that were designed to discover details about potential users of SmartGov: their background, their work, their suppliers and customers, and the work context. See questions 1-41 in Appendix A.

#### 2.2.1.3 Interviews

Eleven structured interviews were conducted with senior and junior managers in each CEC department except City Development. Interviewees either volunteered themselves in response to an email message circulated among the Customer Services Team or were recommended by colleagues.

At the start of the interview, the context and purpose of the SmartGov project were explained. The interviewee was then asked, as far as appropriate to their job function, questions 1-41 in Appendix A.

The questions had been designed to find out about services as they are currently delivered. Very few of CEC's services are currently delivered electronically. However, all employees are very much aware of the Smart City initiative within the Council (see Overview on page 25) and most of those whom we interviewed are already directly involved in various aspects of Smart City.

Two interviewers were present at each interview. One asked questions and directed the interview using questions 1-41 as a guide; the other recorded the answers. Answers were recorded by hand on paper, against the questions as far as possible. Other notes, not directly related to the questions, were also taken. From one interview to the next, the interviewers alternated their roles between questioner and note-taker.

The answers and notes were recorded in Microsoft Word soon after each interview.

#### 2.2.1.4 Analysis

Figure 7 above shows how the recorded answers were analysed.

The recorded answers were examined to find instances where the need of some stakeholder in service delivery was expressed. Often the role of the stakeholder with the need (see 2.2.2.1 below) was not explicitly stated, so we inferred this.

Sometimes the need referred to a particular service in which the interviewee had a special interest. Where possible, we generalised such needs.

In addition to the stakeholder needs expressed in interviews, a small number of needs were inferred from CEC's own *Council Forms Review*, an internal document that reported on the use of forms in CEC. The full list of stakeholder needs is shown in Table 1 on page 30.

For each stakeholder need, we used our understanding of the objectives of SmartGov to decide how the need translated into a requirement of a potential SmartGov user.

We did this by asking the question, "If this need were to be met by SmartGov, who would be using SmartGov and what would their requirement of SmartGov be?"

On the other hand, a few of the extracted needs were so general that it was difficult to identify them with a single user requirement of SmartGov (e.g. we need to reduce our reliance on IT people for designing services). We did not include these needs in further analysis. They are listed in Table 6 on page 59.

Some of these requirements place demands on the SmartGov *development* environment, while others are requirements of the *compiled* SmartGov services with which the end user interacts. (We refer to this as the *runtime* environment.) For each requirement we noted whether it refers to the development or the runtime environment.

Finally we translated each user requirement into a functional requirement on the proposed SmartGov system.

In summary, we repeatedly:

- identified a need of a stakeholder in service delivery
- decided how that need became a requirement of a user of SmartGov
- noted whether the user would be working with development or runtime SmartGov
- translated the user requirement into a functional requirement on the SmartGov system.

#### 2.2.2 Results

#### 2.2.2.1 Stakeholder Roles and Needs

As a result of our interviews, we defined the stakeholder roles as below. It should be noted that very few of our documented requirements relate to IT personnel. This was because CEC has a partnership agreement with BT under which all IT development is outsourced to BT. Our interviews were only with CEC employees.

- service managers: people who are accountable for the delivery of services. Usually they plan, enable and monitor service operation and delivery.
- service designers: people who design both the "front office" (interface with clients) and the "back office" (workflow processes within CEC). Often these are also service managers. Sometimes they are specialists from the Corporate Services department.
- service workers: people who carry out some aspect of a service, either front office or back office. Usually they are close to the service and are relied upon for the smooth running of the service. They cover a wide range of specific roles. Sometimes they are also the designers or even managers of the service. Because they "administer" services, we would have liked to refer to them as service administrators. However, that term has been used in 2.1.1 to refer to people with specific duties in relation to e-services.
- clients inside CEC: people who benefit from using a "support" service, such as employee training or the offering of new employment opportunities.

- clients outside CEC: people who benefit from receiving a council service, such as library users or council housing tenants.
- IT support: people responsible for developing, setting up, running or supporting IT systems that play a part in the delivery of services. As stated above, much of this work is now done for CEC by BT personnel.

One individual may play multiple roles, either simultaneously or at separate times.

Table 1 shows the needs that we identified from our interviews and CEC reports.

Sometimes a stated need is applicable to several of the roles identified above. In these cases, we have grouped roles together as follows:

- all council roles: service managers, service designers, service workers, clients inside CEC, IT support people
- all clients: clients inside CEC and clients outside CEC
- all: all stakeholder roles

this stakeholder role	need(s) to do this
all	enter date information easily
all	get help fast
all	get clear notice of where to go for help if stuck
all	print a paper form that's more or less the same as one that appears on a screen
all clients	dates are not allowed to become obsolete
all clients	be confident that details of who to contact are up to date
all clients	be made aware of services that are available
all clients	get access to relevant supporting documents
all clients	get clear guidance on how to complete a form
all clients	get forms that are easy to scan or photocopy
all clients	get help when needed
all clients	get information about the process behind the form: what happens next, <i>etc</i> .
all clients	work with forms that are well-designed
all clients	have confidence that data requested on a form is required and will be used
all clients	not have to fill in fields in a form when the info is already known

#### Table 1: stakeholder roles and needs

this stakeholder role	need(s) to do this
all clients	read forms easily even with sight impairment
all clients	receive an up-to-date service
all clients	know that the service is up to date
all clients	receive forms in plain, understandable language
all clients	receive forms in readable colours
all clients	receive forms in preferred colours
all clients	receive forms with adequate font size
all clients	receive forms in preferred font size
all clients	see a check(list) of what has been entered and still needs to be entered
all clients	communicate quickly with the council
client outside CEC	receive service through combination of form-filling and other communication ( <i>e.g.</i> personal visit, letter)
client outside CEC	attach a signature with submitted form
client outside CEC	view forms in different languages
client inside CEC	control who gets access to forms
client inside CEC	use shortcut codes to enter data with which user has familiarity
all council roles	improve communication
all council roles	be able to access procedures easily
all council roles	find ways to promote flexible working, <i>e.g.</i> working from home
all council roles	work with standardised forms as much as possible
all council roles	reduce duplication of data entry as much as possible
all council roles	see the computer as a sharing tool, not just a word processor
all council roles	have access to geographical information systems (GIS)
service manager	gather statistics on use of the service (council workers and all clients)
service manager	gather feedback on user needs
service manager	put form design in the hands of service designers, workers and managers, not IT people
service manager	monitor amount of work that has to be redone

this stakeholder role	need(s) to do this
service manager	show that introduction of forms helps planning and efficiency
manager and designer	ensure that back office systems are working well before concentrating on front office systems
manager & designer	ensure that all data requested on form is required and will be used
manager & designer	reduce reliance on IT people for designing services
service designer	reduce costs by delivering services online
service designer	design workflow operations
service designer	make changes to forms on the fly; don't wait until it's cost-effective for a new print run
designer & worker	put Council logo on all forms
designer & worker	reduce requirement for handwritten signature approvals
service worker	advise client of deadlines
service worker	avoid entering same form data more than once
service worker	carry out procedures
service worker	get client details
service worker	communicate with client by email
service worker	inform all clients on what documents are needed
service worker	keep a record of a completed form
service worker	monitor whether correct documents have been submitted
service worker	retain (hard) copy of forms for future reference
service worker	share data with other interested parties
service worker	have confidence that e-forms are not being used by management to check up on workers

#### 2.2.2.2 SmartGov User Roles and Requirements

Table 2 on page 30 shows the results of our analysis of the stakeholder needs in terms of SmartGov users.

Typical user groups, as described in 2.1.1, had already been defined for the SmartGov project: managers, domain experts, IT staff, administrators and end users.

These correspond well with our stakeholder roles, as discussed in 2.3 on page 61, so we have used these corresponding labels:

our stakeholder role	SmartGov user group
service manager	manager
service designer	designer
service worker	worker
client in CEC	end user in council
client outside CEC	end user outside council
all council roles	all council users
all clients	all end users
all	all users

Each line in Table 2 should be interpreted as *<This stakeholder role> needs to <do this>, so <this SmartGov user> <must | should> be able to <do this> in the <development | runtime> environment.* 

Sometimes a single stakeholder need translates into more than one user requirement.

	Table	2:	Stakeholde	er needs	translated	into	<b>SmartGov</b>	user requirements
--	-------	----	------------	----------	------------	------	-----------------	-------------------

this		so this SG	must			in this env <sup>1</sup>	
stakeholder role	need(s) to do this	so inis so user	/should	be able to do this	dev	run	
all	get help fast	all council users	should	get help when required while working in SmartGov	**		
all	get help fast	all clients	should	get help when required while receiving services		**	
all	get clear notice of where to go for help if stuck	designer & worker	must	specify where extra help can be found if the user gets stuck	**	—	
all	get clear notice of where to go for help if stuck	all users	must	find out where extra help can be found if the user gets stuck		**	
all	print a paper form that's more or less the same as one that appears on a screen	all users	must	print a paper form that's more or less the same as the online one	**	**	
all	enter date information easily	all users	must	enter dates	**	**	
all clients	dates are not allowed to become obsolete	designer & worker	must	define what happens if a date becomes obsolete	**	_	

<sup>1</sup> Key to the *dev* and *runtime* columns:

- does not apply

<sup>\*\*</sup> applies

this stakeholder role	need(s) to do this	so this SG user	must /should	be able to do this	in thi dev	s env <sup>1</sup> run
all clients	be confident that dates that appear on forms have not become obsolete	designer & worker	must	define what it means for a date to become obsolete	**	
all clients	be confident that dates that appear on forms have not become obsolete	designer & worker	must	keep dates (that appear on forms) up to date	**	
all clients	be confident that details of who to contact are up to date	designer & worker	must	keep service contact details up to date	**	
all clients	be made aware of services that are available	designer	should	use form to raise awareness of services	**	
all clients	get access to relevant supporting documents	designer	must	associate relevant material with forms	**	
all clients	get access to relevant supporting documents	all end users	must	view any relevant material associated with forms	**	**
all clients	get clear guidance on how to complete a form	designer & worker	must	specify what guidance is required	**	
all clients	get clear guidance on how to complete a form	all end users	must	get appropriate guidance on filling a form		**
all clients	get forms that are easy to scan or photocopy	designer & worker	should	get guidance on design of forms for scanning or copying	**	
all clients	get help when needed	designer & worker	should	add help wherever appropriate	**	
all clients	get information about the process behind	designer	must	interpret process models for benefit of end	**	

this	need(s) to do this	so this SG user	must /should	be able to do this	in this $env^{l}$	
stakeholder role					dev	run
	the form: what happens next, etc.			users		
all clients	work with forms that are well-designed	designer & worker	should	get advice on good form design	**	
all clients	have confidence that data requested on a form is required and will be used	designer	should	state the anticipated use of each piece of data	**	
all clients	have confidence that data requested on a form is required and will be used	all council users	should	check that each piece of collected submitted data has been used	2	
all clients	have confidence that data requested on a form is required and will be used	all council users	should	check that each piece of collected submitted data has not been used inappropriately	2	
all clients	not have to fill in fields in a form when the info is already known	designer	must	identify data in forms that may already be known	**	
all clients	read forms easily even with sight impairment	designer	must	produce forms that are accessible by people with sight impairment	**	
all clients	receive an up-to-date service	designer & worker	must	change the information that a form contains	**	
all clients	know that the service is up to date	designer & worker	must	maintain versions of forms	**	
all clients	receive forms in plain, understandable language	designer	should	get guidance on plain English	**	

 $<sup>^{2}</sup>$  This is a back-office task that is done when electronic transactions are under way. Although vital, it is neither a development or a runtime task.

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this		so this SG	must		in thi	s env <sup>1</sup>
stakeholder role	need(s) to do this	user	/should	be able to do this	dev	run
all clients	receive forms in readable colours	designer	should	receive guidance on readable colour combinations	**	
all clients	receive forms in readable colours	designer	must	specify readable colour combinations	**	
all clients	receive forms in preferred colours	all end users	must	specify preferred colour combinations	**	**
all clients	receive forms with adequate font size	designer	must	specify a preferred font size	**	
all clients	receive forms in preferred font size	all end users	must	specify a preferred font size	**	**
all clients	see a check(list) of what has been entered and still needs to be entered	all end users	must	receive guidance on what data has been entered and which data they should be entering	_	**
all clients	see a check(list) of what has been entered and still needs to be entered	designer	must	specify which data should be entered at which stage in a process	**	
all clients	communicate quickly with the council	designer	must	include email facility in services	**	
client outside CEC	receive service through combination of form-filling and other communication ( <i>e.g.</i> personal visit, letter)	designer	must	define process models that include offline components	**	
client outside CEC	receive service through combination of form-filling and other communication ( <i>e.g.</i> personal visit, letter)	end user outside council	must	switch from online to offline mode and <i>vice versa</i>		**

						1
this stakeholder role	need(s) to do this	so this SG user	must /should	be able to do this	in thi dev	s env <sup>1</sup>
client outside CEC	receive service through combination of form-filling and other communication ( <i>e.g.</i> personal visit, letter)	end user outside council	must	resume online communication after going offline		**
client outside CEC	attach a signature with submitted form	designer	should	allow electronic signature as part of a process		**
client outside CEC	view forms in different languages	end user outside council	should	read a form in their language of choice		**
client inside CEC	control who gets access to forms	designer & manager	must	define user classes and authority of access to forms	**	
client inside CEC	use shortcut codes to enter data with which user has familiarity	designer & worker	should	specify shortcut codes and their meanings	**	
all council roles	be able to access procedures easily	all council users	should	examine process models	**	
all council roles	find ways to promote flexible working, <i>e.g.</i> working from home	all council users	should	interface with SmartGov remotely	**	**
all council roles	work with standardised forms as much as possible	designer	must	define a standard look and feel across different services	**	
all council roles	work with standardised forms as much as possible	designer	must	define a standard look and feel within a service	**	

this		so this SG	maust		in this env <sup>1</sup>	
stakeholder role	need(s) to do this	user	/should	be able to do this	dev	run
all council roles	reduce duplication of data entry as much as possible	designer	should	recognise when data are being duplicated	**	**
all council roles	see the computer as a sharing tool, not just a word processor	all council users	should	share as much information as possible	**	
manager	gather statistics on use of the service (council workers and all clients)	manager	should	calculate indicators of systems use	**	
manager	gather statistics on use of the service (council workers and all clients)	manager	should	state what needs to be measured to monitor system use	**	
manager	gather statistics on use of the service (council workers and all clients)	manager	should	state what needs to be displayed to show system use	**	
manager	gather statistics on use of the service (council workers and all clients)	manager	should	visualise system use	**	
manager	gather feedback on user needs	designer & manager	should	define ways to get input from end users	**	_
manager	put form design in the hands of service designers, workers and managers, not IT people	designer, worker and manager	must	edit forms	**	
manager	show that introduction of forms helps planning and efficiency	manager	should	calculate efficiency and effectiveness of service provision	**	

this		1. 66			in thi	s env <sup>1</sup>
stakeholder role	need(s) to do this	so this SG user	must /should	be able to do this	dev	run
manager	show that introduction of forms helps planning and efficiency	manager	should	state what needs to be displayed to show efficiency and effectiveness	**	_
manager	show that introduction of forms helps planning and efficiency	manager	should	state what needs to be measured to calculate efficiency and effectiveness	**	
manager	show that introduction of forms helps planning and efficiency	manager	should	visualise efficiency and effectiveness	**	
manager and designer	ensure that back office systems are working well before concentrating on front office systems	designer, worker and manager	should	define the process model	**	
manager & designer	ensure that all data requested on form is required and will be used	designer	must	state how each piece of collected data will be used	**	
designer	design workflow operations	designer	must	define process models	**	
designer & worker	put Council logo on all forms	designer & worker	must	include graphics as part of the common look and feel of a form	**	
designer & worker	put Council logo on all forms	designer & worker	must	ensure that essential elements of a form are always there	**	
worker	advise client of deadlines	designer & worker	must	specify deadlines for submission of data or documents	**	
worker	avoid entering same form data more than once	designer	must	state how each piece of collected data will be stored		**

this stakeholder	need(s) to do this	so this SG	must	he able to do this	in this $env^{T}$	
role	neea(s) to ao inis		/should		dev	run
worker	carry out procedures	worker	must	get guidance on what to do next		**
worker	communicate with client by email	designer	must	specify when council can email end users	**	
worker	inform all clients on what documents are needed	designer	must	state which documents are required from end users	**	
worker	keep a record of a completed form	worker & manager	must	store and access a record of a submitted form		**
worker	monitor whether correct documents have been submitted	designer	must	state which documents are required from end users	**	
worker	monitor whether correct documents have been submitted	worker	must	check if required documents have been submitted by end users	3	
worker	retain (hard) copy of forms for future reference	designer	must	specify which forms should have hard copies retained	**	
worker	share data with other interested parties	designer & manager	must	state who can get access to what data	**	

<sup>&</sup>lt;sup>3</sup> See footnote Error! Bookmark not defined. on page Error! Bookmark not defined.

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#### 2.2.2.3 SmartGov Functional Requirements

Finally, we considered each of the user requirements in Table 2 above and decided what functionality SmartGov would need to provide in order to meet the user requirement.

Table 3 below shows each of the functional requirements. Each line should be interpreted as *<This user requirement> places <this functional requirement> on the SmartGov system*.

In all, we identified about 70 functional requirements.

Sometimes a user requirement results in more than one functional requirement; sometimes more than one user requirement results in the same functional requirement

#### Table 3: broad functional requirements for CEC

this SG user	must /should	be able to do this	therefore the system will
all council users	should	get help when required while working in SmartGov	1 provide context sensitive guidance on working with SmartGov
all end users	should	get help when required while receiving services	2 provide context sensitive guidance on how users should interface with electronic services
designer & worker	must	specify where extra help can be found if the user gets stuck	3 provide details of where to go for extra help if the user gets stuck
all users	must	find out where extra help can be found if the user gets stuck	4 provide details of where to go for extra help if the user gets stuck
all users	must	enter dates	5 provide means for users to enter dates without typing
all users	must	print a paper form that's more or less the same as the online one	6 provide print facilities so that paper versions of forms look the same as the online version

this SG user	must /should	be able to do this	therefore the system will
designer & worker	must	define what happens if a date goes "out of date"	7 provide a way of indicating what should happen to forms when certain dates arrive
designer & worker	must	define what it means for a date to be "out of date"	8 provide a way of indicating trigger conditions when certain dates arrive
designer & worker	must	keep dates (that appear on forms) up to date	9 provide a way of checking any dates that appear on forms
designer & worker	must	keep service contact details up to date	10 provide a way of storing and updating council worker details and associating them with services
designer	should	use form to raise awareness of services	11 provide an "advertising" facility to ensure that clients are made aware of new services
designer	must	associate relevant material with forms	12 allow material to be associated with forms
all end users	must	view any relevant material associated with forms	13 allow material associated with a form to be viewed
designer & worker	must	specify what guidance is required	14 allow help and guidance to be associated with forms and their uses
all end users	must	get appropriate guidance on filling a form	15 provide context sensitive guidance on form-filling

this SG user	must /should	be able to do this	therefore the system will
designer & worker	should	get guidance on design of forms for scanning or copying	16 provide guidance on scannability of forms
designer & worker	should	get guidance on design of forms for scanning or copying	17 ?automatically check forms for scannability? <sup>4</sup>
designer & worker	should	add help wherever appropriate	14 (again) allow help and guidance to be associated with forms and their uses
designer	must	interpret process models for benefit of end users	18 display details of process models to end users
designer & worker	should	get advice on good form design	19 provide advice on good form design
designer	should	state the anticipated use of each piece of data	20 allow anticipated use to be stored against each form element
all council users	should	check that each piece of collected submitted data has been used	21 record actual use against data items
all council users	should	check that each piece of collected submitted data has not been used inappropriately	21 (again) record actual use against data items
designer	must	identify data in forms that may already be known	22 store entered data and allow forms or form elements to be associated with such data
designer	must	produce forms that are accessible by people with sight impairment	23 allow forms to be delivered in formats readable by people with sight impairment

<sup>&</sup>lt;sup>4</sup> It is not clear how this might be achieved

this SG user	must /should	be able to do this	therefore the system will
designer & worker	must	change the information that a form contains	24 provide form-editing facilities
designer & worker	must	maintain versions of forms	25 provide versioning
designer	should	get guidance on plain English	26 have simple rules of thumb and tools for identifying complicated text
designer	should	receive guidance on readable colour combinations	27 provide guidance on readable colour combinations
designer	must	specify readable colour combinations	28 allow editing of colours in form design
all end users	must	specify readable colour combinations	29 allow editing of colours in end user interfaces
designer	must	specify a preferred font size	30 allow editing of font sizes in form design
all end users	must	specify a preferred font size	31 allow editing of font sizes in end user interfaces
all end users	must	receive guidance on what data has been entered and which data they should be entering	32 clearly show which data are required at each stage
designer	must	specify which data should be entered at which stage in a process	33 allow each data input to be tagged against each stage in a process
designer	must	include email facility in services	34 receive email messages from end users and direct them to particular recipient
designer	must	define process models that include offline components	35 include offline activities in process model libraries

this SG user	must /should	be able to do this	therefore the system will
end user outside council	must	switch from online to offline mode and vice versa	36 save end user sessions over time
end user outside council	must	resume online communication after going offline	37 allow saved end user sessions to be resumed later
designer	should	allow electronic signature as part of a process	38 provide a facility for authenticating users' electronic signatures
end user outside council	should	read a form in their language of choice	39 provide forms in different languages
designer & manager	must	define user classes and authority of access to forms	40 maintain record of authorised users
designer & worker	should	specify shortcut codes and their meanings	41 associate shortcut codes and their meanings with data items
all council users	should	examine process models	42 allow browsing of service process models
all council users	should	interface with SmartGov remotely	43 have web-enabled interfaces
designer	must	define a standard look and feel across different services	44 support the design and storage of a standard look and feel for forms

this SG user	must /should	be able to do this	therefore the system will
designer	must	define a standard look and feel within a service	45 support the design and storage of a standard look and feel for forms
designer	should	recognise when data are being duplicated	46 check that the same data are not being collected more than once
all council users	should	share as much information as possible	47 maintain access rights for groups and individuals
manager	should	calculate indicators of systems use	48 perform system use calculations
manager	should	state what needs to be measured to monitor system use	49 measure parameters required for monitoring system use
manager	should	state what needs to be displayed to show system use	50 structure data on system use so that they can be visualised
manager	should	visualise system use	51 display statistical visuals
designer & manager	should	define ways to get input from end users	52 provide a facility for council to survey end users
designer, worker and manager	must	edit forms	24 (again) provide form-editing facilities
manager	should	calculate efficiency and effectiveness of service provision	53 perform efficiency and effectiveness calculations
manager	should	state what needs to be displayed to show efficiency and effectiveness	54 structure efficiency & effectiveness data so that it can be visualised
manager	should	state what needs to be measured to calculate efficiency and effectiveness	55 measure parameters required for efficiency and effectiveness measurement

this SG user	must /should	be able to do this	therefore the system will
manager	should	visualise efficiency and effectiveness	56 display efficiency and effectiveness visuals
designer, worker and manager	should	define the process model	57 allow editing of service process models
designer	must	state how each piece of collected data will be used	58 allow data items to be associated with intended uses
designer	must	define process models	57 (again) allow editing of service process models
designer & worker	must	include graphics as part of the common look and feel of a form	59 allow inclusion of graphics in form design
designer & worker	must	ensure that essential elements of a form are always there	60 allow specification of essential form elements
designer & worker	must	specify deadlines for submission of data or documents	61 maintain lists of deadlines for receipt of data or documents at the council
designer & worker	must	specify deadlines for submission of data or documents	62 announce to end users when deadlines are approaching
designer & worker	must	specify deadlines for submission of data or documents	63 announce to council workers when deadlines are approaching
designer	must	state how each piece of collected data will be stored	64 store all data that are submitted by end users
worker	must	get guidance on what to do next	65 access a workflow engine
designer	must	specify when council can email end users	66 receive email messages from council workers and direct them to end user

this SG user	must /should	be able to do this	therefore the system will
designer	must	state which documents are required from end users	67 announce to end users which documents they need to submit to receive a service
worker & manager	must	store and access a record of a submitted form	68 keep a record of submitted forms
designer	must	state which documents are required from end users	69 allow lists of required documents to be associated with services
worker	must	check if required documents have been submitted by end users	70 maintain lists of submitted documents
designer	must	specify which forms should have hard copies retained	71 make hard copies of certain forms
designer & manager	must	state who can get access to what data	72 maintain lists of authorities against data

The requirements have been classified above in terms of the user roles that require them. We also believe that it is useful to classify the requirements according to their implications for:

- designing the SmartGov platform in WP06
- developing a framework for e-government services in WP07

## 2.2.2.3.1 Requirements classified for design

To help with the design of the SmartGov platform, we have classified the system requirements as follows:

- user interface: does this requirement have implications for the user interface?
- **inputs**: does this requirement have implications for the system inputs?
- **outputs**: does this requirement have implications for the system inputs?
- data stores: does this requirement have implications for system data stores?
- **functionality**: does this requirement have implications for system functionality
- **operation**: does this requirement have implications for the way the system is run, managed and maintained?

Notes on the table below:

- A question mark (?) in the table indicates that it is hard to know at this stage whether there are implications.
- The last few requirements in the table, 78-82, are taken from the specific requirements for the CEC pilot application.

#### Table 4: requirements classified in a way that should help in system design

functional requirement	user interface	data stores	inputs	outputs	functionality	operation
1 provide context sensitive guidance on working with SmartGov	yes	yes	no	no	yes	no
2 provide context sensitive guidance on how users should interface with electronic services	yes	yes	no	no	yes	yes
3 provide details of where to go for extra help if the user gets stuck	no	yes	no	no	no	yes
4 provide details of where to go for extra help if the user gets stuck	no	yes	no	no	no	yes

functional requirement	user interface	data stores	inputs	outputs	functionality	operation
5 provide means for users to enter dates without typing	yes	no	no	no	no	no
6 provide print facilities so that paper versions of forms look the same as the online version	no	no	no	no	yes	yes
7 provide a way of indicating what should happen to forms when certain dates arrive	yes	yes	no	no	yes	yes
8 provide a way of indicating trigger conditions when certain dates arrive	yes	yes	no	no	no	yes
9 provide a way of checking any dates that appear on forms	yes	yes	no	no	yes	no
10 provide a way of storing and updating council worker details and associating them with services	yes	yes	no	no	yes	yes
11 provide an "advertising" facility to ensure that clients are made aware of new services	yes	?	no	no	?	yes
12 allow material to be associated with forms	yes	yes	no	no	?	yes
13 allow material associated with a form to be viewed	yes	yes	yes	no	yes	no
14 allow help and guidance to be associated with forms and their uses	yes	yes	no	no	no	yes
15 provide context sensitive guidance on form- filling	yes	yes	no	no	yes	yes
16 provide guidance on scannability of forms	yes	yes	no	no	no	?
17 ?automatically check forms for scannability?	yes	yes	no	no	no	?
14 (again) allow help and guidance to be associated with forms and their uses	yes	yes	no	no	no	yes
18 display details of process models to end users	yes	yes	no	no	?	no
19 provide advice on good form design	yes	yes	no	no	no	yes
20 allow anticipated use to be stored against each form element	yes	yes	no	no	no	yes
21 record actual use against data items	no	yes	no	no	yes	?
21 (again) record actual use against data items	no	yes	no	no	yes	?
22 store entered data and allow forms or form elements to be associated with such data	no	yes	yes	no	yes	no

functional requirement	user interface	data stores	inputs	outputs	functionality	operation
23 allow forms to be delivered in formats readable by people with sight impairment	yes	no	no	no	yes	no
24 provide form-editing facilities	yes	yes	no	no	no	no
25 provide versioning	yes	yes	no	no	yes	no
26 have simple rules of thumb and tools for identifying complicated text	yes	no	?	no	no	?
27 provide guidance on readable colour combinations	yes	yes	no	no	no	?
28 allow editing of colours in form design	yes	yes	no	no	no	no
29 allow editing of colours in end user interfaces	yes	yes	no	no	no	no
30 allow editing of font sizes in form design	yes	yes	no	no	no	no
31 allow editing of font sizes in end user interfaces	yes	yes	no	no	no	no
32 clearly show which data are required at each stage	yes	yes	no	no	yes	yes
33 allow each data input to be tagged against each stage in a process	yes	yes	no	no	no	yes
34 receive email messages from end users and direct them to particular recipient	yes	yes	no	no	no	yes
35 include offline activities in process model libraries	yes	yes	yes	no	?	no
36 save end user sessions over time	yes	yes	no	no	yes	no
37 allow saved end user sessions to be resumed later	yes	yes	no	no	yes	no
38 provide a facility for authenticating users' electronic signatures	yes	yes	no	no	no	yes
39 provide forms in different languages	yes	?	no	no	yes	yes
40 maintain record of authorised users	yes	yes	no	no	no	yes
41 associate shortcut codes and their meanings with data items	yes	yes	no	no	no	yes
42 allow browsing of service process models	yes	no	no	no	no	no
43 have web-enabled interfaces	yes	no	?	?	no	?

functional requirement	user interface	data stores	inputs	outputs	functionality	operation
44 support the design and storage of a standard look and feel for forms	yes	yes	no	no	yes	yes
45 support the design and storage of a standard look and feel for forms	yes	yes	no	no	yes	yes
46 check that the same data are not being collected more than once	yes	yes	no	no	yes	no
47 maintain access rights for groups and individuals	no	no	no	no	yes	yes
48 perform system use calculations	yes	yes	no	no	yes	yes
49 measure parameters required for monitoring system use	yes	yes	no	no	no	yes
50 structure data on system use so that they can be visualised	yes	yes	no	no	no	no
51 display statistical visuals	yes	yes	no	no	yes	no
52 provide a facility for council to survey end users	yes	?	no	no	no	yes
24 (again) provide form-editing facilities	yes	yes	no	no	no	no
53 perform efficiency and effectiveness calculations	yes	yes	no	no	yes	yes
54 structure efficiency & effectiveness data so that it can be visualised	yes	yes	no	no	no	no
55 measure parameters required for efficiency and effectiveness measurement	yes	yes	no	no	no	no
56 display efficiency and effectiveness visuals	yes	yes	no	no	yes	no
57 allow editing of service process models	yes	yes	no	no	no	no
58 allow data items to be associated with intended uses	yes	yes	no	no	no	yes
57 (again) allow editing of service process models	yes	yes	no	no	no	no
59 allow inclusion of graphics in form design	yes	no	no	no	yes	no
60 allow specification of essential form elements	yes	yes	no	no	no	no
61 maintain lists of deadlines for receipt of data or documents at the council	no	yes	no	no	no	yes

functional requirement	user interface	data stores	inputs	outputs	functionality	operation
62 announce to end users when deadlines are approaching	no	yes	no	no	no	no
63 announce to council workers when deadlines are approaching	no	yes	no	no	no	no
64 store all data that are submitted by end users	yes	yes	no	no	no	yes
65 access a workflow engine	no	no	no	no	no	yes
66 receive email messages from council workers and direct them to end user	yes	yes	no	no	no	yes
67 announce to end users which documents they need to submit to receive a service	yes	yes	no	no	no	yes
68 keep a record of submitted forms	yes	yes	no	no	no	no
69 allow lists of required documents to be associated with services	yes	yes	no	no	no	yes
70 maintain lists of submitted documents	no	yes	no	no	yes	yes
71 make hard copies of certain forms	yes	yes	no	no	no	yes
72 maintain lists of authorities against data	yes	yes	no	no	no	yes
73 form elements will be associated with tasks in process models	yes	yes	no	no	no	yes
74 data will be sent to and received from a separate IT application	no	yes	yes	yes	yes	no
75 form elements will be associated with decision points in process models	yes	yes	no	no	no	no
76 the contents of elements on forms can be conditional on some other data	yes	yes	?	?	no	?
77 an authorised role can be associated with an item in an external database	yes	yes	yes	yes	no	?

## 2.2.2.3.2 Requirements classified for framework development

To help with the development of the framework for e-services in WP07, we have also classified the requirements as:

• **processes**: does this requirement have implications for the specification of reference models for process management in electronic transaction services?

- **co-operation**: does this requirement have implications for the specification of reference models for co-operation between interested parties in the design and delivery of electronic transaction services?
- **social acceptance**: does this requirement have implications for the specification of reference models for social acceptance of electronic transaction services?

# Table 5: requirements classified in a way that should help in framwork development

functional requirement	brocesses	co-operation	social
1 provide context sensitive guidance on working with SmartGov	no	no	yes
2 provide context sensitive guidance on how users should interface with electronic services	no	no	yes
3 provide details of where to go for extra help if the user gets stuck	no	yes	yes
4 provide details of where to go for extra help if the user gets stuck	no	yes	yes
5 provide means for users to enter dates without typing	no	no	no
6 provide print facilities so that paper versions of forms look the same as the online version	no	no	no
7 provide a way of indicating what should happen to forms when certain dates arrive			no
8 provide a way of indicating trigger conditions when certain dates arrive	no	no	no
9 provide a way of checking any dates that appear on forms	no	no	no
10 provide a way of storing and updating council worker details and associating them with services	no	no	yes
11 provide an "advertising" facility to ensure that clients are made aware of new services	no	yes	no
12 allow material to be associated with forms	no	yes	no
13 allow material associated with a form to be viewed	no	no	no
14 allow help and guidance to be associated with forms and their uses	yes	no	yes
15 provide context sensitive guidance on form-filling	yes	no	yes
16 provide guidance on scannability of forms	no	no	no
17 ?automatically check forms for scannability?	no	no	no

functional requirement	processes	co-operation	social
14 (again) allow help and guidance to be associated with forms and their uses	no	no	yes
18 display details of process models to end users	yes	no	yes
19 provide advice on good form design	no	no	no
20 allow anticipated use to be stored against each form element	yes	no	yes
21 record actual use against data items	yes	no	yes
21 (again) record actual use against data items	yes	no	yes
22 store entered data and allow forms or form elements to be associated with such data	no	yes	no
23 allow forms to be delivered in formats readable by people with sight impairment	no	no	no
24 provide form-editing facilities	no	no	no
25 provide versioning	no	no	yes
26 have simple rules of thumb and tools for identifying complicated text	no	no	no
27 provide guidance on readable colour combinations	no	no	no
28 allow editing of colours in form design	no	no	no
29 allow editing of colours in end user interfaces	no	no	no
30 allow editing of font sizes in form design	no	no	no
31 allow editing of font sizes in end user interfaces	no	no	no
32 clearly show which data are required at each stage	yes	no	no
33 allow each data input to be tagged against each stage in a process	yes	no	no
34 receive email messages from end users and direct them to particular recipient	no	no	no
35 include offline activities in process model libraries	yes	yes	no
36 save end user sessions over time	yes	yes	no
37 allow saved end user sessions to be resumed later	yes	no	no
38 provide a facility for authenticating users' electronic signatures	no	?	yes
39 provide forms in different languages	no	no	no
40 maintain record of authorised users	no	yes	yes

functional requirement	processes	co-operation	social
41 associate shortcut codes and their meanings with data items	no	no	no
42 allow browsing of service process models	yes	no	no
43 have web-enabled interfaces	no	no	no
44 support the design and storage of a standard look and feel for forms	no	yes	no
45 support the design and storage of a standard look and feel for forms	no	yes	no
46 check that the same data are not being collected more than once	no	yes	no
47 maintain access rights for groups and individuals	no	yes	yes
48 perform system use calculations	no	no	no
49 measure parameters required for monitoring system use	no	no	no
50 structure data on system use so that they can be visualised	no	no	no
51 display statistical visuals	no	no	no
52 provide a facility for council to survey end users	no	no	yes
24 (again) provide form-editing facilities	no	no	no
53 perform efficiency and effectiveness calculations	no	no	no
54 structure efficiency & effectiveness data so that it can be visualised	no	no	no
55 measure parameters required for efficiency and effectiveness measurement	no	no	no
56 display efficiency and effectiveness visuals	no	no	yes
57 allow editing of service process models	yes	no	no
58 allow data items to be associated with intended uses	yes	yes	yes
57 (again) allow editing of service process models	yes	no	no
59 allow inclusion of graphics in form design	no	no	no
60 allow specification of essential form elements	no	no	no
61 maintain lists of deadlines for receipt of data or documents at the council	yes	no	no
62 announce to end users when deadlines are approaching	yes	no	no
63 announce to council workers when deadlines are approaching	yes	no	no

functional requirement	processes	co-operation	social
64 store all data that are submitted by end users	yes	no	no
65 access a workflow engine	yes	no	no
66 receive email messages from council workers and direct them to end user	yes	no	no
67 announce to end users which documents they need to submit to receive a service	yes	no	no
68 keep a record of submitted forms	yes	no	yes
69 allow lists of required documents to be associated with services	no	no	no
70 maintain lists of submitted documents	yes	no	yes
71 make hard copies of certain forms	yes	no	no
72 maintain lists of authorities against data	yes	?	yes
73 form elements will be associated with tasks in process models	yes	no	no
74 data will be sent to and received from a separate IT application	yes	yes	no
75 form elements will be associated with decision points in process models	yes	no	no
76 the contents of elements on forms can be conditional on some other data	yes	no	no
77 an authorised role can be associated with an item in an external database	no	yes	no

### 2.2.2.4 Needs omitted from the analysis

Table 6 below shows those needs that were omitted from the analysis either because they are so fundamental to the SmartGov objectives or because it was hard to relate them to any particular use of SmartGov:

Table 0. needs that were unitted from the analysis	Table 6:	needs t	hat were	omitted	from	the	analysis
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this role	need(s) to do this	comments
all council roles	have access to geographical information systems (GIS)	A specialised type of external system, for which it would be hard to create a generalised interface management facility in SmartGov.
all council roles	improve communication	Communication may be facilitated through the SmartGov's knowledge repository, since various actors insert information into it, which is subsequently retrieved, modified or commented on by other users. This is an indirect and off-line form of communication that may be further enhanced by allowing "notification subscription" to certain events in specific thematic categories.
designer & manager	reduce reliance on IT people for designing services	A key overall goal of the SmartGov platform.
designer & worker	reduce requirement for handwritten signature approvals	This might call for changes to the service, <i>e.g.</i> asking a client to come to an office to verify information already supplied online. Alternatively, approvals may be given electronically, possibly using strong authentication and electronic signatures.
designer	make changes to forms on the fly; don't wait until it's cost- effective for a new print run	It is hoped that SmartGov will reduce the necessity for print runs.

this role	need(s) to do this	comments
designer	reduce costs by delivering services online	Another key goal of SmartGov, which will make service development and delivery easier, thus more services will be made available electronically, thus costs will be reduced.
manager	monitor amount of work that has to be redone	Once again, a key objective of SmartGov.
worker	get client details	May be facilitated by trustworthy authentication schemes; we expect to know who uses which service on behalf of whom. Usernames, passwords or even smart cards may be specified.
worker	have confidence that e-forms are not being used by management to check up on workers	SmartGov acknowledges the need for the application of good management practices in introducing electronic services. Work Package 7 of the project will study social aspects of electronic service delivery.

# 2.3 Consolidated user requirements

In this section the requirements identified for the two PA authorities (GSIS and CEC) are combined, in order to produce a complete list of functional requirements for the SmartGov platform. The first step towards producing this list was to define a mapping between the user groups identified in the user requirements analysis phases within the two PAs. The user group mappings are as follows:

GSIS user group	CEC user group	Comments								
Managers	Service Managers	Functions performed by these user groups are very similar.								
IT staff	IT support	Functions performed by these user groups are very similar. IT support is outsourced in the case of CEC while in the case of the GSIS IT support is provided both by employees of the GSIS and external contractors. This difference however is not considered significant.								
End users	End users inside CEC + End users outside CEC	In the case of the GSIS end users are not distinguished between "internal" and "external" users, while in the case of CEC this distinction is made. The distinction is retained in the consolidated version of the user requirements, so as to produce a requirements list that does not loose significant information.								
Domain experts	Service designers	Functions performed by these user groups are very similar.								
Administrators	Service workers	"Service workers", as defined by the CEC requirements perform a wider range of tasks than "administrators" user group defined by the GSIS. To this end, we will adopt the term used by the CEC, which completely covers the corresponding GSIS group.								

Moreover, the analysis performed within the CEC classifies requirements as "mandatory" (the system *must* offer a facility) and "desired" (the system *should* offer a facility). This classification is used in the consolidated version of the requirements, together with the designation of whether each requirement pertains to the development or production phase of an electronic service. When the classification or the pertinent phase was not obvious, extra input was collected from the PA employees.

User Groups	Managers		Domain Experts		IT Staff		Service workers		End users inside PA	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
User-friendly interface	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Context-sensitive help functionality	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Multilingual interface and content	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Should
Multiple access	$\checkmark$		$\checkmark$		$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Authentication and access control mechanism	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Back up facilities	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			Must
View automated reports	$\checkmark$	$\checkmark$					$\checkmark$	$\checkmark$			Must
Management of statistics	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			Must
Management of predefined TSEs			$\checkmark$		$\checkmark$						Must
Reuse and adaptation of previous work			$\checkmark$								Must
Creation of new TSEs			$\checkmark$		$\checkmark$						Must
Definition of constraints and validation checks			$\checkmark$		$\checkmark$						Must
Modelling of inter-element relations			$\checkmark$		$\checkmark$						Must
Attachment of domain knowledge on form elements			$\checkmark$		$\checkmark$						Must
Composition of manual and instructions for the end users			$\checkmark$		$\checkmark$						Must

User Groups	Man	Managers		Domain Experts		IT Staff		vice kers	End users inside PA	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Composition of documentation about the implemented service			1		$\checkmark$						Must
Connections with third party systems					$\checkmark$	$\checkmark$					Must
Management of user accounts							$\checkmark$	$\checkmark$			Must
Definition of the information to be recorded in the log files					$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$			Must
Definition and editing of service process models	$\checkmark$		$\checkmark$				$\checkmark$				Should
Browsing of service process models	$\checkmark$		$\checkmark$				$\checkmark$				Should
Web-enabled interfaces	$\checkmark$	$\checkmark$	$\checkmark$				$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Should
Design, store and use standard look and feel for forms			$\checkmark$				$\checkmark$				Must
Detect data duplication within a service or across services			$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$			Should
Associate forms with time periods and specify related actions			$\checkmark$				$\checkmark$				Must
Specify deadlines for document submission											Must
Specify trigger conditions when certain dates arrive			$\checkmark$				$\checkmark$				Must

User Groups	Man	Managers		Domain Experts		IT Staff		vice kers	End users inside PA	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Provide checks for dates that appear on forms (special case of "definition of constraints & validation checks")			$\checkmark$				V				Must
Store PA worker details and associate them with services			$\checkmark$				$\checkmark$				Must
Leverage client awareness for the new services			$\checkmark$					$\checkmark$			Should
View material associated with a form			$\checkmark$					$\checkmark$	$\checkmark$	$\checkmark$	Must
Provide context sensitive guidance on form- filling			$\checkmark$		$\checkmark$			$\checkmark$			Must
Associate help and guidance with forms and their uses			$\checkmark$				$\checkmark$				Must
Provide guidance on scannability of forms			$\checkmark$				$\checkmark$				Should
Automatically check forms for scannability			$\checkmark$				$\checkmark$				Should
View process model details									$\checkmark$	$\checkmark$	Must
Access advice and guidance on good form design			$\checkmark$				$\checkmark$				Should
Assess actual use of data items			$\checkmark$	$\checkmark$			$\checkmark$	$\checkmark$			Should
Identify data on forms that may already be known			$\checkmark$								Must

User Groups	Managers		Domain Experts		IT Staff		Service workers		End users inside PA	s End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Design form formats readable by people with sight impairment			$\checkmark$								Must
Maintain versions of forms			$\checkmark$				$\checkmark$				Must
Access form-editing facilities			$\checkmark$				$\checkmark$				Must
Access simple rules of thumb for identifying complicated text			$\checkmark$								Should
Select colours in user interfaces	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Access guidance on readable colour combinations			$\checkmark$								Must
Edit colours in form design			$\checkmark$								Must
Select font sizes in end user interfaces	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	$\checkmark$	Must
Define font sizes in form design			$\checkmark$								Must
Enter indications clearly show which data are required at each stage			$\checkmark$								Must
View which data has been entered and which remains to be entered									$\checkmark$	$\checkmark$	Must
Tag data input against each stage in a process			$\checkmark$								Must
Receive email messages from end users											Must

User Groups	Managers		Domain Experts		IT Staff		Service workers		End users inside PA	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Include e-mail facilities in services			$\checkmark$								Must
Specify notifications for interested parties (service workers and end users) about approaching deadlines			$\checkmark$					V			Must
Provide means for users to enter dates without typing			$\checkmark$								Must
Provide details of where to go for extra help if the user gets stuck			$\checkmark$					$\checkmark$			Must
Provide print facilities so that paper versions of forms look the same as the online version			$\checkmark$					$\checkmark$			Must
Define/view how each piece of data will be used	$\checkmark$		$\checkmark$								Must
Include graphics in form design			$\checkmark$				$\checkmark$				Must
Include offline activities in process models			$\checkmark$								Must
Save sessions to be resumed later									$\checkmark$	$\checkmark$	Must
Switch from on-line to off-line mode and vice versa									$\checkmark$	$\checkmark$	Must
Define when electronic signatures will be produced, accepted or validated			$\checkmark$								Must

User Groups	Man	Managers		Domain Experts		IT Staff		vice kers	End users inside PA	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Define user classes and authority to access forms	√		$\checkmark$								Must
Specify shortcut codes and their meanings			$\checkmark$								Should
Define system use metrics	$\checkmark$		$\checkmark$		$\checkmark$		$\checkmark$				Must
View system use reports in comprehensible form (graph, tables etc)		$\checkmark$		$\checkmark$		$\checkmark$		$\checkmark$			Should
Design end-user surveys	$\checkmark$		$\checkmark$								Should
Define efficiency and effectiveness metrics	$\checkmark$		$\checkmark$								Should
View efficiency and effectiveness metrics in comprehensible forms (charts, tables etc)		$\checkmark$		$\checkmark$							Should
Schedule notifications and announcements for end-users			$\checkmark$					$\checkmark$			Must
Schedule notifications and announcements for PA users			$\checkmark$					$\checkmark$			Must
Access and use data entered by the end-users								$\checkmark$			Must
Get guidance on what to do next								$\checkmark$			Must
State which documents are required from end users			1								Must
Access records for submitted forms		$\checkmark$						$\checkmark$			Must

User Groups	Managers		Domain Experts		IT Staff		Service workers		End users	End users outside	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Check if required documents have been submitted								$\checkmark$			Must
Specify which forms should have hard copies retained			$\checkmark$					$\checkmark$			Must
Specify lists of permissions for data	$\checkmark$		$\checkmark$								

# **3** Barriers to electronic services development

Although strong will has been declared at both national and European level to develop services to promote electronic governance, the current spread of electronic services clearly lags behind the desired level. One of the tasks carried out within the User Requirements Analysis phase of the SmartGov project was to document the causes that impede the development of electronic services. To this end, appropriate information was gathered during the structured interviews conducted with electronic service stakeholders from the participating public authorities. This information was then analysed to pinpoint the actual barriers to electronic services development. The analysis showed that the barriers could be classified into five major categories:

- 1. *Legislative barriers*, related to the existence of the appropriate laws, regulations and directives that allow or facilitate the deployment of electronic services.
- 2. *Administrative barriers*, related to lack of appropriate business models, justification of costs, availability and allocation of skilled personnel and the need for structural reforms.
- 3. *Technological barriers*, associated with the availability of suitable tools, standards and infrastructure to develop, deploy and use the electronic service.
- 4. *User-culture barriers*, which are set by the culture or the profile of the user group. User groups can be viewed from different angles and with different granularities: users internal to PA, external users, local community users, international users, etc.
- 5. *Social barriers*, i.e. impediments related to the social status of the various stakeholders, such as fear of job loss or status degradation; established power structures and contacts networks may also view these developments as a threat.

The barrier categories are analysed in the subsequent paragraphs.

## 3.1 Legislative barriers

Legislative barriers arise mainly from the lack of a suitable legal framework that addresses the submission of electronic documents, liability emerging from electronic documents, proofing value of electronic documents against paper documents and so on.

Especially for the proof-of-identity and the electronic document integrity issue, there does not currently exist a globally accepted framework for all services. Electronic signatures technology is accepted in some countries and/or for specific services, but there exist countries and service classes for which electronic signatures are considered inadequate, e.g. services involving payments to citizens where fraud detection is important. Additionally, legislation for Trusted Third Parties, i.e. bodies that will testify for resolution of disputes between citizens and public authorities in the context of electronic services, is still immature.

The legal requirements for physical inspections, audits and examinations may hinder the transition to electronic services, since some manual processes will still remain in the workflow. Legal issues may affect the ability of the PA to adapt to the requirements of electronic service introduction. In some cases, PA administrative and organizational structure is strictly defined by laws, and thus reforms that will lead to the adoption of a customer-centric model, which is crucial to the success of electronic service delivery, is inhibited.

For services where multiple parties are involved, multiple changes in legislation, systems and processes may be required for modernisation. For electronic services spanning across country borders two additional issues may be identified:

- there may exist inconsistent legislations in the involved countries regarding the legal aspects of the services; if such inconsistencies are not resolved, the service cannot operate successfully.
- the jurisdiction for incidents that require the intervention of authorities must be clearly determined.

Finally, in some cases legislation explicitly prohibits usage of specific technologies, such as Java applets, Active X controls etc. For instance, the city of Florida expressly forbids the use of ActiveX controls (<u>http://www.brevardcounty.us/is/webdevguide/</u>), while the use of Java applets in the UK, though generally accepted, is subject to local security arrangements (<u>http://www.govtalk.gov.uk/schemasstandards/schemasstandards\_faq.asp</u>).

The SmartGov environment per se is not capable of resolving legislative barriers; these must be addressed by the proper bodies. In this report, however, the SmartGov consortium brings these issues to the administrations' notice, in order to be properly included in the action plans for electronic service development and deployment. Especially for issues regarding usage of specific technologies, the SmartGov platform will only make use of the fundamental technologies for each dissemination channel, possibly complemented by technologies that are universally accepted.

## **3.2** Administrative barriers

Public authority administration proves in some cases reluctant to introduce electronic services, mainly for the following reasons:

1. cost justification. Development and deployment of electronic services incurs significant costs for hardware platforms, software development and licensing and employee hiring for electronic service administration and help desk operation. Managers may find it hard to convince that these costs can be justified in terms of quality of service to the citizens, diminishing of productive hours wasted in queues and moving between public authorities, improved workflow within the organization and the reallocation of PA workers from tedious document reception and typing to more fruitful tasks. This is especially true when the target audience for the service is small and/or it is doubtful whether the target audience will finally prefer the electronic version of the service against the traditional paper-based delivery channel, for example the elderly who often don't own a computer and may not be confident or equipped to use web services.

Handling this issue is not within the scope of the SmartGov environment; this issue is adequately covered by numerous surveys, articles or even policies.

- 2. *need for organisational reform.* Introduction of electronic services necessitates organisational reforms within the public authority, to adopt its structure to the needs of novel work and document flows or, more generally, to transform the public authority to customer-centric organisation. Organisational reforms may not be well-accepted by the existing personnel, unless introduced with extreme care. Smooth introduction of organisational reforms is addressed in the SmartGov framework, developed in WP7.
- 3. *complex policies*. Organisational policies may introduce impediments to the development of electronic services. A typical example is the requirement for an overwhelming amount of information from service users, or the definition of complicated policies that require a large number of interwoven transactions. In some cases, policies are oriented towards "organisational comfort" rather than "citizen service", thus necessitating a need for reform as described in item 2. The move to a citizen-centric view is addressed in the SmartGov framework, developed in WP7.
- 4. *lack of methods for productivity and progress monitoring and accountability*. In traditional, paper-based environments, managers have developed tools and methodologies to assess employee productivity and for monitoring the overall progress of various tasks. Moreover, specific individuals or groups can be easily appointed to be accountable for certain actions. In the context of electronic services accountability relies heavily on underlying authentication, logging and security infrastructures, which are not always well-developed; moreover, methods for productivity monitoring and progress assessment need to be radically redesigned, as compared to paper-based systems.

The SmartGov collects sufficient data for measuring productivity and progress monitoring, and accountability is also assured, since the actors of updates are recorded within the information repository.

5. *lack of qualified personnel.* Electronic service development and operation currently depends heavily on IT staff, a resource usually scarce within public administration authorities. Some activities may be outsourced, but achieving high availability and error-free operation for electronic services is especially hard without on-site, dedicated staff. Outsourcing the entire service, including hardware platforms, software and operation is not always a viable solution due to legislation restrictions and/or governmental policies.

The SmartGov tackles this issue by reallocating many of the tasks related to electronic service development and maintenance from IT staff to domain experts. Since most PAs are adequately manned with domain experts while IT staff is always limited, this shift is expected to alleviate this problem.

6. *partner readiness and cooperation*. In some cases the success of an electronic service may require the involvement of bodies external to the public authority. For instance, a taxation-related electronic service may require the cooperation of the banking sector for payment handling. External bodies may not be ready at some given time (either technologically or administratively) to play the required role within the electronic service.

Partner readiness cannot be addressed by the SmartGov environment in any other way than providing support for legacy methods for data exchange, which are encapsulated in the SmartGov agent communication components.

Besides the key issues presented above, two more administrative barriers may be identified: firstly, the central government may have no concrete strategy for promoting electronic service usage, and portals directing citizens to deployed on-line services may have not been developed. In these cases, service penetration may remain low, unless substantial advertisement activities (incurring additional costs!) are undertaken. This barrier does not apply to governments that have developed relevant strategies, policies and centralised service directories.

Secondly, in some cases executives lack awareness regarding the potential of the electronic services and the added value to society they offer. Interviewees have noted that the importance of this factor has lessened during the past few years, since (a) governmental positive attitudes towards electronic services has motivated executives to attend awareness events and extend their knowledge on electronic services and (b) newly appointed executives are, in general, more familiar with electronic service concepts.

## **3.3** Technological barriers

Although the past few years have witnessed significant progress in technologies and infrastructure involved in electronic service development, maintenance and delivery, a number of issues obstruct the development of electronic services. The main technological concerns are analysed in the following paragraphs:

1. *security and encryption*. In the context of public networks, through which electronic services are disseminated, the issues of security and data encryption have not yet been addressed satisfactorily. Although techniques and tools that enhance security and privacy do exist, high levels of security cannot be achieved without significant expertise from the end-users and the use of complex procedures; these requirements are not met in the scope of electronic services.

The SmartGov platform will employ the most widely used security and encryption methods. Moreover, the SmartGov platform architecture will allow the integration of new techniques, when they become available.

2. *insufficient user authentication methods*. User authentication currently depends on *username/password* combinations which is considered a weak scheme for "sensitive" services. Public key infrastructure that would complement *username/password* combinations with physical tokens, such as smartcards, would provide a more secure authentication framework and could be exploited to provide guarantees for document integrity in the form of electronic signatures. However, this infrastructure is not yet widely available.

The SmartGov platform will directly support the most widely used authentication methods, being open for inclusion of novel techniques as they emerge.

3. *slow and unreliable Internet connections*. End users perceive the Internet (which is the primary service dissemination channel) as currently being too slow and/or unreliable for their transactions with the government. This is especially true for services for which:
- a. complex forms must be downloaded and/or large volumes of data must be exchanged
- b. failure to meet certain time deadlines or submission of incomplete/inaccurate data may incur severe penalties.

The SmartGov platform clearly cannot address the issue of Internet connection reliability; as far as communication line speed is concerned, the SmartGov platform will optimise data exchange methods to minimize the volume of information transmitted or received (e.g. more compact forms, suppression of empty value transmission), in order to be able to operate faster and/or with smaller bandwidths. Moreover, the usage of compression techniques will be investigated.

However there has been vast investment in broadband networks in the UK over recent years and many urban areas now have fast internet connections readily available. Over time as coverage improves, and take-up leads to reduce costs to subscribers this is likely to play a major part in alleviating the problem.

4. *use of proprietary technology and lack of standards.* Deployment of complex electronic services requiring the cooperation of more than one public authorities and/or third party bodies (e.g. banks) is sometimes inhibited due to the fact that some of the participants use proprietary products, which have no adequate interfaces for communication with other systems. Standards for communication, such as XML, SOAP, WDDI etc. are emerging, but are not always supported by existing installations or are technologically immature and unstable. The scenery changes as technology advances, e.g. the UK government have developed a set of XML schemas called the e-Government Interoperability Framework (eGIF) to provide a standard for electronic communication between PAs and the commercial sector.

The SmartGov platform capitalises on *de jure* and *de facto* standards, such as XML for information representation and exchange, Apache group server suits for web and application services etc. In this way, communication with third party bodies will be facilitated.

- 5. *difficulties in interoperability with installed IT systems.* Many public authorities have rolled out an IT system for supporting their internal operation. Interoperability between these IT systems and the electronic service delivery environments, which is crucial for integrating electronic services and back-office procedures, may be hard to achieve mainly because:
  - a. some installed IT systems are "closed" platforms and technologically outdated, providing no means for communication with external systems
  - b. security considerations prevent the direct linkage of publicly accessible service delivery environments and back-office systems.
  - c. Security considerations may also prevent the direct linkage between agencies responsible for providing a service. For example Social Work care often overlaps with healthcare, but the sensitivity of confidential patient records and client data raises legitimate concerns about linking these two agencies directly. No standard techniques exist for communication between service delivery environments and installed IT systems, necessitating thus a

*case-per-case* handling of communication. This approach is tedious and error-prone.

Interoperability with installed IT systems is tackled through the introduction of the SmartGov agent and Information Interchange Gateway software modules, which encapsulate all idiosyncrasies and peculiarities of installed IT systems.

An additional impediment, which may be attributed to the high rate that technological innovations appear, is that service implementers are not always aware of the full potential offered by technology or its most appropriate use. In such situations, services that could be successfully rolled out are either not deployed at all, or deployed inefficiently. Finally, some service implementations, in particular online forms services, play merely the role of *state of presence*, rather than a fully operational transaction service. This discourages users and acts against the attainment of a critical mass of users required to justify the use of electronic services.

## **3.4** User-culture barriers

Certain obstacles to the use of electronic services may be ascribed to cultural or special characteristics of the user community. More specifically:

1. *multi-lingual and multi-cultural issues*. Electronic services should be built to address the whole population, without posing any implications regarding the language or cultural background of the users. Some electronic service designs and implementations, however, do not take into account such issues (e.g. a service may be deployed only in the *mostly spoken* language within a country) effectively excluding portions of the populations.

The SmartGov platform addresses this issue by directly supporting modelling and development of multilingual services, relieving any multi-cultural barriers for service usage.

- 2. general attitude against electronic services. Specific citizen communities have a negative stance against electronic services and would only use the "traditional" paper-based service channels. In some cases this stance has its roots in philosophical beliefs. These can be viewed as barriers set by the users themselves in contrast to barriers set to the user group by external factors. In the latter case the problem may stem from the user lack of computer literacy, from lack of financial/economic means, or from the user's special needs, as described in 3. In all cases trust has to be build into the target community. This can only be achieved by ensuring service users that:
  - private data they submit remain confidential
  - their data cannot altered by malicious parties
  - the data will not be disclosed by the receiving PA to any other party
  - the data will not be used for any other reason than the one they were submitted for
  - it is impossible for malicious parties to exploit the electronic service for committing fraud against the service users.

It has to be noted, though, that the negative attitude may have its roots in the *service content*, rather than in the *service quality*: Some services enjoy positive attitudes such as libraries, whereas others suffer from negative attitudes, such as Council Tax. It can therefore be assumed that citizens would place greater 'trust' in electronic transactions with the Libraries Service than with the Council Tax service.

The negative perception of electronic services within the public sector, largely developed from the experience of well documented failures in IT projects, is also a significant barrier to take up by customers and deployment by service managers.

Finally, while Internet usage is increasing, a recent survey in Edinburgh showed that majority of customers still prefer to contact the Council by phone, followed by face to face. The same survey also showed that there was a genuine fear of services being de-personalised by call centres and online services.

The issue of *trust* in the scope of electronic services is handled in the SmartGov framework, developed in WP7. WP7 also addresses the issue of assuring citizens that service delivery will be successful, e.g. where service eligibility is an issue will the e-service correctly identify those eligible.

- 3. external barriers to user groups: The study has determined that certain citizen groups are blocked from using electronic services despite their will to do so, for the following reasons:
  - a. *service use costs.* Using an electronic service requires the access to a computer with sufficient communication capabilities, either at home or at public installations. In both cases a cost is incurred (purchase of equipment and communication fees for home installations; pay-per-use for public installations) which may not be affordable to all citizens. Thus, financially weak portions of the population are effectively excluded and will opt for the traditional service delivery channels which incur no *direct* costs. Notably, CEC as well as other authorities, have policies of *digital inclusion* and actively combat the issue through initiatives such as inclusion of free internet access to citizens in libraries.
  - b. *technological competence*. A prerequisite for using electronic services is the ability to master the end-user devices, typically PCs. Still, large population percentages are not computer literate, and hence incapable of using the services.
  - c. *lack of expert assistance*. When users visit the public authority to make use of a service, they may get expert assistance from the service workers within the PA premises. On the other hand, when using an electronic service such assistance is not available, hindering thus electronic service use, especially for complex services. Furthermore, users must be able to receive help not only regarding the *service content*, but regarding the *service operation* as well, an issue sometimes disregarded in the design phase of electronic services.
  - d. *accessibility*. Service design must take into account user groups with special accessibility needs. Failure to make adequate provisions for such user groups results in their exclusion from service use.

While the SmartGov environment cannot address the issue of service costs, certain measures are planned to alleviate the following three topics. As far as computer literacy is concerned, services developed with the SmartGov platform will only need basic computer usage skills, in order to broaden the target population. Regarding the lack of expert assistance, the SmartGov platform allows for incorporation of extensive parts of the knowledge used throughout the development phase into the delivered services, providing thus service users with adequate expert assistance. Finally, the SmartGov platform will conform to accessibility standards, such as the Web Content Accessibility Guidelines, published by the W3 Consortium.

## 3.5 Social barriers

Social barriers are a class of impediments mainly observed within the context of the public authority and are relevant to the following issues:

- 1. *shift of power*. Employees possessing a certain amount of tacit domain knowledge are considered to have more power (or a more distinguished status) within the organisation. Introduction of electronic services may convert tacit knowledge to explicit, thus depriving these employees of their *source of power*; moreover, a new group of distinguished employees is formed, consisting of the ones most closely related to electronic services.
- 2. *change of duties.* Introduction of electronic services will require structural reforms to the organisation and modifications of job descriptions. Employees may be opposed to such changes for several reasons e.g. objections to give up their working methods, habits and office, negative stance against changes in the working environment etc.
- 3. *fear of job loss*. Many employees, especially ones involved in the paper-based service delivery channels, perceive the introduction of electronic services as a threat jeopardising their jobs. The management should present a clear plan for the transition to the electronic service era, indicating that only job descriptions will change and no jobs will be cut due to the introduction of electronic services.

The impeding social issues described above are handled by the SmartGov framework, developed in WP7.

# 4 Electronic Services Requirements Analysis

In order to identify the building blocks and operations that must be available to the SmartGov platform users for electronic service development, a number of services that are candidate for electronic implementation were analysed in this phase. The knowledge required for the various steps of service development and deployment stages was recognised, in order to be associated with the respective building blocks. The services were chosen so as (a) to provide a complete set of requirements and (b) to be the ones that will be implemented as pilots within the SmartGov platform.

## 4.1 Services for the GSIS

The services chosen for analysis for the GSIS are the electronic submission of VIES documents (recapitulative statement of intra-community supplies and acquisitions) and the electronic submission of e-Commerce statements, a service that is designed to commence within one year. In the following paragraphs, the analysis for these two services is presented and the requirements identified for the SmartGov platform are documented. In particular, for the VIES service, both the current (paper-based) state and the planned (electronic) versions are presented, whereas for the e-Commerce service only the electronic version is presented, since no paper-based system is running or planned.

## 4.1.1 VIES (VAT Information Exchange System)

With the introduction of the single market on 1 January 1993, fiscal customs-based controls at internal frontiers were abolished and a new VAT control system was put in place for intra-Community trade. The most significant benefit was the reduction of the administrative burden on companies, with the elimination of some 60 million customs documents *per annum*.

Under the new VAT system, intra-Community supplies of goods are exempt from VAT in the Member State of despatch when they are made to a taxable person in another Member State who will account for the VAT on arrival. Therefore any taxable person making such supplies must be able to check quickly and easily that their customers in another Member State are taxable persons and do hold a valid VAT identification number. For that purpose, *inter alia*, each tax administration maintains an electronic database containing the VAT registration data of its traders. Such information includes the VAT identification number, the date of issue, the trader's name, the trader's address and, where applicable, the date of cessation of validity of a VAT number.

A computerised VAT Information Exchange System (V.I.E.S.) was set up to allow for the flow of the data held across the internal frontiers which:

- Enables companies to obtain rapidly confirmation of the VAT numbers of their trading partners
- Enables VAT administrations to monitor and control the flow of intra-Community trade to detect all kinds of irregularities

The unit responsible for the control of intra-Community trade in each Member State, the Central Liaison Office (CLO), has direct access through VIES to the VAT registration and turnover database of the other Member States.

#### 4.1.1.1 National Access Mechanism

Traders, making an enquiry as to whether a particular VAT number is valid (query type 1) or whether it is correctly associated with a specified trader name and/or address (query type 2), gain access to the VAT registration verification system through their national CLO, which will give *exactly one* of the following replies:

- Yes, valid VAT number (for query type 1)
- No, invalid VAT number (for query type 1)
- Yes, the VAT number is associated with a given name/address (for query type 2)
- No, the VAT number is not associated with a given name/address (for query type 2)
- VAT is no longer in effect (stop date) (for query types 1 and 2)

(N.B. For security and data protection reasons, the national administrations will not supply the name and address in relation to a valid number).

The methods used in the Member States to deal with trader enquiries differ significantly. Some have implemented on-line systems to automate traders' access to the information while others have administrative units that answer traders' inquiries made by phone, mail or fax.

The VAT has to be transferred from the country where it has already been paid to the Member State where it has to be paid, whenever an intra-Community acquisition or supply of goods takes place. To this end, it is necessary for all taxable persons that participate in such transactions to fill in the form appropriate for the specific transaction.

Taxable persons that supply goods to persons of other Member State have to fill in the "Recapitulative Statement of intra-Community Supplies", where they have to provide information concerning per buyer the total value of intra-Community supplies per quarter. Taxable persons that acquire goods from persons of other Member State have to fill in the "Recapitulative Statement of intra-Community Acquisitions", where they have to provide information concerning per supplier the total value of intra-Community Acquisitions.

### 4.1.1.2 Recapitulative Statement of intra-Community Supplies

This form has to be submitted from taxable persons that are identified by a valid VAT number and supply or transfer goods to other Member States without charging VAT, after having verified through VIES the VAT number of the payer. The supply of services to other Member States, the exports to other countries not belonging to the EU and the local supply of goods are not included.

The Recapitulative Statement contains the following information:

- a) The supplies of goods to traders of another Member State identified by a valid VAT number.
- b) The transfer of goods from a person whose company is located in Greece to another Member State for the needs of his/her company is considered as supply. In this case, the field "buyer's VAT number" is filled in with the supplier's VAT number or the VAT number of his/her tax representative in the Member State where the goods are delivered. The field "Taxable value" is filled in with the total amount of VAT concerning the value of supplies.
- c) The supply of new means of transportation to persons with valid VAT number, who are located in another Member State and the supply of goods subject to special sales tax (mineral oils, alcohol and alcoholic beverages, manufactured tobacco).
- d) A special column is filled in with the total amount of VAT concerning the "triangular" intra-Community supplies. The term "triangular" is clarified with the following example: Suppose A, B, C are taxable persons situated in three different Member States. A invoices goods to B and B invoices these goods to C, while the goods are transferred directly from A to C. The supply of goods from B to C is considered as a normal supply for B and a normal acquisition for C, whereas the supply of goods from A to B is considered as a "triangular" one.
- e) The discounts and the rebates for intra-Community supplies that have been already reported in a previous invoice, either within the same quarter or within a previous one, are subtracted from the amount of supplies related to the specific buyer. In the case of a negative result, it is presented with the sign "-", whereas in the case of a zero result, the number "0" is used.

This statement contains the previous information for each trimester. The taxable person submits this statement to the local tax administration in three copies, from which one is returned, signed to him/her. The deadline of submission is the same as the one defined for the submission of the periodic VAT statement of the third month of the trimester for which it is submitted. If the taxable person did not make any intra-Community supply in this trimester, he/she is not obliged to submit the Recapitulative Statement. With the submission of the Recapitulative Statement the taxable person has to present his/her periodic VAT statements of this period, in order to validate the sum of intra-Community supplies in the statement.

In the case of a statement of a final termination of business, the taxable person has to submit the Recapitulative Statement with his/her periodic VAT statement of the last period, provided that at least one intra-Community supply has taken place within this period.

In the case that during the initial submission of the Recapitulative Statement a specific intra-Community supply was declared erroneously or not at all, or there was later additional information that was not available at the time of the initial submission, the taxable person has to submit a Corrective Recapitulative Statement. The statement should be filled in with the new correct data with only one record for each buyer, whose information is changed. In the case of wrong initial record of the VAT number of the buyer, the wrong one should be written again in the corrective statement,

leaving the remaining columns of the record blank. In the following row the correct VAT number with the correct information should be written.

The intra-Community Supplies form, translated into English, can be found in Appendix B.

### 4.1.1.2.1 Description of the Statement

The statement contains two parts: one part with fields concerning the personal data of the taxable person and the other part with fields concerning the intra-Community supplies. Each field is identified by a code number. The codes are described in detail in the following text.

### 4.1.1.2.2 Part 1: Personal Data

- 001: local tax administration
- 002: tax administration where the Recapitulative Statement is submitted
- 003: number of the statement
- 004: date of submission
- 005: date of retrieval
- 006: period
- 007: checked when the statement is a corrective one
- 008: number of trimester (1-4) and the two last digits of the year (for example, for the year 2002 the digits are 02)
- 010: surname of the taxable person or name of the company
- 011: first name of the taxable person
- 012: name of the father of the taxable person
- 013: title of the taxable person
- 014: address (street, number or location) of the taxable person or the company
- 015: municipality
- 016: zip code
- 017: telephone number with the area code
- 018: fax number with the area code
- 021: VAT number of the taxable person
- 022: file number
- 023: current page number and total number of pages (in the case of transactions with more than 25 intra-Community taxable persons, more than one pages of the Recapitulative Statement should be filled in)
- 024: checked when the currency used for the total amounts is Euro

### 4.1.1.2.3 Part 2: Data for intra-Community supplies

For each buyer only one row should be used. The currency used for total amounts can be either Euro or drachmas, according to whether the field 024 is checked or not.

- Column 2: country of the buyer
- Column 3: prefix of the buyer's country. The prefixes are: Belgium = BE, France = FR, Germany = DE, Denmark = DK, Ireland = IE, Spain = ES, Italy = IT, Luxemburg = LU, Great Britain = GB, Netherlands = NL, Portugal = PT, Austria = AT, Finland = FI, Sweden = SE
- Column 4: VAT number of the buyer. The number of digits for each country is: Belgium = 9, France = 11, Germany = 9, Denmark = 8, Ireland = 8, Spain = 9, Italy = 11, Luxemburg = 8, Great Britain = 9 (+3 for subsidiary companies), Netherlands = 12, Portugal = 9, Austria = \_+ 8, Finland = 8, Sweden = 12. The VAT numbers must be filled in from the start of the respective field.
- Column 5: total amount of VAT value of the supplies concerning the buyer (the term "total" indicates that where more than one supplies concern the same buyer, the VAT amounts for each supply must be added and the sum should be filled in).
- Column 6: total amount of VAT value of a "triangular" supply for a specific buyer
- Row 26: Columns 5 and 6 are filled in with the total amount of the normal and "triangular" intra-Community supplies, respectively, for all the buyers of the specific page of the statement.

The Recapitulative Statement is signed by the taxable person, his/her accountant and the employee of the tax administration that receives the statement.

#### 4.1.1.3 Recapitulative Statement of intra-Community Acquisitions

This form has to be submitted from taxable persons that are identified by a valid VAT number and buy goods from other Member States without VAT charge, after having verified through VIES the VAT number of the supplier. The acquisition of services from other Member States, the imports from other countries not belonging to the EU, the local acquisition of goods are not included.

The Recapitulative Statement contains the following information:

- a) The acquisition of goods from persons of another Member State identified by a valid VAT number.
- b) The transfer of goods from a person whose company is located in another Member State to Greece for the needs of his/her company is considered as acquisition. In this case, the field "supplier's VAT number" is filled in with the buyer's VAT number or the VAT number of his/her tax representative in Greece. The field "Taxable value" is filled in with the total amount of VAT concerning the value of acquisitions.
- c) The acquisition of new means of transportation to persons with valid VAT number, who are located in Greece and the acquisition of goods subject to

special sales tax (mineraloils, alcohol and alcoholic beverages, manufactured tobacco).

- d) A special column is filled in with the total amount of VAT concerning the "triangular" intra-Community acquisitions. The term "triangular" is clarified with the following example: Suppose A, B, C are taxable persons situated in three different Member States. A invoices goods to B and B invoices these goods to C, while the goods are transferred directly from A to C. The acquisition of goods from B to C is considered as a normal acquisition for C, whereas the acquisition of goods from A to B is considered as a "triangular" one.
- e) The discounts and the rebates for intra-Community acquisition that have been already reported in a previous invoice, either within the same trimester or within a previous one, are subtracted from the amount of acquisition related to the specific supplier. In the case of a negative result, it is presented with the sign "-", whereas in the case of a zero result, the number "0" is used.

This statement contains the previous information for each trimester. The taxable person submits this statement to the local tax administration in tree copies, from which one is returned, signed to him/her. The deadline of submission is the same as the one defined for the submission of the periodic VAT statement of the third month of the trimester for which it is submitted. If the taxable person did not make any intra-Community acquisition in this trimester, he/she is not obliged to submit the Recapitulative Statement. With the submission of the Recapitulative Statement the taxable person has to present his/her periodic VAT statements of this period, in order to validate the sum of intra-Community acquisitions in the statement.

In the case of a statement of a final termination of business, the taxable person has to submit the Recapitulative Statement with his/her periodic VAT statement of the last period, provided that at least one intra-Community acquisition has taken place within this period.

In the case that during the initial submission of the Recapitulative Statement a specific intra-Community acquisition was erroneously declared, or not declared at all, or there was later additional information that was not available at the time of the initial submission, the taxable person has to submit a Corrective Recapitulative Statement. The statement should be filled in with the new correct data with only one record for each supplier, whose information is changed. In the case of wrong initial record of the VAT number of the supplier, the wrong one should be written again in the corrective statement, leaving the remaining columns of the record blank. In the following row the correct VAT number with the correct information should be written.

The intra-Community Acquisitions form, translated into English, can be found in Appendix B.

## 4.1.1.3.1 Description of the Statement

The statement contains two parts: one part with fields concerning the personal data of the taxable person and the other part with fields concerning the intra-Community acquisitions. Each field is identified by a code number. The codes are being described in detail in the following text.

#### 4.1.1.3.2 Part 1: Personal Data

- 001: local tax administration
- 002: tax administration where the Recapitulative Statement is submitted
- 003: number of the statement
- 004: date of submission
- 005: date of retrieval
- 006: period
- 007: checked when the statement is a corrective one
- 008: number of trimester (1-4) and the two last digits of the year (for example, for the year 2002 the digits are 02)
- 010: surname of the taxable person or name of the company
- 011: first name of the taxable person
- 012: name of the father of the taxable person
- 013: title of the taxable person
- 014: address of the taxable person (street, number or location) or the company
- 015: municipality
- 016: zip code
- 017: telephone number with the area code
- 018: fax number with the area code
- 021: VAT number of the taxable person
- 022: file number
- 023: current page number and total number of pages (in the case of transactions with more than 25 intra-Community taxable persons, more than one pages of the Recapitulative Statement should be filled in)
- 024: checked when the currency used for the total amounts is Euro

### 4.1.1.3.3 Part 2: Data for intra-Community acquisitions

For each supplier only one row should be used. The currency used for total amounts can be either Euro or drachmas, according to whether the field 024 is checked or not.

- Column 2: country of the supplier
- Column 3: prefix of the supplier's country. The prefixes are: Belgium = BE, France = FR, Germany = DE, Denmark = DK, Ireland = IE, Spain = ES, Italy = IT, Luxemburg = LU, Great Britain = GB, Netherlands = NL, Portugal = PT, Austria = AT, Finland = FI, Sweden = SE
- Column 4: VAT number of the supplier. The number of digits for each country is: Belgium = 9, France = 11, Germany = 9, Denmark = 8, Ireland = 8, Spain = 9, Italy = 11, Luxemburg = 8, Great Britain = 9 (+3 for subsidiary companies), Netherlands = 12, Portugal = 9, Austria = \_+ 8,

Finland = 8, Sweden = 12. The VAT numbers must be filled in from the start of the respective field.

- Column 5: total amount of VAT value of the acquisitions concerning the supplier (the term "total" indicates that where more than one acquisitions concern the same supplier, the VAT amounts for each acquisition must be added).
- Column 6: total amount of VAT value of a "triangular" acquisition for a specific supplier
- Row 26: Columns 5 and 6 are filled in with total amount of the normal and "triangular" intra-Community acquisitions for all the suppliers of the specific page of the statement.

The Recapitulative Statement is signed by the taxable person, his/her accountant and the employee of the tax administration that receives the statement.

#### 4.1.1.3.4 Processing the Recapitulative Statement

#### 4.1.1.3.4.1 by the local tax administration

During the submission of the Recapitulative Statements by the taxable person, the local tax administration checks whether his/her VAT number is valid and belongs to this administration and whether the information given within the statement agrees with his/her periodical VAT statements of the current trimester. Another check is whether the same VAT number of a supplier or a buyer appears in the respective Recapitulative Statement more than once. In case of an error the taxable person is instructed to correct the data; if no errors are detected, the submission is accepted and the taxable person and the local tax administration keep one copy each, whereas the third one is sent to GSIS.

#### 4.1.1.3.4.2 by GSIS

Every trimester all the Recapitulative Statements of intra-Community Transactions (Supplies and Acquisitions) are gathered by the General Secretariat of Information Systems (GSIS) and are processed, in order to send the necessary information to the other Member States. All the data of the statements are entered in a proper database and an automated check is performed to verify that the VAT number of each buyer has the correct number of digits for his/her country and that its check digit is correct. In case of errors, the respective local tax administration is informed in order to contact the taxable person. The correct data are sent to the Member States for further processing. Each member state informs the other Member States of the total amount in Euro, of the VAT to be refunded. This is done not later than 31<sup>st</sup> July of each year in respect of VAT deducted in return submitted during the first half of the year in question and not later than 31 January of each year in respect of VAT deducted.

When GSIS receives the relevant data from the other Member States, it has to verify that the VAT numbers of the Greek buyers are valid for the specific trimester. In case of error, an error file is created and sent back to the Member State to correct the data.

## 4.1.1.4 Actors of VIES

Taking into account all the above analysis, the involved actors (Figure 8) for the VIES service are the following:

## 4.1.1.4.1 Taxable person

A "taxable person" is a person that is identified by a valid VAT number and supplies/buys or transfers goods to/from other Member States without charging VAT, after having verified through VIES the VAT number of the receiver/supplier. The supply/acquisitions of services to/from other Member States, the exports/imports to/from other countries not belonging to the EU, the local supply/acquisition of goods are not included.

## 4.1.1.4.2 Local Tax Administration

The employees of the Local Tax Administration to which the taxable person belongs and submits his/her Recapitulative Statement.

## 4.1.1.4.3 GSIS

The General Secretariat Information Systems

## 4.1.1.4.4 Member States

The other Member States of the EU.



Figure 8: Actors of VIES

### 4.1.1.5 Use cases

A complete description of all business functions through certain Use Cases using UML notation is presented in the following text.

## 4.1.1.5.1 Taxable Person Use Cases (Figure 9)

**Submits Recapitulative Statement**: The taxable person fills in and submits to the Local Tax Administration the Recapitulative Statement of intra-Community Acquisitions or Supplies. The information that the taxable person has to provide and general instructions have been described previously in this text.

**Receives Error Notification**: The taxable person is notified by the Local Tax Administration in case of errors or omissions in the submitted Recapitulative Statement.

**Corrects Recapitulative Statement**: The taxable person corrects the Recapitulative Statement and provides the requested supplementary data.



Figure 9: Taxable Person Use Cases

## 4.1.1.5.2 Local Tax Administration Use Cases (Figure 10)

**Collects Recapitulative Statements**: The Local Tax Administration collects the submitted Recapitulative Statements for further processing.

**Checks Recapitulative Statements**: The Local Tax Administration performs various checks on the submitted Recapitulative Statements before sending them to GSIS. These checks are:

- Cross-checks data with periodic VAT statement: Cross-checks of VAT amounts contained in the Recapitulative Statement with the respective ones in the periodic VAT statement are performed.
- Validates VAT number of the taxable person: A check is performed whether the VAT number of the taxable person is valid in the current period and belongs to the specific Local Tax Administration.
- Checks for duplicate VAT numbers of buyers/suppliers: As described above, each row of the Recapitulative Statement must have a unique VAT number of buyer/supplier.

**Sends Recapitulative Statements to GSIS**: After the performed checks, the Recapitulative Statements are sent to GSIS.

**Notifies taxable persons of errors**: The Local Tax Administration in case of any error or omission notifies the taxable person to submit a corrective Recapitulative Statement.



Figure 10: Local Tax Administration Use Cases

## 4.1.1.5.3 GSIS Use Cases (Figure 11)

**Receives Recapitulative Statements from Local Tax Administrations**: Every trimester all the Recapitulative Statements of intra-Community Transactions (Supplies and Acquisitions) are gathered by GSIS.

**Performs data entry**: The data contained in the paper based Recapitulative Statements are entered in a proper database.

**Receives data from other Member States**: GSIS receives the respective data entries of the Recapitulative Statements from each Member State.

**Request data processing procedure**: The GSIS employee initializes a data processing procedure. The tasks that are performed are the following ones:

- Consolidation. Consolidated records are produced per seller and Member State
- Checks Recapitulative Statement: GSIS performs various checks on the Recapitulative Statements before computing the total VAT amount to be refunded to each country. These checks are:

- Checks for VAT validity of buyers/suppliers: An automated check is performed to verify that the VAT number of each buyer respects the associated construction rules of each member state VAT number. Concerning the data received from other Member States, a check is performed to verify that the VAT number is active for the current trimester.
- Checks for data integrity: Checks are performed to ensure the data integrity.

Sends data to Member States: All the consolidated records of suppliers are sent to the respective Member State.

**Notifies Local Tax Administration of errors**: In case of any error, GSIS notifies the respective Local Tax Administration to ask for a corrective Recapitulative Statement from the taxable person.

**Receives Error Reports**: GSIS receives error reports from the other Member States concerning either VAT numbers validity or correctness of VAT amounts.

**Sends Error Reports**: GSIS sends error reports to the other Member States concerning either VAT numbers validity or correctness of VAT amounts.



Figure 11: GSIS Use Cases

## 4.1.1.5.4 Member States Use Cases (Figure 12)

**Receives data**: The Member State receives the respective data entries of the Recapitulative Statements from GSIS.

**Validates VAT numbers**: A check is performed to verify that each VAT number is active for the current trimester.

**Refunds VAT amount**: The Member State refunds the total VAT amount to Greece.

**Sends Error Reports**: The Member State in case of any error during the validation of VAT numbers or other processing creates and sends an error report to GSIS.



Figure 12: Member States Use Cases

### 4.1.1.6 E – VIES

In the e–VIES system, the taxable person will submit electronically the Recapitulative Statement of intra-Community Supplies and Acquisitions via forms that resemble their paper-based counterparts; this resemblance allows for capitalizing on a sharp learning curve, since system users will already be familiar with the presented forms. The various checks concerning the validity of the VAT numbers submitted and the correctness of the total amounts of VAT will be automated and the taxable person will be appropriately notified in case of error. In order to verify whether the information given within the statements agree with his/her periodical VAT statement of the current quarter, the SmartGov platform needs to access the data concerning the submitted VAT statements. The SmartGov platform has to perform queries on the VIES database in order to verify the validity of the VAT number of the buyers/suppliers for the period for which the e-VIES statement pertains to.

By the end of each quarter GSIS will process the data that has been submitted electronically by the taxable persons and send it to the appropriate Member State.

## 4.1.1.7 E-VIES Actors

Taking into account all the above analysis, the involved actors (Figure 6) for the E-VIES service are the following ones:

# 4.1.1.7.1 Taxable person

A "taxable person" is a person that is identified by a valid VAT number and supplies/buys or transfers goods to/from other Member States without charging VAT, after having verified through VIES the VAT number of the receiver/supplier. The supply/acquisitions of services to/from other Member States, the exports/imports to/from other countries not belonging to the EU, the local supply/acquisition of goods are not included.

# 4.1.1.7.2 GSIS

The General Secretariat Information Systems

## 4.1.1.7.3 Member States

The other Member States of the EU.



Figure 13: Actors for E-VIES

## 4.1.1.8 Use cases

A complete description of all business functions through certain Use Cases using UML notation is presented in the following text.

## 4.1.1.8.1 Taxable Person Use Cases (Figure 14)

**Registers to the E-VIES**: The taxable person registers in order to be able to use the E-VIES service. He/she submits his/her personal data and receives identification credentials to be used during the log in procedure.

**Logs in the E-VIES**: The taxable person logs in the E-VIES to be able to submit his/her Recapitulative Statements.

**Submits Recapitulative Statement Electronically**: The taxable person fills in and submits an e-form of the Recapitulative Statement of intra-Community Acquisitions or Supplies. The information that the taxable person has to provide and general instructions have been described previously in this text.

**Receives Error Notification**: The taxable person is notified through e-mail or during the process of submission in case of errors or omissions in the Recapitulative Statement.



**Corrects Recapitulative Statement**: The taxable person corrects the Recapitulative Statement electronically and provides the requested supplementary data.

Figure 14: Taxable person Use cases

## 4.1.1.8.2 GSIS Use Cases (Figure 15)

**Request data processing procedure**: The GSIS employee initializes a data processing procedure. The tasks that are performed are the following ones:

- **Computes VAT to be refunded**: The total VAT amount to be refunded to each Member State is computed.
- **Consolidation:** Consolidated records are produced per seller and Member State
- Checks Recapitulative Statement: GSIS performs various checks on the Recapitulative Statements before computing the total VAT amount to be refunded to each country. These checks are:

- Cross-checks data with periodic VAT statement: Cross-checks of VAT amounts contained in the Recapitulative Statement with the respective ones in the periodic VAT statement are performed.
- Validates VAT number of buyers/suppliers: An automated check is performed to verify that the VAT number of each buyer has the correct number of digits for his/her country and that its check digit is correct. Concerning the data received from other Member States, a check is performed to verify that the VAT number is active for the current trimester.
- Checks for duplicate VAT numbers of buyers/suppliers: As described above, each row of the Recapitulative Statement must have a unique VAT number of buyer/supplier.

**Sends data to Member States**: All the records of suppliers are sent to the respective Member State. The total VAT amount to be refunded is also sent.

**Receives data from other Member States**: GSIS receives the respective data entries of the Recapitulative Statements from each Member State.

**Sends Error Reports**: GSIS sends error reports to the other Member States concerning either VAT numbers validity or correctness of VAT amounts.

**Receives Error Reports**: GSIS receives error reports from the other Member States concerning either VAT numbers validity or correctness of VAT amounts.

**Notifies taxable persons for errors**: GSIS in case of any error or omission notifies the taxable person to submit a corrective Recapitulative Statement.



Figure 15: GSIS use cases

## 4.1.1.8.3 Member States Use Cases (Figure 16)

**Receives data**: The Member State receives the respective data entries of the Recapitulative Statements from GSIS.

**Validates VAT numbers**: A check is performed to verify that each VAT number is active for the current trimester.

Refunds VAT amount: The Member State refunds the total VAT amount to Greece.

**Sends Error Reports**: The Member State in case of any error during the validation of VAT numbers or other processing creates and sends an error report to GSIS.



Figure 16: Member States use cases

### 4.1.2 VAT on E-Commerce

### 4.1.2.1 Description

Electronic Commerce over the Internet is a new way of making business. The growth and the potential of electronic commerce sparked the interest of the Community in order to ensure that such services consumed by customers established in the Community are taxed in the Community and are not taxed if consumed outside the Community.

That means that radio and television broadcasting services and electronically supplied services provided from third countries to persons established on the Community or from the Community to recipients established in third countries should be taxed at the place of the recipient of the services.

To facilitate compliance with fiscal obligations by operators providing electronically supplied services who are neither established nor required to be identified for tax purposes within the Community it is proposed to establish a special scheme: Any operator supplying such services by electronic means to non-taxable persons within the Community, should register for identification in a single Member State, unless he/she is otherwise identified for tax purposes within the Community.

Where the non-established operator is registered for the special scheme, any input value added tax that is incurred in respect to goods and services used by him for the purpose of his tax activities falling under the special scheme, should be refunded by the Member State where the input value added tax was incurred.

We must mention here with regard to this special scheme that no exchange of relevant information will take place before 1 July 2003.

#### 4.1.2.2 Business Analysis

### 4.1.2.2.1 Functionality Overview

Every third-country taxable person who has neither established his business nor has a fixed establishment within the Community and who wishes to offer electronic services has to join this special scheme in order to carry out all the actions associated with the e-commerce taxation using electronic means.

Every NETP (Non-established taxable person) must join the special scheme through a member state of his choice (MSI - Member State of identification). The Member State of identification has to broadcast to the other Member States all the relevant data and their modifications. The NETP can offer electronic services to all Member States independently of the MSI.

The NETP shall submit by electronic means to the MSI a value added tax return for each calendar quarter whether or not electronic services have been supplied. The value added tax return shall be made in euro. Member States that have not adopted the euro, may require the tax return to be made in their national currencies. A complete value added tax return cycle requires the submission of an electronic form via the internet and the deposit of the respective amount to a bank account designated by the MSI.

The VAT on E-Commerce Electronic Service for the Greek Ministry of Economics and Finance aims to be used from all the NETPs that wish to use Greece as their MSI in order to offer electronic services in the Community. The service will offer the full functionality that is described in the document "VAT on E-COMMERCE – USER REQUIREMENTS ANALYSIS" – TAXUD/D3-GR/D(02) and all payments will be made in euro. The proposed functionality is presented in the following chapters via the definition of the Actors and the Use Cases of the service.

We must state here that the service that is proposed using the Smart-Gov platform will focus exclusively on the part of the VAT on E-Commerce life cycle that concerns the interactivity of the NETP and the MSI. Because of the fact that no forms (paper or electronic) exist, there are no commitments to their appearance and internal functionality.

### 4.1.2.2.2 Actors

The involved actors for the "Vat in E-Commerce" service are the following ones:

#### 4.1.2.2.2.1 Non-established taxable person (NETP)

"Non-established taxable person" is a taxable person who has neither established his business nor has a fixed establishment within the Community and who is not otherwise required to be identified for tax purposes.

#### 4.1.2.2.2.2 Member State of identification (MSI)

"Member State of identification" is the Member State that the non-established taxable person chooses to contact to notify when his activity as a taxable person within the Community commences in accordance with the electronic services stated previously.

#### 4.1.2.2.2.3 Member State of consumption (MSC)

"Member State of consumption" is the Member State in which the supply of the electronic services takes place.



Figure 17: Involved actors diagram

### 4.1.2.3 Use cases

This section provides a complete description of all business functions through certain use cases using UML notation.

### 4.1.2.3.1 Non-established taxable person's use cases

#### 4.1.2.3.1.1 NETP Creation

Within this use case, non-established taxable persons (NETPs) identify (register) themselves to the service. This may occur only once per NETP. The Non-Established Taxable Person (NETP) provides the Member State of Identification (MSI) with the following information:

- Name
- Postal Address
- Electronic Address
- Including Web sites
- National Tax Number
- Statement that the NETP is not identified for VAT purposes within the Community

### 4.1.2.3.1.2 NETP Modification

Covers any subsequent modification of the NETP identification data. It may occur many times after the initial registration.

#### 4.1.2.3.1.3 NETP Deletion

Covers the cancellation of the NETP. This may occur only once after the initial registration.

#### 4.1.2.3.1.4 Submission of VAT return declaration

The NETP shall submit by electronic means to the MSI a value added tax return declaration for each calendar quarter whether or not electronic services have been supplied.

The NETP using the VAT on E-Commerce Electronic Service for the Greek Ministry of Economics and Finance will make the VAT return in euro. So all amounts have to be converted to euro if any electronic services are delivered to a Member State that hasn't adopted the euro. The layout of the declaration data should be like the following example:

MSC (Member State of consumption	Transactions			
	Net Value	VAT rate	VAT amount	
France	100,00 EUR	19,6%	19,60 EUR	
Denmark	47,10 EUR	25%	11,77 EUR	
Sweden	214,93 EUR	25%	53,73 EUR	
United Kingdom	96,17 EUR	17,5%	16,83 EUR	
Greece	250,00 EUR	18%	45,00 EUR	

The amounts concerning Denmark, Sweden and the United Kingdom are the result of the conversion of the original amounts (in national currency) in euro.

#### 4.1.2.3.1.5 VAT Payment

The NETP shall pay the VAT when submitting the return. Payment shall be made to a bank account in euro, designated by the Greek Ministry of Economics and Finance.

The payment must take place within the deadlines defined by the legislation, after the commitment of the VAT return declaration.

### 4.1.2.3.1.6 Transaction Record Provision

The NETP shall keep records of the transactions covered by this service in sufficient detail to enable the tax administrator of the Member State of consumption to determine if the declared VAT return is correct. These records should be made available electronically on request to the MSI and the MSC. These records should be maintained for a period of ten (10) years after the end of the year when the transaction was carried out. Record maintenance options include retaining the records within the on-line databases and off-line storage using tapes or other archival media. Within the



framework of SmartGov, service workers are expected to exploit the facilities offered by the platform to implement the policy defined by the GSIS management.

Provide transaction record

Figure 18 – Use cases for NETP

## 4.1.2.3.2 Member State of identification's use cases

#### 4.1.2.3.2.1 Exclusion of a NETP

The MSI shall exclude the NETPs from the identification register if:

- The NETP notifies that he no longer supplies electronic services, or
- It otherwise can be assumed that the NETP's taxable activities have ended, or
- The NETP no longer fulfills the requirements necessary to be allowed to use the special scheme, or
- The NETP persistently fails to comply with the rules concerning the special scheme.

### 4.1.2.3.2.2 Creation of NETP UID

The MSI shall identify the NETP by means of an individual number. Every Member State is free to implement its own identification scheme. This may cause problems between the identifier provided by the MSI and the ones invented by the other Member States. A proposal exists to guarantee the uniqueness of the NETP individual number across the different Member States. A unique identifier would be built as the concatenation of four fields:

• "EU"

- The MSI country code
- Seven digits
- A final check digit

### 4.1.2.3.2.3 Notification of NETP UID

The MSI shall notify the NETP by electronic means of the identification number allocated to it.



Figure 19 – Use cases for the MSI

## 4.1.3 Requirements for the SmartGov Platform

From the service analysis presented above, a number of requirements for the SmartGov platform may be identified, which are summarised in the following table. Some of these are refined (or specific) versions of requirements identified in section 2.1, since they have been drawn from specific service needs, rather than generic platform requirements.

Requirement	Environment (Dev/Run)	Existing/ New <sup>5</sup>
Create forms	Dev	Existing
Create form fields	Dev	Existing
Define placement of forms on fields	Dev	Existing
Define appearance attributes of forms and form elements	Dev	Existing
Define fields that draw values from specific lists	Dev	New
Define sections on forms for grouping of related fields	Dev	New

<sup>&</sup>lt;sup>5</sup> A requirement is characterised "Existing" if it has been identified as a generic requirement in section 2; otherwise it is characterised as "new"

Requirement	Environment (Dev/Run)	Existing/ New <sup>5</sup>
Define navigation facilities between form sections	Dev	Existing
Define repeating fields/field groups for implementing tabular forms	Dev	New
Define tables with a fixed number of rows	Dev	New
Define tables with dynamically varying number of rows	Dev	New
Define fields with pre-filled values	Dev	New
Define display-only fields with constant values	Dev	New
Define display-only fields that present calculation results	Dev	New
Retrieve values from registries for pre-filling fields	Dev	New
Associate descriptions with fields/sections/forms	Dev	Existing
Associate examples with fields/sections/forms	Dev	Existing
Associate legislative information with fields/sections/forms	Dev	Existing
Designate which pieces of associated information should be available for end-service users	Dev	New
Designate the methods through which end-users will access the extra information (descriptions, examples, etc) in the deployed service	Dev	New
Define allowable value types for fields	Dev	New
Define which fields are mandatory	Dev	New
Define maximum length for text fields	Dev	New
Define minimum and maximum values for arithmetic fields	Dev	New
Define validation checks on individual fields	Dev	Existing
Define validation checks on field combinations	Dev	Existing
Define set-oriented checks for tabular sections, such as uniqueness, cardinality, etc.	Dev	New
Define validation checks involving fields within a service and data from a registry or another service	Dev	Existing
Designate whether a validation check should be performed in the user interface environment (e.g. web browser) for early error detection, or only in the back- end	Dev	New
Define appropriate error messages whether validation checks fail	Dev	New

Requirement	Environment (Dev/Run)	Existing/ New <sup>5</sup>
Define warning conditions, i.e. cases that need the user's attention but do not inhibit the continuation of a submission	Dev	New
Designate the format of the protocol numbers that will be assigned to statements upon submission	Dev	New
Designate whether submitted documents may be withdrawn (deleted) or edited	Dev	New
Facilitate generation of customisable login screens	Dev	New
Facilitate generation of user registration forms, user authentication procedures and generation of user identification credentials	Dev	New
Define communication paths and data interchange formats with external information systems	Dev	Existing
Select the platform that will be used to deploy the service	Dev	New
Allow for definition of multilingual content	Dev	Existing
Define desired authentication mechanism strength	Dev	New
View list of available services and select the desired ones	Run	New
Save data already filled in and resume the session later, without considering the statement as "final"	Run	Existing
Customise the user interface with respect to font size and colour combination	Run	Existing
Browse and print submitted documents	Run	Existing
View error messages together with the fields involved in the respective validation checks	Run	New
Produce "exports" of the submitted data	Run	New
Automatically inform users for "lately detected" errors	Run	New
Provide facilities for correcting "lately detected" errors		New
Access information (help texts, examples, etc) associated with fields/sections/forms	Run	Existing
Select interface language	Run	Existing
View complete image of form before submittal	Run	New

# 4.2 Services for the CEC

### 4.2.1 Method

Figure 20 shows the method that we used to determine requirements for the specific chosen application in CEC. All of the processes were carried out by Napier staff: where people outside Napier were involved, they are shown in the figure as a resource.



#### Figure 20: method for capturing user requirements for a specific application

Several potential applications were considered and one selected. These are briefly described in section 4.2.2.

The selected application was studied in more detail, following the method shown in Figure 21. We conducted several interviews with the Business Manager of the Social Work department in CEC to help us understand the application. We followed the Unified Modelling Method (UML) to identify actors and use cases, returning often to the Social Work department to get feedback on the UML model as we developed it. We developed activity diagrams for the more complex operations in the application. The actors, use case diagrams and activity diagrams are all presented in section 4.2.3.



#### Figure 21: method for analysing specific user needs

We also extracted user requirements for the various actors in the UML use cases. For each of these user requirements, we looked at each one in turn to decide whether the previously defined broad functional requirements would support it. Wherever the previous functional requirements were not adequate, we defined new functional requirements.

## 4.2.2 Choice of Service

Several candidate applications have been considered at CEC:

- the internal service for job advertising and applying for jobs. There is a welldefined procedure for Managers to create job advertisements through the Corporate intranet, and then advertise them electronically and in paper bulletins once the request has been formally agreed by a Committee called the Vacancy Monitoring Group. This is a very promising candidate for the pilot application of SmartGov with only a slight drawback that as much of this process has already been placed online there are not too many technical challenges remaining so a less developed application area may be preferable.
- the external service for receiving applications for housing benefit and handing out the benefit. This encompasses everything related to providing housing related benefits for citizens within the CEC's region. Typically such citizens are on low income, unemployed or disabled and administration of their benefit may be in conjunction with other departments in the Council. There was deemed to be a lot of scope for deploying SmartGov in this challenging area with the regular

(fortnightly) change in statutory regulations making it ideally suited to fully testing the toolkit. However the complexity of the processes involved suggested it may be too difficult to adopt within the time constraints of this project. There was a further issue of an external contractor already undertaking to do work in this area who had already committed to an application environment that is likely to be difficult to integrate with the SmartGov toolkit.

- the external service for advertising adult education opportunities and processing requests from the public. This service was proposed to have been deployed in public buildings and libraries, and through the Corporate website CapInfo. While servicing a real and worthwhile need it was deemed that such an application would not prove sufficiently challenging to take advantage of the full features of SmartGov with there likely to be low demand to modify the service once it had been deployed.
- the external service for access to education and employment in West Edinburgh. This has a similar remit to the adult education candidate above but would be deployed on a local portal within a socially disadvantaged community to the West of the City Centre. In preliminary consultation with interested parties SmartGov was not enthusiastically embraced and some of them felt that this target audience may not be suitable as candidates for testing SmartGov, though this was not unanimously considered to be the case. However due to the lack of interest shown by the stakeholders it was deemed that success would be unlikely.
- the external service to supply special equipment to help elderly, ill and disabled citizens (equipment and adaptations see below). This application area was favoured as it is sufficiently complex but not so much as to have a low chance of success, has the potential to add a great deal of value to a worthwhile service, is not heavily developed so many challenges remain, and has been received enthusiastically by Managers within the Social Work Department who provide the service.

## 4.2.3 Equipment and Adaptations

Having selected Equipment and Adaptations as the preferred candidate application a series of more in-depth interviews was arranged. The key contact was the Social Work Department Business Systems Manager who has had a long period of service within this department and gained extensive knowledge about the fine details of all of the processes involved. After an initial interview in which the candidate application area was identified, three further interviews were arranged. The first was to fully detail the Equipment and Adaptations processes, the second occurred having created an initial model and served to clarify any omissions and check that the model was correct, and the final confirmed the changes made. The resultant models constitute the diagrams in this Section.

The Equipment and Adaptations service is provided by the Social Work department to supply, service and maintain and uplift any equipment required in the care of their customers.

There are a large number of Users who can potentially be involved. The customers for example could be an elderly person, disabled person or a carer acting on their behalf, Occupational Therapists or Social Workers employed by CEC or external Healthcare Professionals have responsibility for assessing the client and ordering the equipment, and there is a network of stores staff who actually supply it. These user groups are summarised in Figure 22, and fully defined in the text below.



Figure 22: Equipment and Adaptations user groups

**Social Work Customer:** Any customer requiring Social Work Services. Usually either elderly or disabled.

- Elderly Person: Potentially any elderly person within catchment area of CEC.
- **Disabled Person:** Potentially any disabled person within catchment area of CEC.
- Carer: A carer acting on a Customer's behalf.

**Healthcare Professional:** Health care professional includes people such as District Nurses or Occupational Therapists. The type of equipment that they can order is dependent on professional training and qualifications.

• **Occupational Therapist (NHS):** Occupational therapist based within an NHS hospital.

- **District Nurse:** Any district Nurse.
- General Practitioner: Doctor or staff within GP surgery.

**Social Work Staff:** Generic grouping for any worker directly employed by the Social Work Department of the City of Edinburgh Council.

- **Social Worker/OT:** Grouping for convenience, as many tasks within Social Work can be performed by either professional.
  - Social Worker: Directly deals with clients.
  - **Occupational Therapist/CCA**: Occupational Therapists and Community Care Assistants (CCA) are employed directly by the Social Work Department. A Community Care Assistant is a professional performing similar tasks to an OT, but does not hold the formal OT qualification.
- **Stores Worker:** Anyone who works in the stores. Can be either the storeman, stores administrator or the stores manager.
  - **Storeman:** There are 6 storemen who are responsible for issuing and maintaining all of the equipment.
  - **Stores Manager/Advisor:** The stores manager has the overall managerial responsibility for all stores activities. Also responsible for re-ordering stock.
  - **Stores Administrator:** Performs administrative duties with regard to ensuring that drivers have their delivery schedules and maintaining customer records.
  - **Delivery Driver:** There are 7 fulltime-employed drivers who each cover their own geographic region of the city or the surrounding area.

The existing procedure for procuring equipment for a customer involves either a Social Worker, Occupational Therapist or Healthcare professional assessing the client's need and creating a Care Plan. Having then agreed it with the Customer their equipment needs, if any, are identified and then ordered using paper forms. These are then passed to stores who are responsible for the administration and moving of the equipment to the customer and reclaiming it when it is no longer required. The following figure describes the steps involved and includes reference to the three databases (Carenap, Core Client and Midas) currently used to administer the service. The use cases mentioned in the figure are described in the accompanying text.



Figure 23: The existing Equipment and Adaptations service

**Assess Need:** A client assessment form is completed by the qualified professional. Through it a client's need for equipment will be ascertained. Once completed the client is asked to agree that the assessment is accurate. Nurses are employed by the Health Service and use their own system of assessment and application for equipment. (This is a historical legacy of the Healthcare and Social Work services developing independently. Moves are already underway to link the two networks which would allow a common SmartGov platform to be seamlessly deployed. However as Social Work own, maintain and administer the service, the Healthcare professionals will be purely interacting in a user capacity which can be achieved through the online forms.) The result of the assessment is a Care Plan.

**Complete Paper Form:** A standard paper form is used to apply for all equipment. The need for the equipment is assessed primarily on client's need, but also takes into account budgetary considerations. Each worker has a unique user ID which authorises them to order a specific subset of equipment.

**Pass Order to Stores:** The order is passed to stores who acquire and ship all equipment.

**Deliver Equipment:** A team of drivers each responsible for a particular geographic region of the city deliver the equipment. The Stores Administrators organise their delivery schedules from data supplied by the Midas stock control system.

Arrange Uplift: Arrange to uplift any unwanted items from a customer's home.

**Service And Repair Equipment:** Faulty equipment needs to be repaired, and some may require servicing periodically. Either the Customer or a Service Professional can initiate this process.

Carenap: A Microsoft Access Database. It holds the Care Plan details.

**Social Work Client Database:** Core database used by Social Work Department to record customer details.

**Midas Stock Management System:** Stock management database. It is currently independent of the Social Work Core Client Database, and consequently many of the customer details have to be entered twice.

There is great scope for SmartGov to add value to this process by providing online forms. The Social Work Department and the Health Services involved each have their own IT backbone (currently they are not linked together but a project is underway to facilitate this) on which SmartGov could be deployed.

Initial interaction would be at the assessment stage where service professionals could complete an assessment online. From there where appropriate they may then browse the inventory of Equipment, place an order and track its progress. Occasionally certain items may be out of stock or not held in stores and so a facility to view and order replacement items would also be desirable. This then also allows the possibility of a user providing a self assessment for smaller (cheaper) items of equipment which won't necessarily require any specialist advice and for them to place and track their own orders online. While it is true that the typical customer of the Social Work Department may not have internet access within their own home, they could readily be given access at GP surgeries and in public buildings such as libraries and social services.

It is important to note that in order to provide this service SmartGov must provide user authentication so that each class of User can only view and order the particular pieces of equipment that their level of expertise allows.

The following two figures model the requirements for SmartGov in order to achieve this desired functionality. The first is an update to the Current process model shown earlier, and the second details the back office services within the Stores. For each a description of the use cases is given.


Figure 24: Equipment and Adaptations user requirements

**Assess Need:** A client assessment form is completed by the qualified professional. Through it a client's need for equipment will be ascertained. Once completed the client is asked to agree that the assessment is accurate. Nurses are employed by the Health Service and use their own system of assessment and application for equipment. The result of the assessment is a Care Plan.

**Self Assess:** Facility for client to assess their own need for a range of low cost equipment which does not need healthcare professional involvement.

**View Product Information:** Browse an online catalogue detailing all equipment held. Visibility of items should be limited depending on the user type who is browsing.

**Check Availability:** Check availability of items within the stores. Visibility of items should be limited depending on the user type who is browsing.

Order Equipment: Complete an order for equipment using an online form.

**Order Substitute:** If desired item is not available then provide a list of alternatives. Certain choices may require advice from specific professionals as to its suitability for the job.

**Check Order Progress:** The customer or Service Professional can track the status of equipment they have on order.

Arrange Delivery: Arrange to deliver ordered items to customer's home.

**Service And Repair Equipment:** Faulty equipment needs to be repaired, and some may require servicing periodically. Either the Customer or a Service Professional can initiate this process.

Arrange Uplift: Arrange to uplift any returning items from a customer's home.



Figure 25: Equipment and Adaptations stores use cases

**Deliver Equipment:** A team of drivers each responsible for a particular geographic region of the city delivers the equipment. The Stores Administrators organise their delivery schedules from data supplied by the Midas stock control system.

**Update Customer Records:** On receipt of a paper equipment order form - which is a facility that the system will need to cater for even if a web interface is provided - enter the customer details into the database.

**Query Stock:** Query facilities for monitoring the stock level and performance, and writing reports.

**Update Inventory:** Whenever an item of equipment is issued or received it is necessary to update the inventory. A facility for stating that some items are in-stock but currently unavailable (e.g. due to repair or cleaning) would provide useful functionality that the current Midas system does not have.

**Search Customer Records:** Reasons for needing to search customer records include providing information to a customer about equipment they have ordered and for general administrative purposes.

**Service And Repair Equipment:** Faulty equipment needs to be repaired, and some may require servicing periodically. Either the Customer or a Service Professional can initiate this process.

**Order Stock:** When stock items fall below set minimum thresholds new items need to be re-ordered. The stores manager/assistant has this responsibility. Most items can be re-ordered from suppliers under standard contracts. Expensive/specialist items need authorisation from Central Purchasing.

Some of the internal processes within the Stores department are rather complex and may benefit from some further elaboration. Particularly for passing an order to Stores, delivery and uplifting of equipment this is of particular value. In Figure 26 et seq. the activities undertaken in performing these tasks are detailed.



Figure 26: Passing an order to Stores



Figure 27: Delivering a piece of equipment



Figure 28: Arrange uplift of unwanted equipment

### 4.2.4 User Requirements

Table 7 below show the user requirements that have emerged from the above analysis of the proposed new Equipment and Adaptations service. For each requirement, we have matched it with the broad functional requirements, already identified in Table 3 on page 42. In some cases, none of the previous functional requirements meets the stated user requirement. For these, new functional requirements have been derived and are shown in the last column of Table 7.

## Table 7: specific requirements for Equipment and Adaptations

this role	need(s) to	already met by reqt(s)	new functional requirement
other	define rules for assessment of customer needs	6	
health care professional	refer customer to Social Work Dept	new reqt 78	78 form elements will be associated with tasks in process models
social worker/OT & health care professional	browse customer records	$(15, 32, 33, 43, etc.)^7 +$ new reqt 79	79 data will be sent to and received from a separate IT application
social worker/OT & health care professional	edit customer records	79	
social worker/OT & health care professional	make an assessment of customer needs	79	

<sup>&</sup>lt;sup>6</sup> a requirement on other systems

<sup>&</sup>lt;sup>7</sup> Several general requirements, such as those noted here, apply to many of the needs identified in this table, e.g. 43 "have web-enabled interfaces". For clarity, not all of them are shown, nor are they repeated against each need to which they apply.

this role	need(s) to	already met by reqt(s)	new functional requirement
customer	make a self-assessment of needs	79	
social worker/OT & health care professional	create a care plan for a customer	79	
social worker/OT & health care professional	show care plan to customer	79	
social worker/OT & health care professional	view others' assessments of customer needs	79	
customer	agree care plan	new reqt 80	80 form elements will be associated with decision points in process models
Social Work staff	look up catalogue of equipment	79	
Social Work staff & health care professional	maintain catalogue of equipment	79	
social worker/OT & health care professional	check availability of equipment in stock, i.e. check inventory	79	
social worker/OT & health care professional	select alternative equipment if requested equipment not available	79, 78	
professional advisers (nursing & OT)	define rules for selection of alternative equipment	new reqt 81	81 the contents of elements on forms can be conditional on some other data
social worker/OT & health care professional	place an order for equipment to be delivered to a customer	79, 78	

this role	need(s) to	already met by reqt(s)	new functional requirement
stores administrator	maintain database of people, roles and authorities	40	
stores administrator	associate item of stock with role(s) authorised to order it	40 + new reqt 82	82 an authorised role can be associated with an item in an external database
stores administrator	check authority of person ordering item for delivery	40	
customer	place an order for equipment to be delivered to self	79 + new reqt 78	
stores administrator	put order on hold if equipment not available	8, 63, 79	
stores administrator	revive order as soon as equipment becomes available	8, 63, 79, 78	
stores manager	place an order for new stock from regular supplier	79, 78	
stores manager	place an order for new stock from one-off supplier	79, 78	
all	maintain inventory	79	
stores administrator	generate schedule for driver delivery	79, 78	
delivery driver	get equipment from stores and prepare delivery	79, 78	
delivery driver	deliver equipment	78	

this role	need(s) to	already met by reqt(s)	new functional requirement
customer	confirm delivery of equipment	79	
delivery driver	confirm delivery of equipment	79	
all	check progress of equipment order for customer	79	
customer	request repair of equipment while in customer's home	79, 78	
health care professional, social worker/OT and Social Work customer	request repair of equipment while in customer's home	79, 78	
other	repair equipment while in customer's home	78	
customer	request uplift of equipment from customer	79, 78	
Social Work staff & health care professional	request uplift of equipment from customer	79, 78	
stores worker	confirm return of equipment to stock	79	
stores worker	indicate status of equipment in stock (needs cleaned, needs serviced, being cleaned etc.)	79	
storeperson	clean or service equipment	78	

this role	need(s) to	already met by reqt(s)	new functional requirement
stores manager	send equipment for cleaning or service	78	
other	integrate equipment ordering system with core client system	8	
other	integrate equipment ordering system with CareNap system	8	
service manager	gather statistics on equipment use	48-51, 53-56	

<sup>&</sup>lt;sup>8</sup> a key top-level requirement of SmartGov: integration with other systems

# 4.3 Consolidated Electronic Services Requirements

In this section the requirements emerging from the needs of the pilot applications of the two PAs (GSIS and CEC) are combined, in order to produce a complete list of functional requirements for the SmartGov platform. Since a substantial amount of the requirements identified from analysing the applications had already been identified in the user requirements analysis phase and have been documented in section 2.3, in this section only the *new* requirements are listed. Thus, the requirements listed in the following table, together with the ones listed in section 2.3, form the complete set of functional requirements for the SmartGov platform.

User Groups	Man	agers	Dom Expe	ain erts	IT S	taff	Ser wor	vice kers	End users	End users	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Define fields that draw values from specific lists			1		$\checkmark$				$\checkmark$	$\checkmark$	Must
Define sections on forms for grouping of related fields			1		$\checkmark$						Must
Define repeating fields/field groups for implementing tabular forms			$\checkmark$		$\checkmark$						Must
Define tables with a fixed number of rows			$\checkmark$		$\checkmark$						Must
Define tables with dynamically varying number of rows			$\checkmark$		$\checkmark$						Must
Define fields with pre-filled values			$\checkmark$		$\checkmark$						Must
Define display-only fields with constant values			$\checkmark$		$\checkmark$						Must
Define display-only fields that present calculation results			V		$\checkmark$						Must
Retrieve values from registries for pre-filling fields			$\checkmark$		$\checkmark$						Must
Designate which pieces of associated information should be available for end-service users			$\checkmark$		$\checkmark$		V				Must

User Groups	Man	agers	Dom Expe	ain erts	IT S	taff	Ser wor	vice kers	End users	End users	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Designate the methods through which end- users will access the extra information (descriptions, examples, etc) in the deployed service			$\checkmark$		$\checkmark$		$\checkmark$				Must
Define allowable value types for fiel			$\checkmark$		$\checkmark$						Must
Define maximum length for text fields			$\checkmark$		$\checkmark$						Must
Define minimum and maximum values for arithmetic fields			$\checkmark$		$\checkmark$						Must
Define set-oriented checks for tabular sections, such as uniqueness, cardinality, etc.			$\checkmark$		$\checkmark$						Must
Designate whether a validation check should be performed in the user interface environment (e.g. web browser) for early error detection, or only in the back-end			$\checkmark$		$\checkmark$						Must
Define appropriate error messages whether validation checks fail			$\checkmark$		$\checkmark$						Must
Define warning conditions, i.e. cases that need the user's attention but do not inhibit the continuation of a submission			$\checkmark$		$\checkmark$						Must

User Groups	Man	agers	Dom Expe	ain erts	IT S	taff	Ser wor	vice kers	End users	End users	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
Designate the format of the protocol numbers that will be assigned to statements upon submission			V		$\checkmark$						Must
Designate whether submitted documents may be withdrawn (deleted) or edited			V		$\checkmark$						Must
Facilitate generation of customisable login screens			$\checkmark$		$\checkmark$						Must
Facilitate generation of user registration forms, user authentication procedures and generation of user identification credentials			$\checkmark$		$\checkmark$						Must
Select the platform that will be used to deploy the service			$\checkmark$		$\checkmark$						Must
View list of available services and select the desired ones									$\checkmark$	$\checkmark$	Must
View error messages together with the fields involved in the respective validation checks									$\checkmark$	$\checkmark$	Must
Produce "exports" of the submitted data						$\checkmark$		$\checkmark$			Must
Automatically inform users for "lately detected" errors						$\checkmark$		$\checkmark$			Must
Access facilities for correcting "lately detected" errors									$\checkmark$	$\checkmark$	Must

#### 3/6/2002

User Groups	Man	agers	Dom Expe	ain erts	IT S	taff	Ser wor	vice kers	End users	End users	Must/
Functional Specifications	Dev.	Run	Dev.	Run.	Dev.	Run.	Dev.	Run.	(Run.)	PA (Run.)	Should
View complete image of form before submittal									$\checkmark$	$\checkmark$	Must
Associate form elements with tasks in the process model			$\checkmark$		$\checkmark$						Must
Define communication channels with separate IT applications (possibly through data repositories)			$\checkmark$		$\checkmark$						Must
Associate form elements with decision points in the process model			$\checkmark$		$\checkmark$						Must
Define form elements whose contents are conditionally dependent on other data			$\checkmark$		$\checkmark$						Must
Associate authorised roles with items in external databases			$\checkmark$		$\checkmark$						Must

# 5 Knowledge management issues

"If two individuals get together and exchange a dollar, they each walk away with a dollar. If the same individuals get together and exchange an idea, they both walk away with two ideas"

T. Jefferson

# 5.1 Opening statement

This section has been written with a view to establish a common understanding about knowledge management issues in the context of *SmartGov* project. This common understanding is necessary for the formulation of the specifications for the knowledge management component. Organisations<sup>9</sup> are continuously adapting their processes to face the challenges of the new economy, and knowledge is increasingly recognised as one of the most important success factors. But, generally speaking, there is a poor understanding of what knowledge is, and a lack of proven methods for designing knowledge management systems.

**Knowledge Management** produces impressive and exciting results by aligning an organisation's people, processes, products, and technology into an integrated system that enables the organisation to:

- learn about its clients,
- understand their needs,
- rise to their expectations,
- develop close relationships with them,
- identify client channel preferences,
- personalise the service,
- develop client profiles,
- deliver quality services,
- create a client-centric culture,
- develop client trust, loyalty and satisfaction,
- optimise internal operations,
- lead to a high quality working environment and organisational intelligence,
- focus on every interaction with a client as a "moment of value", i.e. as an opportunity to achieve a win-win situation.

As people interact with their environments they make different types of exchanges: We take in oxygen, water, food, money, energy and knowledge. We give out carbon dioxide and waste; we take in data and information from the interactions with other people, things and processes. We exchange knowledge with the environment in terms of **thoughts**, **emotions** and **acts**.

#### Some questions that organisations must face:

- Do you know who your **clients** are?
- Do you know which of your **products** or **services** each one buys/uses?

<sup>&</sup>lt;sup>9</sup> General warning: To apply specifically the discussion to the SmartGov scenario, the reader may interchange the terms "client" and "citizen", and organisation and "public administration" as well.

- Do you systematically collect information from all client contacts and share the resulting **insights** for the benefit of the next contact?
- Are you applying the best experience available to you in decision making?
- Can you access **best practices** from your entire organisation when you need to?
- Are you being efficient in the use and re-use of **know-how** throughout your organisation?

The following figure illustrates ideas around knowledge:



Figure 29: Knowledge assets

Knowledge assets are the core of the processes. They can be defined as organisationspecific resources that are indispensable to create values for the organisation. Knowledge assets support the business value chain and can be divided into three types:

- *Systemic knowledge assets*: They consist of tacit and explicit knowledge articulated through vision, values and strategies. This represents both the **why** and **what for** perspective and are vision- and motivation-oriented. An example is corporate values and the PA managers' visions.
- **Conceptual knowledge assets**: They consist of explicit knowledge articulated through symbols, models, images and language. They represent the **what** perspective of knowledge and are representation-oriented. They focus only on relevant details, ignoring others. They are a key to learning and communicating. An example is the knowledge concerning the *SmartGov Transaction Service* design.

• *Operational knowledge assets*: They consist of "routinised" and embedded knowledge in the day-to-day actions and practices of the organisation. They are a blend of shared tacit and explicit knowledge. They represent the **how** perspective and are product-oriented. An example is the know-how that public workers apply to the provision of a PA service.

Operational assets can take many forms in the context of an organisation, such as: client knowledge, process knowledge, service knowledge, technical knowledge, strategy knowledge, legal knowledge and so on. Conceptual and systemic knowledge constitute the precursor of operational knowledge.

From a dynamic perspective, knowledge emerges from the minds of people through their jobs and their interactions. In brief, we can state that knowledge emerges from interactions. So, the knowledge in a complex network is contained *in the links, rather than the nodes* (the agents).

Finally, the following assessment represents a global view of what an organisation is.

• Organisations are streams of actions undertaken to meet some purpose guided by knowledge.

# 5.2 Knowledge and knowledge management

This section analyses the trends and general principles in knowledge management in the context of achieving enhanced working conditions and excellence in service provisions. This requires an effective integration of all elements of the organisation or the Public Administration (mission, goals, business rules, business drivers, processes, working practice, information, technology) under a systemic, holistic and multidisciplinary approach. This section aims to provide a framework for developing shared awareness among project's stakeholder.

Presently, knowledge has come to play the main role in the design, implementation and provision of services, so that organisations are turning into knowledge-intensive methodologies for managing the life cycle of electronic services. In this scenario, knowledge is the most powerful engine of production and service provision. Knowledge can be seen under two viewpoints or dimensions:

- *Epistemological dimension*, which focuses on the nature and foundations of knowledge as well as on the knowledge processes such as collecting, distributing, and re-using existing codified knowledge. It is content-oriented.
- **Ontological dimension**, which focuses on people, knowledge socialisation processes, relationships and knowledge sharing. It is interaction-oriented.

We live in a world characterised by: non-linear thinking, unpredictability, lack of control and no mechanistic, organic functioning. This situation demands a different understanding of the world as well as a new way of thinking and interacting. The new situation raises new challenges, such as:

## • Proliferating linkages

International, national, regional and local linkages within and between organisations are proliferating more and more rapidly.

• Growing diversity and complexity

Members of organisations have to cope with more and more diverse ways of sensing, perceiving, behaving and acting.

• Rapid technological development

### • Complex flow of information

Members of organisations have to cope with faster, larger, and more complex flows of information.

There is a business shift from an asset-centric environment to a knowledge-centric environment.

## 5.2.1 What is knowledge?

Knowledge and knowledge management are interdisciplinary concepts. Based on the work of Scarborough [Scarborough1999] knowledge can be defined as follows: "Knowledge can be seen as the entirety of cognitions, emotions and abilities which are used by individuals to solve problems. This comprises theoretical perceptions as well as practical daily rules and guidelines and is an organised set of statements of facts, insights, and ideas, presenting a reasoned judgement or an experimental result. Knowledge Management comprises any process or practice of creating, acquiring, combining, sharing, learning and using this knowledge, wherever it resides, to enhance the performing in organisations".

In the context of the discussion that follows, knowledge encompasses the capacity to act. Knowledge includes: ideas, values, stories, beliefs, procedures, experiences, emotions, intuitions, facts, data, practices and so on.

In relation to e-services, we can classify the knowledge around a service as shown in the following figure.

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#### Figure 30: Knowledge types

The main carrying vector of knowledge is the knowledge worker. The profile of a knowledge worker, i.e. the required and desired skills that a knowledge worker must possess, is depicted in the next figure:



Figure 31: Knowledge professional profile

## 5.2.2 Categories of knowledge

From an ontological point of view, knowledge can be classified into three broad categories:

- *Tacit knowledge*. It is personal, context-specific and unspoken knowledge. Therefore such knowledge is usually difficult to formalize, capture, record or articulate (it is stored in the heads of people). In other words, tacit knowledge is *the things an individual is able to do*, and it is difficult to express in words.
- *Explicit knowledge*. It is a component of knowledge that can be codified and transmitted in a systematic way and using formal languages: database, documents, e-mails, charts, web pages, etc. It can be expressed in words and numbers.
- *Implicit knowledge*. It is the knowledge that is inherent (embedded) in a particular process, i.e. the thorough and unspoken set of decisions and activities that are performed to transform a defined input into a defined output. This corresponds to the implicit way of doing a task, which is not recorded in an explicit, written manner.

The more interesting category is tacit knowledge. Around knowledge, there are three basic processes:

• *Knowledge creation process* can be thought of those activities that enable the conversion of tacit knowledge to explicit knowledge (also called *externalisation*). This process is often driven by metaphors and analogies. Knowledge creation is the process of development, creation and representation of insights, heuristics, beliefs, skills, and relationships. In this context, this process is basically the formalisation of thoughts into words (logos), i.e. to put knowledge in usable form aimed at solving problems, making decision, supporting business value chain.

In a broader view, knowledge creation consists of:

- Conversion of tacit knowledge into explicit knowledge: through formal expressions.
- Conversion of explicit knowledge to explicit knowledge: through synthesis from information from diverse sources.
- Conversion of explicit knowledge to tacit knowledge: through internalisation, enrichment and modification of the proper knowledge.
- Conversion of tacit knowledge to tacit knowledge: through observation, imitation and practice.
- *Knowledge sharing* includes disseminating and making available what is already known.
- *Knowledge utilisation* comes into the picture when learning is integrated into the organisation. Whatever is broadly available throughout the organisation can be generalised and applied to new situations.

The following figure displays the links between business processes, knowledge types and knowledge management.



Figure 32: Knowledge management system

These are the sources of knowledge that feed a KM system:

Source of knowledge	Explicit / codifiable	Tacit / needs explication
Employee knowledge, skills, and competencies		
Experiential knowledge (individual and group level)		
Team-based collaborative skills		
Informal shared knowledge		
Values		
Norms		
Beliefs		
Task-based knowledge		
Knowledge embedded in physical systems		
Human capital		
Knowledge embedded in internal structures		
Knowledge embedded in external structures		
Client capital		
Experiences of the employees		
Client relationships		

Figure 33: Sources of knowledge<sup>10</sup>

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<sup>&</sup>lt;sup>10</sup> Amrit Tiwana

Knowledge within organisations is created in two distinct and interrelated cycles: personal and collective. Personal knowledge is created through the experiential exposure to problems. Through this learning-oriented interaction, personal knowledge is refined based on personal expertise and serendipity factors and new knowledge is added to the existing one. Collective knowledge is created by the application of context sensitive personal knowledge through social interactions providing new insights and knowledge.

### 5.2.3 What is knowledge management?

Knowledge management enables the creation, communication, and application of knowledge to achieve business goals. Knowledge management addresses business problems, in particular:

- creating and delivering products and services,
- personalising the products and services to client needs,
- managing and enhancing relationships with clients, partners, and suppliers,
- improving working practices and processes,
- improving organisational and individual learning processes,
- and helping the right people apply the right knowledge at the right time.

Knowledge management, on the other hand, is not about:

- Knowledge management is not solely a technology problem.
- Knowledge management is not solely an information process.
- Knowledge management is not an intranet.
- Knowledge management is not about "document capture"

Knowledge management is an integrated system, consisting of complex interrelationships of people, purposes, technology, organisations, culture, assumptions, heuristics and the processes associated with the ways of creating, sharing and using knowledge supporting the processes of doing business and creating products and services. The knowledge management system facilitates:

- sharing past achievements,
- learning,
- innovative ideas,
- enhancing core competencies,
- collaboration,
- and client/employee loyalty and trust.

Under a common strategy:

Knowledge management is an art integrating competencies, skills, expertise, creative thinking, emotions, social aspects, knowledge and learning together.

#### Knowledge management role

Knowledge management is a way of looking at reality in organisations to come up with challenges, threats, opportunities, problems and solutions. There is no right or wrong answer to the question of what knowledge is. The main role of knowledge management is to orchestrate a real and virtual context in which people are stimulated and facilitated to apply, develop, share, combine, innovate and consolidate knowledge. Primarily focus on creating a vision of knowledge and related knowledge processes in the business domain and fostering an environment that supports the creation of smart ways of working and interacting.



Figure 34: Objective of knowledge management

Knowledge management consists of steering the process of knowing (socialisation, externalisation, combination, and internalisation), the process of creating and sharing best practices.

A *Knowledge management system* is the aspect of an *organisation*, which provides, uses and distributes *knowledge*. It is thus an aspect of a human system.

A Human *system (or Organisation) is the* structured group of people, possibly using machines (including *computers*), co-ordinating their efforts towards certain goals.

Computers support business in the following ways:

- communication, co-ordination and collaboration between agents,
- local provision of information and IT function,
- increasing automation of business activities,
- increasing response speed to demand,
- increasing a distributed structure for making decision,
- increasing social relationships.

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To solve service provision problems what To solve operational problems To enhance organisational dynamics To solve management problems To enable organisation transformation and growth KM svstem Building a rich set of communication and Building knowledge directories collaboration tools to support the distribution and sharing of the knowledge KB building • Defining the k-categories that are relevant to the organisation (ontologies) Identifying k-owners for each category managing Creating a searchable directory using

#### Figure 35: Knowledge management

The dynamics of the modern world force continuous changes on the business activities of all types of organisations (including public administrations). Coping with this change demands ever more powerful and flexible knowledge systems.

The following principles envisage a road to becoming an e-government organisation [Siebel2001].

#### *How to become an e-government organisation:*

- 1. Know your client.
- 2. Use multiple channels to interact with your client.
- 3. Personalise the client experience.
- 4. Optimise the value of every client interaction.
- 5. Focus on 100% client satisfaction.
- 6. Develop a client-centric e-government architecture.
- 7. Leverage and extend the e-government ecosystem.
- 8. Organisational culture based on excellence and innovation.

#### 5.2.4 Knowledge management drivers

Let us see key drivers for knowledge management.

- The emergent need for knowledge distribution.
- The need to deal with complex expectations.
- The need to avoid repeated and often-expensive mistakes.

- The need to avoid unnecessary reinvention.
- The emerging need for competitive responsiveness.
- The potential for creating extraordinary leverage through knowledge.
- Convergence of products and services.
- The need to predictive anticipation and respond to social trends.
- The need to support effective cross-functional collaboration.
- The need to provide a systematic unlearning processes. Organisations are often caught up in the past and continue to apply old practices, methods, and processes that no longer apply. Organisations must learn to unlearn what they have learned from past experience if it does not apply anymore. Knowledge management can potentially provide the devices for recognising such a need.
- The need to foster a knowledge-sharing environment.

Organisations are *complex adaptive systems*. The term *complex* denotes non-linear networks of agents, links, diversity and interactions. The term *adaptive* denotes learning, knowledge and feedback. The term *systems* stands for co-evolution, purpose, teleological behaviour, emergency and innovation.

In other words, organisations consist of a number of **components**, or agents, that **interact** with each other according to **sets of rules** that require them to examine and respond to each other's behaviour in order to **improve their behaviour** and thus the behaviour of the system they comprise.

That is, such systems operate in a manner that constitutes **learning**. Because these learning systems operate in environments that consist mainly of other learning systems it follows that together they form a **coevolving suprasystem** that, in a sense, creates and learns its way into the future [Stacey1996]. Finally we may draw some conclusions:

- Knowledge management helps avoid unnecessary work duplication, expensive reinvention, and repeated mistakes.
- Knowledge management promotes collaboration and organisational intelligence. Collaboration is the kernel of knowledge work.
- Knowledge management creates competence.
- Knowledge management provides devices to make your organisation a proactive anticipator.
- Knowledge is created from data by adding meaning to them.

## 5.2.5 Knowledge management in practice

The knowledge management concepts presented in the previous paragraphs may be put into practice as depicted in the following figure:



Figure 36: Knowledge management in practice

- In *a creativity context*, the role of KM is to enhance people's ability to think creatively through generation of large volumes of ideas such that a few particularly valuable ideas may emerge and be selected for implementation. There are many kind of tools to assist this process step: e-meetings, groupware, collaboration tools, mindmaps, ontologies and taxonomy builders, shared (virtual and real) spaces, modelling tools, visual engineering tools, simulation tools, classification and categorisation tools to analyse things and discovering relationships to map things on to a pre-existing structure, etc.
- In *a learning context*, the role of KM is to provide education and training routes, to provide means to learn before, during and after activities to increase effectiveness: "Organisations learn only through individuals who learn. Individual learning does not guarantee organisational learning, but without it, no organisational learning occurs" [Senge1999]. Tools to assist this process step are e-learning management systems, competence catalogues, expert directories, etc.
- In *decision-making context*, the role of KM is to support the decision-making process through voting and consensus building from the generation of an idea through to closure by collecting votes and rankings and using statistical tools to analyse the degree of consensus. Frequently decisions are made without a clear understanding of the consequences. KM can help by bridging a broad range of information sources relevant to the decision. Tools to assist this process step are collaboration tools, scenario planning and modelling tools, simulation tools, text mining, summarisation tools, linguistic analysis tools, etc. Advanced dynamic profiling and tracking technology can help locate appropriate expertise to participate in collaborative decision-making spaces.
- In *an implementation context*, KM includes functionality to support the following:
  - **Best practices**. They are not static documents describing "how to do x", but rather collections of guidelines, based on ever-evolving experiences in a particular domain.

- Lessons learned. A record of the success and failure experiences of the organization.
- Storytelling. Narratives to communicate complex ideas in simple terms.
- Cases. A record of problems and solutions for a particular context.
- Just in time training. Condensed pieces of training to speed up the acquisition of new competencies or abilities for the job.
- **Tools** to assist this process step are expertise location, communication, collaboration tools, etc.



Figure 37: On the road to e-government

A Knowledge management system is an essential tool for an organisation on its road to e-government (see Figure 37), since it provides devices to:

- Improve responsiveness.
- Improve interaction.
- Improve competency.
- Improve innovation.
- Improve efficiency.
- Improve learning.
- Improve communications.
- Improve collaborations.
- Improve leadership.
- Improve knowledge processes: creation (knowledge externalization), sharing and using.
- Improve content management.
- Leverage best practices.

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Figure 38: Knowledge management in practice

A detailed view of the knowledge base is shown next:



# Figure 39: Knowledge base structure

A core of KM system is knowledge-based community (k-community). A kcommunity (of practice, interest, value, knowledge, etc.) can be defined as an interdependent group of people inhabiting the same knowledge space (noosphere, the human sphere, i.e. a very information-rich environment where knowledge is free-

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flowing, like air) and interacting with each other through synergetic relationships under a shared reality.

A knowledge-based community is characterised by:

- the **knowledge workers** (the nodes),
- the **relationships** (the specific links between knowledge workers combining knowledge and actions),
- the **topography** of the network (who is connected with whom at a given time),
- a high-level of co-ordination and communication between people,
- a high degree of individual autonomy,
- a shared dynamic knowledge base,
- a complex, rich, dynamic inter- and intra-organisational relationships,
- a continuous sensory awareness of the state of the environment,

• and an intelligent behaviour in response to threats and opportunities. In order to deploy a KM system, the following steps should be keep in mind:



Figure 40: Knowledge management system steps

## 5.2.6 Domain modelling

Domain modelling is the process of putting the knowledge of a particular business domain in a usable form. Basically, domain modelling consists of locating important knowledge in the organisation, formalising it and then publishing a picture that shows where to find it.

Two tools can be used to formalise knowledge, knowledge maps and knowledge units:

• A *knowledge map* is a representation of concepts and their relationships. It is a navigational tool to enable users to hone in rapidly on the desired concept and then follow links to relevant knowledge sources (documents or people). Knowledge maps stimulate collaboration and teamwork.

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• A *knowledge unit* contains a solution to a given problem in a given context.

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CASE = A SOLUTION	TO A PROBLEM	IN A CONTEXT
Piece of Knowledge	User Need	Filter

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#### **Domains & Knowledge**

Figure 41: Knowledge domain modelling

Some issues to be taken into account for tacit knowledge codification (that is the representation of the knowledge of expert into knowledge units) are [Davenport1997]:

- Relevance is far more important than completeness.
- Employees, rather than the organisation, own the critical asset: knowledge and insight.
- Finding the sources of the knowledge (experts, documents, cases, business rules, specifications, business strategies, competencies, experiences of employees, norms, clients, management processes etc.) is essential.
- Tacit, complex knowledge, developed and internalised by the knower over a long period of time, is almost impossible to reproduce in a template or turn into a stepby-step procedure, rules and formulations (e.g. trying to capture the ability of an engineer to quickly diagnose many different types of equipment failures).
- Codification process for the richest tacit knowledge is generally limited to searching some expert with the knowledge, pointing the seeker to it, and fostering them to interact.
- Knowledge map links people, processes and knowledge. Its main purpose is to display people in the organisation where to go when they need expertise.
- A good story is often the best way to convey meaningful knowledge. Human beings learn best from stories. According to K. Weick [Weick2000] "people think narratively rather than argumentatively". Narratives are the best way to teach and learn complex knowledge stuff.

- Tacit knowledge can be externalised and embedded in company products or services. Any manufacturing process is constructed from the knowledge of individuals.
- Think about the organisation/projects as a "system".
- Facilitate communities of interests, learning and practice.
- Work along multiple fronts at once (organisation, culture, technology, processes, information).
- There is a strong connection between tacit knowledge, people's ego and job performance.
- What happens after the project is over is more important than what happens during the project. It is necessary to adopt a total lifecycle perspective.
- Establish an environment leading to knowledge management.

Taking into account the previous items, the idea is to design a process in order to facilitate the extraction of tacit knowledge.

# 6 Platform and Services Specifications

# 6.1 General Overview of the SmartGov Platform

The following picture summarizes the general architecture of the SmartGov Platform as discussed in the kick-off meeting.





As depicted, the SmartGov Platform consists of the following parts:

- Transaction Service Elements (TSEs), either generic or service specific
- Domain Knowledge Repository, pertinent to the Organization the SmartGov Platform is deployed
- Interaction Templates, basic code structure to handle interaction of the service as presented to the user through various dissemination channels.

In addition to the above components, the SmartGov platform includes a *Layout Repository*, for handling the various representations of the e-service according to different dissemination channels, user needs/roles etc.

It is projected that these modules will be used mainly by domain experts sporadically assisted by IT staff within the organization. Services will be developed and tested in the Development Server. When development reaches a mature stage, services deemed suitable for deployment will be moved to the Production Server (perhaps after "compilation" or "integration" or "assembly") to commence final run-time performance.

The "SmartGov Platform" is defined as the modules needed to develop, test and deploy services. Therefore the Production Server is not regarded as part of the SmartGov Platform. The SmartGov project should provide for some demonstrational

mappings to existing production platforms (such as LAMP:Linux-Apache-MySQL-PHP or ColdFusion-IIS-MS.SQL) that would help to exemplify its flexibility and extensibility.

The actual modules comprising the SmartGov Platform are regarded as "consumables". That is they can be replaced in accordance to technological advances, trends and ... fashion. In stark contrast, the API of these modules is considered of the outmost importance. We propose an XML-based messaging approach that we believe is going to be both extensible and scalable and at the same time suitable for the distributed development module that has been adopted for the SmartGov Platform [as example please of such idea. refer to Vinci/IBM an an <www.almaden.ibm.com/cs/people/bayardo/vinci/vinci.html>].

## 6.2 Interaction between modules

All communication between modules of the SmartGov Platform is envisioned to be message-based, with messages in a suitable XML-based format.

Basic messages will be defined beforehand that will enable core module functionality. Each module will be able to understand and handle those basic messages, but will also be able to handle gracefully arbitrary extensions to them as well as new as yet undefined messages. In this context, "gracefully" means that the module will handle all that it can and ignore without error or other unexpected behaviours what it cannot understand. These extra messages could be handled on the next module upgrade (if any).

Along the same line of thought, TSEs, Domain Knowledge, Interaction Templates as well as Layout Information will be defined in an XML fashion. The same level of robustness that is expected in handling the various messages is expected here also. That is "upgrades" in the definitions, for example by adding an extra attribute, should not result into abnormal behaviour by the modules that consume them.

We believe that such a model will considerably speed the SmartGov Platform development as well as help enhance the stability and robustness of the final product.

As an added bonus, the SmartGov Platform will be independent of any specific commercial product's idiosyncrasies and could, theoretically, be ported to any environment.

To sum up, for a successful implementation of an e-service the following steps are needed (not necessarily in the order presented here):

- The organization defines suitable TSEs or extends on the TSEs provided by a generic SmartGov Platform.
- Domain experts define the appropriate validation rules or other constraints needed for the realization of the e-service in the Knowledge Repository along with any additional information such as regulations, examples, extended help, etc. Entries in the knowledge repository reference TSEs as needed through a symbolic notation.
- Depending on the dissemination medium of the e-service, the Layout is designed and stored in the Layout Repository. A suitable symbolic notation is used here also to refer to TSE or to a property of a TSE.

- An Interaction Template is chosen for the e-service or a new one is constructed if there are no corresponding ones for the desired behaviour.
- Communication paths with external information systems are defined, i.e. methods for exchanging data with systems "outside" the SmartGov platform. Such information systems may include IT systems installed within the organisation, or outside the organisational limits, such as legislative databases, information portals etc.
- Within the Development Server, lives the Integrator. The Integrator is the module that combines the various definitions and produces the final computer code that will be executed to provide the e-service. It reads TSEs, relevant entries in the knowledge repository, layout information as well as the selected interaction template and compiles them into a real entity that a computer can execute.
- The code produced by the Integrator is tested in the Development Server and probable glitches are ironed out by repeating the usual development cycle (edit-compile-test-edit-compile-test...)
- When the domain experts are satisfied, or the managers decide, the resulting code is transferred from the development server to the production server and the e-service comes to life.

# 6.3 Transaction Service Elements (TSEs)

Transaction Service Elements (TSEs) are considered as the basic building block of an e-service. They are used to represent basic data types used within the organization. For example: SSN (Social Security Number) for a hypothetical Ministry of Health while the Ministry of Finance could use AFM (Arithmos Forologikou Mitroou-Tax Record Number). TSEs are not to be confused with basic data types as handled by programming languages. They are not just strings, integers, floats etc: TSEs are conceptual constructs that map onto the organization's practices. A TSE represents a real-world entity and its attributes model this entity's characteristics in a self-contained manner. Ultimately, TSEs define the Universe of Discourse, if something is not defined in a TSE, it doesn't exist!

TSEs are defined in an XML format and could contain the following properties (the following list is definitely not exhaustive):

- unique identifier, for obvious reasons
- machine-oriented data type, e.g. integer, string, float etc.
- data type format rules
- presentational info, possibly according to dissemination channel, e.g. length of data, number of decimals, colour, etc.
- interface definitions for transforming the TSE values from and to different formats and for communicating with the SmartGov agent they refer to (for exchange of data with third-party systems)
- generic name and/or service specific aliases (or handles)

• generic validation constraints/conditions. Service specific constraints and/or more detailed ones are considered to belong to the Knowledge Repository.

TSEs can be grouped arbitrarily and the resulting group is in itself a TSE with all the aforementioned properties.

TSEs are "cloned" when the time comes to implement a new service. The properties of the cloned TSEs can be overridden with service-specific properties. These properties are expected to be specialized versions of the properties offered by the generic TSE they clone, suitable for the service they refer to. This is coherent with the object-oriented paradigm, where generic object templates are instantiated and the generated instances may supplement, override or cancel attributes or behaviour inherited from the object template.

TSEs (or specific attributes of them) are referenced by objects residing in other elements of the SmartGov Platform, such as objects in the Knowledge Repository and objects in the Layout Repository. Therefore a TSE repository is needed to coordinate access and to ensure overall consistency, e.g. that referenced items are not deleted in a later stage.

# 6.3.1 Theoretic notations for TSEs

TSEs define the Universe of Discourse for a single organization. For this universe we assume that the unique name assumption stands. As a result, each object defined within the SmartGov Platform for this Organization has a unique identifier or name associated with it. A single TSE can be viewed as a predicate with a number of multivalued attributes. The number of attributes defines the arity of the predicate. In the usual case, the arity remains constant. However in the SmartGov platform we have accepted that the arity can change as well. Thus, a TSE can be formally represented as follows:

Let A, denote the name of the TSE, then  $A=(x_1,...,x_n)$ , represents an instance of a TSE with arity *n* at a given point in time with single-valued attributes  $x_j$ . For the case of multi-valued attributes the above definition can be rewritten as  $A=(x_{11},...,x_{nm})$  or with the condensed form  $A=x_{jk}$ , j=1..n, k=1..m. So, the TSE repository can be written as  $A=A_i(x_{jk})$ , i=1...0, j=1...n, k=1..m,  $i,j,k,n,m,o \in N$ .<sup>11</sup>



**Figure 43:** A possible representation of the TSE A with the number i in the TSE repository **A**, having five attributes  $(x_1, x_2, x_3, x_4, x_5)$  with each attribute having a

<sup>&</sup>lt;sup>11</sup> Alternatively, the TSE repository **A** can be represented as a 3-dimensional array A[i,j,k].
different number of values. Referencing a particular value of a specific attribute of the TSE  $A_i$  is possible by using appropriate indices.

TSE attributes can be simple or complex terms (themselves another TSE). Complex terms for attributes are needed to support the grouping of TSEs. Although TSEs may exist and handled autonomously, grouping may prove useful for event handling and for defining interfaces with the SmartGov Agents or other elements of the SmartGov Platform that do not require visual feedback.

<example> data record format for information exchange with 3rd party systems </example>

No specific requirement is imposed on attribute's contents. In the most general form, they can be an arbitrary length string. Actual interpretation of values is left to the Integrator.

By representing the TSE repository as a multi dimensional array, a temporal flavour can be easily incorporated by adding another dimension in the array. That way, versioning can be supported, a useful feature for maintaining different versions of essentially the same e-service, something that is common for the Public Sector, or at least the Greek Public Sector.

<example>

the same form needs to be submitted, but in different currencies, drachmas and euros. Submitting forms pertaining to periods before January 1<sup>st</sup> 2002 should use the version expressing amounts in drachmas, while forms pertaining to periods after January 1<sup>st</sup> 2002 should use the version expressing amounts in euros.

#### 6.3.2 A possible DTD for the TSE repository

For this sample DTD some attributes have been chosen following the highly scientific process of "informed guess"...

```
<!--- tse.dtd --->
<!ELEMENT tse
<!ELEMENT details
                                    (details)+>
                                    (service id?, tse id,
                                    (type|output|min value|max value|html type|
         editable|size|maxlength|description|format)*)>
<!ELEMENT service id (#PCDATA)>
<!ELEMENT tse_id (#PCDATA)>
<!ELEMENT type (EMPTY)>
<!ATTLIST type (ssn|float|number_positive|text|number)</pre>
"text">
<!ELEMENT output (EMPTY)>
<!ATTLIST output (0|1) "0">
<!ATTLIST output (0|1) "0">
<!ELEMENT min_value (#PCDATA)>
<!ELEMENT max_value (#PCDATA)>
<!ELEMENT html_type (EMPTY)>
<!ATTLIST html_type (checkbox|select|text|textarea) "text">
<!ELEMENT editable (EMPTY)>
<!ATTLIST editable (0|1) "1">
<!ATTLIST editable (0|1) "1">
                                    (#PCDATA)>
<!ELEMENT
                size
<!ELEMENT maxlength (#PCDATA)>
```

```
<!ELEMENT description (#PCDATA)>
<!ELEMENT format (#PCDATA)>
```

### 6.4 SmartGov Knowledge Repository

The Smartgov project directly addresses the main objectives of Key Action I.3.1 "Intelligent environment for public sector employees at all levels". One of the major contributors of the Smartgov system to these objectives is the Knowledge Based Platform component, from now on named Services Knowledge Database (SKDB) or Knowledge Repository. The SKDB is the technological enabler to support the organisational knowledge management. The creation and maintenance of e-services based on e-forms requires an improvement of the working environment of public employees in order to provide them with the necessary technical skills and domain knowledge to use form templates or to create new services. This is the approach that SmartGov proposes to support the main stakeholders of e-services, namely:

- The **managers** who need to take a strategic view of the provision of services, and wish to obtain useful information (e.g. statistics, performance indexes, etc.) from e-forms.
- The **domain experts** who possess the necessary background knowledge for the design and the implementation of a public service. This knowledge includes the legislation that a service is based on, that is laws, processes, directives, prerequisites and so on. Domain experts also play a consultative role to the managers for the design, evaluation and possible alterations of public services and they provide the necessary input to IT staff for the implementation of the technical aspects of the electronic services.
- The **IT** Staff possess the necessary technological knowledge for the development of an electronic public service. They design the system from scratch, defining system architecture, database schema, user interface and functionality. They also provide the necessary interfaces for data exchange between the electronic service platform and the back-end systems.
- The **administrators** (or *service workers*) support the users of the e-service that could be the employees of the public service and the end users. They help them to familiarize with the environment of the e-service and cope with possible problems that may occur. They are responsible for the management of user accounts, the integrity of the data (back up functions etc.) and the security of the system.
- The end-users, either citizens or organizations or other public sector employees that have to fill in e-forms.

In the public sector the employees, rather than the organisation, usually own knowledge and insight. Therefore, the SmartGov system must integrate these two critical assets by means of encompassing the knowledge and insight that support the development of electronic transactions. This requires that knowledge be aligned with the processes and services that SmatGov system will provide to their users. The SmartGov project introduces and incorporates the key notion of the *transaction service element* (TSE), which is perceived as the main building block of transaction services. A TSE is the equivalent of a form field (for instance, the input space for a

citizens id number or surname) but also contains metadata and domain knowledge that is attached by the form developer. Metadata may encompass the object's type, range of values, multilingual labels, and on-line help, while domain knowledge includes information about the relation of the object to other elements, legislation information, etc. The **transaction service** (TS), as well, is the equivalent of a form set, containing TSEs and service knowledge such as rules that govern the service, prerequisites for its usage, etc. Simple transaction services are expected to comprise of a single form, whereas more complex transaction services will encompass a more forms. In summary this is a set of the possible contents of the Knowledge Repository:

- Service construction rules and constraints provided by administrators and domain experts.
- Narratives or examples associated with the design of e-forms and the usage of TSEs.
- Categorisation of the legislation, rules or procedures on which the service, or service portion, is based.
- Best practices, regarding service usage by the end-users or procedures that may be followed within the organisation.
- Referrals to external information systems, regarding help texts, examples, legislative information, best practices, etc.

When selecting technologies to be used for building knowledge bases a primary issue to be considered is the necessity to manage sources of unstructured information stored in documents and multimedia formats. The vast majority of the information associated with the organisational processes is always stored in documents. Obviously the SKDB *module* has to do with the handling of sets of unstructured information: examples, best practices, "rules of thumb", extended help, regulations, manuals, instructions, expert location, etc., and the activities involved in creating, codifying and distributing these assets to the organisation as well. But additionally, the SKDB has to do with knowledge collaboration, communication and sharing among managers, domain experts and IT staff for the definition and implementation of e-services. According to these two perspectives of knowledge, there are two valid approaches to the knowledge repository module:

• THE REPOSITORY APPROACH: The understanding of KM focused on the management of explicit or codified knowledge. Knowledge is viewed as an object that can be captured in some explicit or observable form and stored as documents. The repository model utilizes technology for capturing, organising, storing and distributing explicit knowledge providing an implementation of the knowledge production and consumption cycle (acquisition, storage and access). In this sense currently state of the art KM systems put emphasis on knowledge *categorization* (creation of topic trees and taxonomies to organize knowledge items), *browsing* (the ability to navigate and discover knowledge assets) and *retrieval* facilities (applying "pull" and "push" technologies based on user preferences and behaviour information). The use of database technology (for storing knowledge production and consumption user roles) are mandatory to store the codified knowledge items. The integration of other technologies (such as

search engines, automatic categorisation tools and k-map builders) around the database engine shall be evaluated.

• THE NETWORK APPROACH: The understanding of KM as the management of people and processes. The network model uses directories and collaboration and communication tools to connect experts (knowledge owners) and people (knowledge users). Because of knowledge is closely tied to individuals the KM module should help people to identify and locate knowledge owners (navigating through knowledge categories), and to communicate and share tacit knowledge through groupware applications (virtual rooms, virtual discussions, etc.), asynchronous e-mail exchange and synchronous communication tools (chatting, videoconferencing, etc.). An investigation shall be carried out to identify and select which existing software tools can be easily integrated in the SKDB module.



**Figure 44: Knowledge management modelling approaches** 

These models are not mutually exclusive, so they can be implemented and accommodated in a given scenario.

#### SKDB service layers

As shown in Figure 45, external and internal knowledge assets or units generated by IT staff, administrators and managers shall be captured, categorised and stored in the knowledge repository (often called *the knowledge base*). The creation and use of the knowledge repository shall be founded on software tools that allow the administration (acquisition, codification, categorisation, storing and maintenance) of the knowledge units and its use (access and retrieval). Concluding and according to the previous approaches, the SKDB shall provide services for the life-cycle management of the generated knowledge units in the context of e-services based on e-forms. These services can be grouped as follows:

- Knowledge acquisition and codification service layer.
- Knowledge organisation, categorisation and storage service layer.
- Knowledge access and use service layer.
- Knowledge audit and evaluation service layer.
- Knowledge networking and collaborating service layer.



Figure 45: Knowledge repository system breakdown

Many technologies possess the functionality suitable for implementing the services. As stated in WP3, there is no single product that provides the whole range of services so that it will be necessary to integrate available software tools and ad-hoc developments to provide the full service. The following sections provide an overview of their functional scope and the alternatives for their implementation, and anticipate the work to be done in WP5 as well.

## 6.4.1 Knowledge acquisition and codification service layer

The SKDB shall offer capabilities for capturing knowledge at *service level*. Presently, the domain knowledge used to develop e-services is provided either by means of extra documentation, or implicitly within the application or not at all. As a result, this *implicit* domain knowledge cannot be easily extracted, re-used for developing other services, or modified, when needed. The adoption of the SmartGov solution aims to overcome this current situation that can be characterised in summary as follows:

- The lack of value-added **domain-specific services** based on the data of e-forms that allow the acquisition, sharing, and distribution of domain knowledge and expertise.
- The lack of mechanisms to **encapsulate the knowledge** of the organisation to convert tacit knowledge into explicit.

Thus in the scope of the SmartGov platform, it is essential to solve how to transfer the domain knowledge used at service level to a formalised system, in other words how to

"codify" the knowledge owned by employees. And what is more important, how to extract the knowledge embedded into practices, data, culture, business model and process model, and record it explicitly and formally, in order to increase performance, leverage best practice and provide effective decision support. The SKDB acquisition and codification capabilities (services, tools and methods) shall be specified, designed and developed during the work scheduled in WP5.

The SKDB will manage different types of knowledge assets such as best practices, lessons learned, examples, service rules, online assistance, judgements, legislation, and any other form of codified knowledge that may be useful to IT staff, domain experts and managers at service development or usage.

Therefore the preliminary activities to be carried out at this phase are:

- The definition of a "*Knowledge Unit*" (*KU*) as a formal representation of knowledge assets attachable to TSEs and TSs:
  - Contextual information about organisational and functional aspects, user descriptions, judgements and perceptions, and associated unstructured information (procedures, rules and documents related).
  - The KU design and structuring shall be founded on the XML and XSL standards to take advantage of their facilities to structure, access and transfer structured and unstructured information.
- The design of the process and tools to capture and codify knowledge units which addresses the following functional issues:
  - how to create, edit and modify a KU making use of a suitable and easy-to-use KU editing tool,
  - ▶ how to create and manage KU attachments to TSEs and TS,
  - > and how to manage user roles for KUs edition, verification and approval.

The detailed specification of the KU capture and codification services will be achieved in WP5, i.e.:

- The low-level specification of the procedures, forms, functions and tools needed for their implementation, and the interface to the rest of the SmartGov system module by specifying a "*KU capturing and codification SKDB service layer*".
- The implementation of the "*KU capturing and codification SKDB service layer*", considering the use of user friendly, intuitive and easy-to-use forms and interfaces to help experts in accessing and editing of KUs.

#### 6.4.2 Knowledge organisation, categorisation and storage service layer

The SmartGov system has to manage captured KU providing a suitable repository foundation where the user will be able to search and browse the information. When building the knowledge repository, a critical task is the definition of a browsable taxonomy or directory of categories or topics where KUs can be described and organised. This is usually referred to as the *knowledge map*, a representation of the topics of interest to the organisation as well as the framework presented to users to locate and retrieve the knowledge assets. As was stated in WP3, the distinction between searching and browsing is significant: searching is adequate for smaller, well

defined sets of documents, while browsing is better for exploring large amounts of information, and particularly when you are not exactly sure of what is available (supporting serendipity):

- When searching, terms must be known previously and you cannot easily see what is in the collection before you start the search.
- When browsing, you navigate through a directory where content is allocated. You can use a search to locate a specific directory branch, and then navigate up or down.

Browsing is becoming increasingly important for the vast majority of online sites, including Intranets and Internet. And it will be relevant for providing SmartGov system users with the ability to locate KUs regarding TSEs and TSs at service level.

Therefore the preliminary activities to be carried out at this level are:

- The creation and design of a schema, hereafter named "*Knowledge Map*" (*K*-*Map*), to organise and categorise the content (KUs) of the SKDB into an intuitive topical hierarchy or taxonomy.
  - The knowledge map will consist of a set of knowledge domains capable of storing and handling knowledge around the SmartGov services.
  - It is critical to have subject matter experts (CEC and GSIS) involved in the definition of the initial taxonomy structure because the k-map must reflect the way in which employees intuitively seek and use knowledge and information.
- The design of the process and tool to support administrators in the management of the k-map schema and the storing of KUs in the SKDB repository which addresses the following functional issues:
  - how to make use of the KU attributes to import, link to categories and physically store KUs around the k-map schema,
  - ▶ how to manage the version control of KUs and access restrictions,
  - ▶ how to manage the physical storage of a KU,
  - ▶ how to manage the cycle of publication of KUs to allow their use,
  - ▶ how to manage user and group authentication data and access profiles,
  - how to support changes (addition of new terms, or deletion of existing ones) of the SKDB classification scheme over time to reflect the evolution of the services requirements and needs allowing for the adoption of new services.

The k-map management and tools can become a major concern for the Public Authorities (GSIS and CEC). The definition of knowledge topics, categories and hierarchies shall be accomplished by managers and domain experts of the Public Authorities and the creation of a k-map usually can become a very time-consuming task for large organisations with multiple knowledge domains. They must have a sound knowledge about the behaviour of the employees, how they usually organise and request the information they apply to specific tasks, and even the jargon they typically use to refer to relevant documents or any other aspect of a job task. The use of software tools to infer and suggest topic trees based on the frequency of term occurrences is not considered in this phase.

The work scheduled in WP5 towards specifying and developing the **knowledge** categorisation and storage services shall include:

- The low-level specification of the procedures, forms, functions and tools needed for their implementation, and the interface to the rest of the SmartGov system module, by specifying a "*KU categorisation and storage SKDB service layer*".
- The implementation of the "*KU categorisation and storage SKDB service layer*", considering the use of user friendly, intuitive and easy-to-use forms and interfaces to help administrators in the creation and maintenance of the SKDB KU repository.

#### 6.4.3 Knowledge access and use service layer

The knowledge map provides users with a very useful approach to discover and retrieve knowledge and information by browsing or drill down into areas of content. User profiling will be required to control access rights to SKDB resources.

The SKDB shall provide end users with a user-friendly, intuitive and easy-to-use interface to navigate and browse services and knowledge. But the access and use of the knowledge accumulated in the SKDB may be restricted within the SmartGov service development environment.

Therefore the preliminary main activities to be carried out at this level are:

- The identification and definition of user access profiles for accessing to the SKDB resources. The definition of profiles may be enriched with tracking information, user preferences and knowledge competencies.
- The design of the procedure and tool to allow the browsing and searching of the kmap schema and the retrieving of KUs from the SKDB repository which addresses the following functional issues:
  - how to easily navigate the k-map schema collapsing and expanding topics and sub-topics,
  - how to build and launch simple queries for retrieving KUs by matching its attribute values (contextual data and metadata tags),
  - ➢ how to browse a KU (read only mode),
  - ▶ how to retrieve and view the unstructured documents linked to the KU,
  - ➢ how to check-in/out a KU for editing.

Optionally, the study will include the feasibility of integrating a search engine to provide the ability to automatically index KUs and process keyword searches based on pattern matching recognition techniques and formulate simple boolean expressions combining terms with "*AND*, *OR and NOT*" operators. This feature would allow users to retrieve a KU by querying for terms that are present in the body of any of its structured parts. It would become an alternative retrieval method that supplements the k-map query and browsing.

The work scheduled in WP5 towards specifying and developing the **knowledge** access and use services shall include:

- The low-level specification of the procedures, forms, functions and tools needed for their implementation, and the interface to the rest of the SmartGov system module by specifying a "*KU access SKDB service layer* ".
- The implementation of the "*KU access SKDB service layer*", considering the use of user friendly, intuitive and easy-to-use forms and interfaces to help administrators in the creation and maintenance of user profiles and ACL in the SKDB KU repository.

#### 6.4.4 Knowledge audit and evaluation service layer

The SDKB shall provide a feedback mechanism from the SmartGov runtime environment that will allow the managers to evaluate the use, acceptance and effectiveness of the SKDB knowledge repository. System administrators will be able to gather metrics and statistics on user behaviour (tracking information), knowledge assets use, SDKB performance (logs), suggestions by the users (surveys), etc.

Measuring the contribution of the knowledge repository to leverage the organisations' knowledge assets is one of the major challenges to be faced by a "smart" organisation. Audit information is indispensable to evaluate the effectiveness of the SKDB content and functionality and to learn about the user needs and the SKDB behaviour. Finally this will help to tailor the SKDB functions and services to the individual user needs in the context of their work activities.

Therefore the preliminary main activities to be carried out at this level are:

- The design of the procedures and tools to allow administrators the population and management of audit data from the SKDB repository which addresses the following functional issues:
  - how to populate, filter, organise and store statistical data from the SKDB activity log,
  - how to design reports, rankings and metrics based on statistical data in accordance with specific criteria expressed by SKDB managers,
  - how to collect user suggestions and opinions to get feedback on the SKDB suitability.

The work scheduled in WP5 towards specifying and developing the **knowledge audit** and evaluation services shall include:

- The low-level specification of the procedures, forms, functions and tools needed for their implementation, and the interface to the rest of the SmartGov system module by specifying a "*KU audit and evaluation SKDB service layer*".
- The implementation of the "*KU audit and evaluation SKDB service layer*", considering the use of user friendly, intuitive and easy-to-use forms and interfaces to help administrators in the management of statistics and reports.

#### 6.4.5 Knowledge networking and collaborating service layer

The hybrid model of the SKDB shall provide facilities to support the transferring of tacit knowledge between domain experts, managers and IT staff. Networking and collaborating capabilities will be founded on the k-map schema as the topics and

hierarchies can be used to create directories of experts and characterise threaded discussions.

Therefore the preliminary main activities to be carried out at this level are:

- The design of the procedure and tool to allow users to communicate and transfer tacit knowledge which addresses the following functional issues:
  - how to identify and locate knowledge domain experts based on the k-map schema,
  - how to contact experts by sending messages and notifications (likely linking to the organisation's messaging system from the SKDB module),
  - how to create and maintain threaded discussions between managers, experts and IT staff.

The work scheduled in WP5 towards specifying and developing the **knowledge networking and collaborating services** shall include:

- The low-level specification of the procedures, forms, functions and tools needed for their implementation, and the interface to the rest of the Smartgov system module by specifying a "*KU networking and collaborating SKDB service layer*".
- The implementation of the "*KU networking and collaborating SKDB service layer*", considering the use of user friendly, intuitive and easy-to-use forms and interfaces to help users to communicate each other.

## 6.5 E-process management

Knowledge about the organization's processes and use of TSEs is captured inside the Knowledge Repository. It is envisioned as a service-oriented repository with referrals to predefined TSEs.

Approaches such as BPML (Business Process Mark-Up Language) <<u>www.bpml.org</u>>, BRML (Business Rules Mark-Up Language) or CommonRules <<u>www.alphaworks.ibm.com/tech/commonrules</u>> as well as commercial products (such as JRules by iLog <<u>www.ilog.com</u>>) provide useful hindsight, which we feel should be evaluated. (See also <oopsla.acm.org/oopsla2k/postconf/tavorath.pdf>)

Validation constraints, i.e. business rules, in the proposed approach are defined in two distinct places:

- within the TSE itself, when the truth value of the constraint can be decided by the information contained within the TSE
- within the Knowledge Repository, when the validation of the constraint depends on information from more than on TSE or from external sources.

## 6.6 Interaction Templates

These templates form the basis of what the end-user perceives as an e-service. They provide for all end-user interactivity and navigation control within an e-service and take care of data I/O within the boundaries of the Production Server (or the Development Server while the service is under development).

They may be specific to dissemination channels but not necessarily to a specific eservice (although as everything else in the SmartGov Platform, they can be cloned to provide for specialized cases). For example, the navigation controls specified in the interaction template pertaining to the WWW dissemination channel may be different than the ones designated in the interaction template used for the WAP channel, since the former is usually accessed by equipment with richer input and display facilities than the latter (e.g. PCs compared to mobile phones). In this sense, a service delivered through the WWW channel will employ enhanced navigation controls, whereas the same service, when delivered through the WAP channel will employ only basic navigation controls.

Interaction Templates are probably, the most difficult part of the SmartGov Platform to be modelled and handled by intuitive user applications; the SmartGov platform will definitely provide mappings of the Interaction Templates to production environments and will facilitate, to some extent, the authoring of interaction templates.

For an e-service to be realised, provided everything is well defined and conflict-free, the SmartGov Engine utilises required TSEs, constraints from the Knowledge Repository and Interaction Templates assembling an executable whole. Layout Repository's information is used to build versions of the e-service according to the dissemination channel used by the user to access the e-service. These versions are realized first at the Development Server where the newly created e-services can be tested and possible inconsistencies ironed-out.

The debugged and "officially" approved version of the e-service can then be deployed to the Production Server.

## 6.7 Layout Repository

The Layout Repository stores information about the different layout of a specific eservice as it is presented to the end-user through different dissemination channels (Web, WAP, etc).

The Layout Repository can employ "hints" specific to a presentation layer. In a similar fashion, the Layout Repository does not refer only to the whole of an e-service, but can hold parts of re-usable components that could be utilized throughout the organization.

## 6.8 SmartGov Agent – Information Interchange Gateway

When a SmartGov installation is deployed, it is expected to exchange data with an organizational IT system. Usually this IT system will be the "back-end" system for the organization, from which citizen or enterprise registry data will be retrieved and to which transactional data will be stored. Different organizations have diverse back-end systems, with substantial differences or idiosyncrasies, which hinder the use of a common framework for communicating with them. Moreover, communication should take place in a high level of abstraction, without involving design and implementation details of the installed IT system.

One scheme for achieving the aforementioned goals is to employ two software modules, the *SmartGov Agent* and the *Information Interchange Gateway*. The

*SmartGov Agent* is an integral part of the SmartGov platform, enabling the submission of *requests* to external systems and the retrieval of the respective results. The Information Interchange Gateway is attached to the installed IT system and arranges for interception of the requests originating from the SmartGov agents, their execution and the returning of the appropriate results. Communication between the SmartGov agent and the Information Exchange Gateway may be performed using any standard data exchange protocol, such as WDDX, XML etc. The architecture of a SmartGov platform involving the SmartGov agent, the Information Exchange Gateway and an Installed IT system is depicted in Figure 46, while a more detailed positioning of these modules within the SmartGov platform is illustrated in Figure 47.



Figure 46: Communication with installed IT systems



Figure 47: Placement of SmartGov Agents in the overall architecture

The Information Interchange Gateway publishes an *exported service list*, which defines the requests that it is willing to accept and serve. Each service is described by its name, a set of input parameters and a result type. Requests from the SmartGov agent to the Information Exchange Gateway include the request name and the (request-specific) set of input parameters. Upon reception of such a request, the

Information Exchange Gateway verifies that the invoked service is included within the exported service list and that the input parameters are correct in number and type. Then, the information exchange gateway invokes a procedure, which performs the requested task and returns the results, which are then forwarded to the SmartGov agent. The procedures that actually execute the requested tasks will be coded by the organization's IT staff (or will be outsourced) and they practically encapsulate all the internal details and peculiarities of the installed IT system. This approach is well proven for interconnecting heterogeneous information systems (e.g. CORBA [Bolton2001], RPC [Sun2000]).

In the following paragraphs the *SmartGov Agent* and the *Information Interchange Gateway* are described in more detail.

#### 6.8.1 SmartGov agent

The *SmartGov agent* accepts requests from the SmartGov platform for communication with external IT systems and arranges for the communication to be performed. Each such request contains a *function name*, designating the service to be invoked and may define parameters to be passed to the service, while the service may return results that must be returned to the caller. Upon receipt of a request the *SmartGov agent* should perform the following functions:

- 1. Locate the information system to which a request should be made. The requested service may be offered by one or more IT systems. The SmartGov agent should determine which IT systems offer the requested service, select the most appropriate one and direct the request to it. Service-to-IT systems mappings may either be determined statically, via a configuration file, or dynamically through systems communication.
- 2. Collect the values of the parameters provided in the context of the invocation. The SmartGov agent should retrieve from the SmartGov platform the values of the parameters that should be sent to the IT system, in order for the request to be fulfilled. Once the values have been collected, it might be appropriate for them to be formatted according to some specifications to facilitate their processing by the IT system offering the service. Formatting instructions to be used with a specific parameter should be coupled with it, whereas the designated format should be supported by the TSE type that the value has been instantiated from.
- 3. *Invoke the service on the IT system and collect the response.* The request is sent to the IT system and the reply is colleted. Communication errors are also handled in this stage.
- 4. *Extract the results contained within the reply and return them to the caller.* The results returned from the invoked service should be mapped to specific TSE instances, in order to be usable within the SmartGov platform. Thus, the SmartGov agent should cater for these mappings, instantiating the appropriate TSEs and setting their values through the input methods provided by the TSEs. Each TSE should support a suitable input method for importing the corresponding value returned by the service.

The SmartGov agent is also responsible for handling subscriptions to triggering events that may affect service operation. For instance, if a service is dependent on a

specific law, the SmartGov agent may subscribe to a legal document database to receive notifications when this law is revised or complemented, and will arrange for appropriately reporting to the SmartGov platform administrators. Finally, the SmartGov agent manages referrals to external information sources, in order for them to appear to the users as seamlessly integrated with the SmartGov platform.

#### 6.8.2 Information Interchange Gateway

The information exchange gateway is attached to the IT system that offers services that may be invoked from the SmartGov platform. If multiple IT systems should offer services for SmartGov platforms, then each such system should run a separate instance of the Information Interchange Gateway. The Information Interchange Gateway should encompass the following functionalities:

- 1. *Service directory*. The Information Interchange Gateway offers through the service directory a list of the services offered by the specific IT system to SmartGov platforms. The description of each service should contain the service name, the number and type of parameters, and the type of results returned. The service directory functionality may be used by the SmartGov agent during the process of service location.
- 2. Service execution. Once a service invocation from a SmartGov platform has been received, the Information Interchange Gateway should arrange for the execution of the appropriate code fragment that implements the service. As a first step, the values of the parameters accompanying the request should be extracted, and the appropriate code fragment, its execution method and the parameter passing convention that must be employed should be determined. For instance, if the code fragment is an external program, parameters may passed as command line arguments and results might be returned through the program's output; if the code fragment is compiled into a dynamically loadable library, it will be necessary to load the library and invoke the corresponding entry point within it, passing the parameters through the stack.
- 3. *Remote administration facility.* This facility enables the installation, deinstallation and modification of services offered by the Information Interchange Gateway, without the need for other types of access to the IT system. In order to add a new service administrators should be able to provide a description the new service, including its name, parameters, results and invocation method, together with the code fragment that implements this service. The code fragment might be in source form, in which case an appropriate set of commands to transform it in an executable form should be provided. Service de-installation only requires the service name, whereas service modification may be implemented through de-installation followed by a new installation. In all cases, administration facilities are accessed after suitable authentication.

In the event of modifications to the installed IT system, it is expected that the administrators of the installed IT system will notify the administrators of the SmartGov platform, providing any necessary information for bringing the service implementations up to date.

#### 6.8.3 Technical considerations

SmartGov agents and Information Interchange gateways act on XML-messages they receive or are themselves originators of one. These XML-messages will typically have a control and a data part. It is the responsibility of the SmartGov Agent to interpret the control part and act accordingly.

Specialized or idiosyncratic data formats as well as access to data sources (such as databases or remote systems) is delegated to appropriate SmartGov Agents specifically crafted. Inevitably, this will result in specialized IT staff involvement. The Project's goal should be to make things easier for the IT staff by providing basic, general-purpose mechanisms as well as the XML-messaging clickety-clack for communication with other parts of the SmartGov Platform. Frequently used and foreseeable actions could be represented in an abstract form to facilitate easier and speedier development. For example, a generalized method for accessing databases could be provided in the form of a DSN (Data-Source-Name).

As is usually the case in Public Administrations, there are already data centres operating under IT staff that closely guards access to resources for stability, performance, security and other reasons. Update of the SmartGov Agent that sits within these systems is not expected to be a frequent event. Therefore, SmartGov Agents should allow for remote updating of themselves through specific messages in XML format. W3C specifications of XML-RPC and/or SOAP could be of help in this area.

So far it has been implied that all necessary information for an e-service to operate is present locally within the SmartGov deployment platform, i.e. it has already been collected from 3rd party systems and stored in a readily accessible storage area by previous actions of appropriate SmartGov Agents. If communication with remote systems is needed, a two-phase commit approach is proposed. That is, user interaction is concluded and a preliminary submission of user data is accepted. Final approving of these is pending dependent on the remote system data.

## 6.9 System adaptivity considerations

Services delivered by public authorities may undergo changes for a number of reasons:

- Legislation or regulations governing the service is modified.
- □ Generic changes to legislation or regulations take place affecting the service, such as the introduction of the Euro currency, which necessitated the need for changes to all forms involving currency fields.
- □ Changes occur to paper form layout, for some reason other than the ones listed above, and the electronic forms are modified to be consistent to their paper counterparts.
- □ Feedback from users or other evaluation activities indicate that changes need to take place regarding layout, interaction or merely aesthetic aspects.
- Processes associated with the internal handling of the documents submitted via the electronic service are modified.

□ Technical parameters of the installation, such as the database server in which the documents are stored or the web server through which the service is disseminated, change.

The SmartGov platform should either directly support or facilitate the adaptation of the electronic services to potential changes. In the following paragraphs the provisions of the SmartGov platform addressing service evolution and adaptivity are discussed.

### 6.9.1 Adaptivity facilities for the SmartGov platform

In the following paragraphs the facilities offered by the SmartGov platform and may be exploited for supporting adaptivity and evolution of electronic services are discussed in relation to the causes that may trigger changes to an electronic service, as discussed in the previous section.

#### 6.9.2 Legislation-regulation changes

One of the most usual triggers to the modification of electronic services are changes to legislation or regulations governing the service, in general, or the electronic version of a service, in particular. The changes may affect the data collected by the service (data elements may be added or removed), the validation rules governing the service (checks may be added, deleted or modified) or generic service parameters, such as the deadlines for submitting the documents.

In all these cases, the elements of the service that are affected by the change need to be identified and appropriately updated. Within the SmartGov platform, updating an electronic service includes both updating the knowledge units representing the supporting legislation and regulations and revising the forms, transaction service elements, validation rules service parameters that are influenced by the change. The most efficient way of performing the necessary modifications is to employ taxonomies or search facilities to locate the knowledge units that correspond to the updated legislation or regulations. These knowledge units may be directly revised, or cloned and then revised (introducing thus a new version of the knowledge unit). Then, the links contained in each knowledge unit may be exploited to locate the forms, transaction service elements, transaction service element groups or validation rules that depend on the revised knowledge units. Each such item may then be modified accordingly. Links between KUs and items, although not mandatory, should be established in the SmartGov environment, since they are one of the basic means of interweaving knowledge management and electronic service development. Neglecting the establishment and maintenance of such links demotes the SmartGov environment to a conventional electronic service development platform, diminishing the added value offered by knowledge management techniques.

For newly introduced items (transaction service elements or validation rules), it suffices to create the item and link it to the related KU.

It might be argued that a KU corresponding to a piece of legislation or a regulation might actually contain a very large number of links to forms, transaction service elements, transaction service element groups or validation rules, thus the objective of isolating the links actually pointing to affected items is not trivial. One should however consider that the SmartGov platform provides the possibility to store each piece of legislation and regulations at a finer level of granularity (e.g. article level or

paragraph level) and employing a higher-level "index" KU to point to these granules. Under this scheme, each legislation or regulation granule will only contain a small number of links, facilitating the location of the affected items. Moreover, complementary to navigation through KUs, it is possible to locate an item by navigating through the visual entity hierarchy (form sets, forms, TSE groups, TSEs) or employ search mechanisms to locate a specific item through its description, or any other property.

#### 6.9.3 Generic changes to legislation or regulations

Generic changes to legislation or regulations, such as the introduction of the euro currency in the EU or the adoption of a new policy for immigration, are not easy to manage, since they are unforeseeable by nature and may affect any portion of the electronic service. Moreover, changes in these cases are introduced through generic laws or regulations, rather than specific ones (e.g. "money in all transactions will hereafter be entered using the Euro currency" as opposed to "data required by articles 1, 2 and 4 of law 1234/1998 will be entered using the Euro currency") thus pinpointing the affected items (KUs, TSEs, validation rules etc) is not a trivial task.

In such cases, the evolution and adaptation tasks can be greatly assisted by an appropriate classification of items in taxonomies, existence of appropriate descriptions or keywords and/or usage of specialised classes (data types) to represent TSEs with similar characteristics. For example, all items related to immigration (across all services) may be linked under the same taxonomy node and/or have the keyword "immigration" in their description or as a keyword entry. Having this information available, it is possible to locate the affected items through browsing (by traversing links within the taxonomy node) or via searching (requesting the items that have specific pieces of text within their description or among their keywords).

The SmartGov platform can readily support both modes of locating affected items, since all SmartGov objects may be linked to taxonomies and allow for descriptions to be entered. It must however be noted that without appropriate linking or tagging by the SmartGov platform users, locating affected items may be quite tedious.

#### 6.9.4 Paper form layout changes

When changes occur to paper forms it might be desirable for their electronic counterparts to be modified accordingly, in order to keep the interface facets (paper and electronic) consistent. Within the SmartGov platform, a form layout change may be easily addressed, since it maps to the following two subtasks:

- 1. modification of the respective visual layouts of the service forms (or form sets), in order to match the layout of the paper forms. This task is obviously required in order to bring the electronic forms "in sync" with the paper-based counterparts.
- 2. update links between form visual elements and SmartGov platform items (KUs, TSEs, TSE groups), as part of the service instantiation process. This part is necessary because the XHTML visual layout does not normally contain information regarding the links to the SmartGov service and knowledge database. Despite this limitation, the SmartGov consortium is examining solutions that will allow for tighter integration between visual layout development and linkage to SmartGov platform objects. These solutions will allow users to move visual

objects between forms without needing to re-enter the semantic information associated with the linkage between the moved visual objects and the SmartGov platform items.

#### 6.9.5 Response to feedback or evaluation

Maintenance activities may be triggered by input collected from users or other evaluation activities. This feedback will mainly target layout issues, interaction patterns or aesthetic aspect of the services. The SmartGov platform can facilitate such maintenance activities as follows:

- 1. layout modifications may be handled as described in section 6.9.4, since in both cases the objective is to have a revised layout for the electronic service.
- 2. issues regarding interaction patterns may be treated by changing the form sequence within a specific form set, or by using the constructs provided by the SmartGovLang in order to dynamically enable or disable specific fields or complete forms, tailoring thus the interaction scheme to the desired needs.
- 3. modifications to aesthetic aspects of the service can be treated by appropriately modifying the service visual elements, which are defined through the XHTML forms. We note here that the XHTML part of the electronic services is developed using third-party tools (COTS or shareware/freeware software), thus the best practices recommended for XHTML development and/or the use of these tools should be followed, in order to implement such changes in the most efficient way.

#### 6.9.6 Modification of processes

It is possible that the internal workflow or the internal procedures for handling the documents submitted through the electronic service of the organisation delivering an electronic service will change in time. Although such changes are bound to occur for services developed and deployed using the SmartGov platform, we note here that the actual handling of these changes does not fall within the scope of the SmartGov project: the SmartGov project aims at supporting the development, deployment and maintenance of electronic services; back-end activities related to the services should be supported by a different set of tools. The SmartGov platform, however, can be tailored to communicate with such tools supporting internal workflow or other processes, through appropriate customisation of the communication services (SmartGov Agent-Information Interchange Gateway). Thus the appropriate data may be stored in the organisational repositories, facilitating adaptation to a changed environment.

#### 6.9.7 Changes in the Technical Environment

Throughout the lifetime of an electronic service, certain aspects of the IT environment in which the service operates may change, such as the database server in which the documents are stored or the address of an organisational back-end system. The SmartGov platform facilitates the work of IT staff in such situations through the following list of features:

- 1. *automatic deployment*. Electronic services developed using the SmartGov platform are automatically generated deployed on the service delivery environment, thus a change of the electronic service delivery platform merely necessitates the re-initiation of the deployment procedure.
- 2. *encapsulation of DBMS storage in the XML repository and communication services.* The XML repository and the communication services screen all idiosyncrasies of DBMSs (or data repositories, in general) that may are used for storage and retrieval of electronic documents and relevant data. Thus a change in the data repository component of the service delivery environment does not imply changes to the running service, except possibly for some tuning.
- 3. encapsulation of the interaction with third-party systems into the communication services. The organisational back-end, or any third-party system that the running service interacts with, may undergo changes for any reason. Such changes do not directly affect the running service, since any implementation details are encapsulated in the communication services, and more specifically into the IIG-SEP modules. Naturally, these modules will need to be adapted to the changes and this adaptation is considered as an integral part of the procedure for applying changes to the third party system. Moreover, by encapsulating the interaction with third-party systems into the communication services, it is possible to easily locate the modules affected by a specific change and then bring them up to date; if the interaction were directly coded into the e-service logic, it would be hard to identify all code fragments needing update (thus some updates could be missed) and the risk of performing incompatible updates in different code fragments would be introduced.

## 7 Conclusions

This addendum identifies the triggering events for an electronic service update to occur and documents the features of the SmartGov platform that directly or indirectly support the work needed to perform the required updates. The SmartGov platform offers a rich set of tools and facilities, including knowledge management, searching, automation and parameterisation, for assisting SmartGov platform stakeholders to perform the relevant tasks.

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## Appendix A: Structured Interview for User Requirements Capturing Procedure

This appendix presents the questions that were used in the context of the structured interview. Following the question list, a quantitative and qualitative analysis of the collected replies is given.

## User background

1. How long have you been working for the PA?									
2. Are you a computer user?	🗌 Yes	🗌 No							
3. How long have you been a computer user?									
4a. How frequently do you work on the c	computer?								
b. For how long?									
5. What computer applications do you u	se regularly?								
6a. Do you use the Internet or WWW?	🗌 Yes	🗌 No							
b. What for? (e.g. email, surfing, etc.)									
7a. Do you know programming?	Series Yes	🗌 No							
b. What environments have you used?									
8a. Would you be willing to participate in	n computer seminars? 🗌 Yes	🗌 No							
b. For what subjects?									

#### 9. What do you think of electronic services?

#### Work

10. What is your job function/role?

11a. Describe the tasks you have to carry out.

b. How are these tasks accomplished?

c. What is the outcome of these tasks?

12. Which of these tasks you think can be automated?

13a. How often do you carry out these tasks?

b. Are they seasonal?

Yes No

14. What are the attributes affecting the time needed to complete these tasks?

15. Which are the most time consuming tasks?

16.	What are the deadlines for the tasks?		
17a	Do these tasks change?	🗌 Yes	🗌 No
b	. How often?		
c	How soon should changes be incorporated?		
18.	What/who initiates changes?		
19a	What tasks are most error prone?		
 b. [	Why?		
20. [	Who else is involved in this given task?		
 21. ר	What are the objectives?		
22a	Who is your customer?		
h	What are their needs?		

b. V  с. Н	What are they? Now rigidly do you follow them? ow often do procedures change?
с. Н	ow often do procedures change?
с. н	ow rigidly do you follow them?
	ow often do procedures change?
d. H	
24a. W	/ho defines changes in procedures?
b. H	low are they implemented?
25a. A	re there any documents exchanged?
Ь. Г	Do you have any templates?
c. W	That is the role of the documents exchanged?
d. Is	any of the information exchanged restricted/ classified? Yes No
e. W	ho else has access to this information?
∠ 26. W	ho are you accountable to?
27. W	Tho is accountable to you?
28. H	ow are efficiency and effectiveness measured?
29. W	That training did you need to do this job?
⊔ 30. H	ow often you need to re-train?
31. W dis	hat methods of training do you use (seminars/training courses, on the jo stance learning,)

- 32. What information do you need to perform your task?
- 33. Where do you get this information from (IT system, colleagues, ...)?
- 34. Would you consider using an electronic tool to assist you in your work?
  - Yes No
- 35. What functions do you expect that such a tool would perform?
- 36. How do you feel such a tool would affect your current work?
- 37a. What parts of your work cannot be automated?
  - b. Why?
- 38. What are the problems you face, regarding your job?
- 39. What things you would like to alter?
- 40. How would the proposed tool help to this regard?

#### **Context**

41. What do you think of the workspace condition (noise, distractions, layout, available resources)?

## Knowledge Management

42. Do you identify/discover existing knowledge by consulting colleagues or documents?

Yes No
If yes, which one(s)?
43. Do you add new information (post-it, notes, opinions, comments,) into documents, forms, reports, etc?
Yes No
If yes, which one(s)?
44. Do you compare the information produced with similar existing information?
If yes, which one(s)?
45. Do you comment (working practices, experirences, solutions,) with other colleagues?
Yes No
If yes, which one(s)?
46. Can you describe how you explain complex or difficult things to others?
Yes No
If yes, what strategies do you use?
47. Do you record and classify the information in order to be easily retrieved and re- used (by other people)?
Yes No
If yes, what strategies do you use?
48. What knowledge type do you use in your job:
descriptive methodological procedural
49. Does staff show an active interest in knowledge creation with regard to key aspects of the public services operations?
Yes No

50. Does Public Administration provide systematically to all public servants continuous learning (courses, roadmaps,...): in order to upgrade the competencies of their human resources?

Yes	🗌 No
-----	------

51. To what extent are creativity and expressions of new services ideas systematically encouraged?

	1		2		3		4		5		Х
	Never		Seldom		Sometimes		Quite often	l	Always	Ic	lo not know
4	52. To v	what ext	ent are	public s	ervants	encoura	aged to	obtain f	òrmal ti	raining	degrees,
(	liploma	s, certifi	cates, et	c?				1		1	
	1		2		3		4		5		Х
	Never		Seldom		Sometimes		Quite often		Always	Ιc	lo not know
4	53. Do y	ou iden	tify inte	rnal and	l externa	al source	es of inf	ormatio	n?	Yes	No
]	f yes, w	hich on	e(s)?								
4	54. Do v	ou elim	inate gro	osslv irr	elevant	informa	tion and	d duplic	ation? [	<b>∀es</b>	No
-	,			j							
4	55 Do v	ou gath	er filter	and int	egrate in	nformati	ion?			Yes 🗆	lNo
•											
4	56 Do v	ou class	ify the i	nforma	tion acc	ording t	0.				
•		ou class				orung t	0.				
	corporate standards individual needs										
4	57. Do y	ou deve	lop a se	arch str	ategy?			Yes	No		
	If yes, what type?										
	Browsing categorizing (topic, trees, taxonomies,)										
	Full text (by patterns and boolean operators,)										
	Using semantic expansion (thesaurus, dictionaries)										
		C	Combine	differe	nt searcl	n strateg	v?				
(	Others										

58. To what extent do you hire new public servants or recruit workers to add a										
particula	r set of	knowled	ige con	ipetenci	es?					T
1		2		3		4		5		X
Never	_	Seldom		Sometimes		Quite often	l 	Always	Ιc	lo not know
59. To what extent do e-services effectively integrate/tackle/support the demands from the other departments and citizens?										
1		2		3		4		5		Х
Never		Seldom		Sometimes		Quite often	l	Always	Ιc	lo not know
60. To w	hat exte	ent does	staff o	rganize	all new	knowled	dge?			
	L	ocaly (I	Pc)							
	F	ile serve	ers							
	D	atabase	S							
	D	ocumer	nt Mana	gement	System	s 🗌				
Others										
61. To w	hat exte	ent is Se	nior Ma	anageme	ent mak	ing full	use of tl	he comp	etences	of their
employe	es to cre	eate new	busine	ss oppo	rtunities	in relat	ion with	n e-servi	ces?	
1		2		3		4		5		Х
Never		Seldom		Sometimes		Quite often	l	Always	Ιc	lo not know
62. Is the	ere a co-	ordinate	ed, strat	egic inn	ovation	plan for	r all type	es of e-s	ervices	?
1		2		3		4		5		Х
Never		Seldom		Sometimes	1	Quite often	l	Always	Ιc	lo not know
In relation	on with t	the mair	tenance	e-manag	gement of	of corpor	rate kno	wledge.		
63. E	Do you n	nake co	ntrol ve	rsioning	;?		]Yes		]	No
64. Do you eliminate out-of-date information? Yes										
65. Do you synchronize information with external sources? (URL, feedback of citizens and collegues)										
				Yes			No			
66. Do you disseminate new knowledge internally as needed? Yes No										

67. To what extent does Staff communicate to public servants what it considers most valuable in the corporate culture?							
1	2	3	4	5	X		
Never	Seldom	Sometimes	Quite often	Always	I do not know		
68. To	what extent are	public servant	s satisfied with	n the information	on they receive		
about the	e changes that ta	ake place?	[]		]		
1	2	3	4	5	X		
Never	Seldom	Sometimes	Quite often	Always	I do not know		
69. To w	what extent do ye	ou effectively us	se all your know	vledge to create	a social service		
value?	] [						
1	2	3	4	5	X		
Never	Seldom	Sometimes	Quite often	Always	I do not know		
70. To v	what extent do y	your emotions a	mplify or dimir	nish the value of	of your personal		
capital?	,						
1	2	3	4	5	X		
Never	Seldom	Sometimes	Quite often	Always	I do not know		
71. Do y	71. Do you implement strategies, methods, policies, and metrics for using knowledge?						
Yes No							
If yes, w	If yes, which one(s)?						
72. Do y	vou associate kn	owledge with sp	pecific job roles	or tasks?			
-	Г	]Yes					
If ves. w	hich one(s)?						
	(-)						
73. To v	what extent is at	tracting the right	nt type and amo	ount of staff for	successful new		
		3	4	5	x		
1		5	т	5			
Navar	Saldarr	Sometin		A 1	I de not ima		
inever	Seidom	Sometimes	Quite offen	Aiways	I UO NOT KNOW		

74. To what extent is the strategy of the public organization influenced by the knowledge obtained in the relationship between officers and the public organization? 4 1 2 3 5 Х Never Seldom Sometimes Ouite often Always I do not know 75. Do you have assessment programs, policies, and procedures relative to measurement criteria? **Yes** No If yes, which one(s)? 76. Are civil servants motivated to contribute in knowledge management activities (such as knowledge generation, knowledge transfer, knowledge use)? 1 2 3 4 Х 5 Never Seldom Sometimes Ouite often Always I do not know 77. To what extent do public servants learn on the job? 1 2 3 4 5 Х Never Seldom Sometimes Quite often Always I do not know 78. Are the questions from citizens in relation with the new e-services answered? 4 1 2 3 5 Х Never Seldom Sometimes Ouite often I do not know Always 79. To what extent are public servants extra rewarded if they come up with new or more useful ways of doing things? 1 2 3 4 Х 5 Never Seldom Sometimes Ouite often Always I do not know

## Questionnaire details

In the following paragraphs details are given on qualitative and quantitative characteristics of the collected questionnaires. Only the most important questions within the questionnaires are elaborated on, in order to provide a compact and clear picture of the interviewees' profiles and the implication the responses have to the design of the SmartGov platform.

In total, twenty-five questionnaires have been filled-in and analysed, eleven for the CEC and fourteen for the GSIS. The details for the collected replies are listed in the following tables.

Qı	iestion	Replies
1.	How long have you been working for the PA?	Min: 2
		Max: 23
		Avg: 8
2.	Are you a computer user?	Yes: 85%
		No: 15%
3.	How long have you been a computer user?	Min: 2 years
		Max: 13 years
		Avg: 7 years
4.	How frequently do you work on the computer?	Min: once a week
		Max: full day (7.5 h)
		Avg: 5.2
5.	What computer applications do you use regularly?	Word processing (all), spreadsheets (some), development environment (some), tailor-made applications (some)
6.	Do you use the Internet or WWW? What for?	Yes (all) for e-mail (all), surfing (all), access to technical information (some), access to domain information (some), web applications (some)
7.	Do you know programming? What environments have you used?	Yes (57%), No (28%). C, Cobol, SQL, mostly independent compilers, not integrated environments

#### 8.1.1 Section 1: User background

Q	uestion	Replies		
8.	Would you be willing to participate in computer seminars? For what subjects?	Yes (all). Computer usage (57%), development tools and environments (28%); don't know (15%)		
9.	What do you think of electronic services?	A general positive attitude towards e-services was recorded.		

## 8.1.2 Work

Question	Replies
10. What is your job function/role?	Manager (7%), programmer- IT staff (28%), service worker (50%), support staff (15%)
11. Describe the tasks you have to carry out. How are these tasks accomplished? What is the outcome of these tasks?	Decision making, service design and development, service administration, help desk support, service evaluation, service maintenance, report preparation.
12. Which of these tasks you think can be automated?	Submission of requests from citizen, certain forms of processing and help desk activities, report preparation.
13. How often do you carry out these tasks? Are they seasonal?	Daily to yearly periodicities were recorded, with some tasks being seasonal.
14. What are the attributes affecting the time needed to complete these tasks?	Several reasons were recorded, with access to up- to-date and precise information being the dominant factor. Support by appropriate tools was also heavily mentioned. Working teams with many members and diverse expertise also affect adversely the time needed. Support for citizens is generally lengthy.
15. Which are the most time consuming tasks?	Analysis of services and cooperation; support for citizens; interaction with citizens for receipt of forms.

Question	Replies
16. What are the deadlines for the tasks?	Ranging from "real-time" (service workers) to 6 months (service design and implementation tasks)
17. Do these tasks change? How often? How soon should changes be incorporated?	Most tasks remain the same over many years with minor changes, which should be incorporated within approx. 6 months. Major changes occur once every 5 years.
18. What/who initiates changes?	Political decisions, national or European legislation
19. Which tasks are most error prone? Why?	Manual and repetitive tasks (including data entry) produce high error rates. Tasks dependent on vague legislation are also error prone.
20. Who else is involved in this given task?	IT staff has quoted domain experts; domain experts have quoted IT staff and service workers; service workers have quoted IT staff and domain experts
21. What are the objectives?	Deliver high quality service; meet the deadlines; be cost effective
22. Who is your customer? What are their needs?	Political authorities and the public (managers); citizens (service workers); management and the public (domain experts and IT staff).
23. Do you follow certain practices/procedures? What are they? How rigidly do you follow them?	Certain practices and procedures are generally followed. Amount of rigidity ranges from strictly to very loosely.
24. Who defines changes in procedures? How are they implemented?	Management, legislation or political authorities. Personnel are trained to adopt; major changes imply structural changes.

Question	Replies
25. Are there any documents exchanged? Do you have any templates? What is the role of the documents exchanged? Is any of the information exchanged restricted/ classified? Who else has access to this information?	Documents are exchanged in most cases (excluding help desk support). Templates generally exist, may be loosely followed in some cases. Document exchange facilitates transfer of data, requests-commands and notifications. A small number of documents may be classified.
26. Who are you accountable to?	Management, politic authorities.
27. Who is accountable to you?	Group leaders (managers), group members (group leaders)
28. How are efficiency and effectiveness measured?	Group leader/manager personal opinion.
29. What training did you need to do this job?	Seminars, on-the-job training
30. How often you need to re-train?	Ranges from 4 years to 8 years.
32. What methods of training do you use (seminars/training courses, on the job, distance learning,)	Seminars, training courses and on-the-job training
33. What information do you need to perform your task?	Statistic and qualitative data (managers), legislation (domain experts), business rules (all), simplified domain knowledge (IT staff and service workers), solutions to common problems (service workers), required statistics and reports (IT staff)
34. Where do you get this information from (IT system, colleagues,)?	IT staff, legal databases, organisational rules, managers
35. Would you consider using an electronic tool to assist you in your work?	Yes (93%), No (7%)
36. What functions do you expect that such a tool would perform?	Facilitate cooperation; express needs clearly; automate tasks
Question	Replies
---	--
37. How do you feel such a tool would affect your current work?	Ease work by alleviating every-day problems
38. What parts of your work cannot be automated? Why?	Custom code writing and analytical work (IT staff), business rule adaptation and structural reforms (managers), portions of end- user support (service workers), formulation of proposals for legislation change.
39. What are the problems you face, regarding your job?	Difficult to measure productivity and success; lack of rapid adaptability to changes (managers), codification of legislation (domain experts), hard deadlines and lack of comprehensible requirements; tedious analysis phases (IT staff), hard deadlines and problem diversity (service workers)
40. What things you would like to alter?	Concrete methods for measurement of success and more flexible environments (managers); better cooperation (all); explicit codification (domain experts); shortening of analysis phases and generic environments (IT staff); solution repository lookups (service workers)

Qu	estion								Replies
41.	How regard	would !?	the	proposed	tool	help	to	this	Directly support common metrics and facilitate change management (managers); provide tools for codifying and searching legislation (domain experts); provide generic mechanisms and relieve of tedious analysis parts by shifting work to domain experts (IT staff); support solution repository building and querying (service workers)

#### 8.1.3 Context

Question	Replies
42. What do you think of the workspace condition	The shortage of IT staff was
(noise, distractions, layout, available resources)?	generally quoted.

### Knowledge Management

Question	Replies
43. Do you identify/discover existing knowledge by consulting colleagues or documents? If yes, which one(s)?	Yes (all). Legislation documents and experienced colleagues are the most common sources of knowledge.
44. Do you add new information (post-it, notes, opinions, comments,) into documents, forms, reports, etc? If yes, which one(s)?	Yes (all). Explanations, examples, clarifications, questions.
45. Do you compare the information produced with similar existing information? If yes, which one(s)?	Yes (21%); No (79%). Data from other services, cross-check of opinions.
46. Do you comment (working practices, experirences, solutions,) with other colleagues? If yes, which one(s)?	Yes, mostly informally, with colleagues working in the same or similar subject.
47. Can you describe how you explain complex or difficult things to others? If yes, what strategies do you use?	Yes (28%); No (44%); Not necessary (28%). Mostly through examples.

Question	Replies
48. Do you record and classify the information in order to be easily retrieved and re-used (by other people)? If yes, what strategies do you use?	No (72%); classification for my own later use, possibly useful to others as well (28%). Mostly classified under thematic categories.
49. What knowledge type do you use in your job: (note: more than one answers could be given)	Descriptive (43%); methodological (57%); procedural (79%)
50. Does staff show an active interest in knowledge creation with regard to key aspects of the public services operations?	No (85%); Yes (15%)
51. Does Public Administration provide systematically to all public servants continuous learning (courses, roadmaps,): in order to upgrade the competencies of their human resources?	Yes (28%); No (65%); don't know (7%)
52. To what extent are creativity and expressions of new services ideas systematically encouraged?	Never (21 %); Seldom (14%); Sometimes (8%); Quite often (21%); Always (14%); Don't know (21%)
53. To what extent are public servants encouraged to obtain formal training degrees, diplomas, certificates, etc?	Never (28%); Seldom (21%); Sometimes (7%); Quite often (7%); Always (7%); Don't know (28%)
54. Do you identify internal and external sources of information?	Yes (21%); No (79%). Legislative databases, books.
55. Do you eliminate grossly irrelevant information and duplication?	Yes (50%); No (15%); Don't know (35%)
56. Do you gather, filter and integrate information?	Yes, explicitly (21%); Yes, tacitly (64%); No (7%); Don't know (15%)
57. Do you classify the information according to:	Corporate standards (28%); Individual needs (72%)
58. Do you develop a search strategy?	Yes (all); browsing and categorizing (all); full text (21%)
59. To what extent do you hire new public servants or recruit workers to add a particular set of knowledge competencies?	Never (35%); Seldom (15%); Sometimes (7%); Quite often (0%); Always (7%); Don't know (35%)

Question	Replies
60. To what extent do e-services effectively integrate/tackle/support the demands from the other departments and citizens?	Never (0%); Seldom (7%); Sometimes (21%); Quite often (21%); Always (28%); Don't know (21%)
61. To what extent does staff organize all new knowledge?	Locally (PC) (72%); File servers (14%); Don't know (14%)
62. To what extent is Senior Management making full use of the competences of their employees to create new business opportunities in relation with e-services?	Never (14%); Seldom (14%); Sometimes (21%); Quite often (21%); Always (14%); Don't know (14%)
63. Is there a co-ordinated, strategic innovation plan for all types of e-services?	Never (28%); Seldom (21%); Sometimes (0%); Quite often (7%); Always (7%); Don't know (35%)

## 8.1.4 In relation with the maintenance-management of corporate knowledge:

Question	Replies
64. Do you make control versioning?	Yes (21%); No (79%)
65. Do you eliminate out-of-date information?	Yes, proactively (15%); yes, upon detection (78%); No (7%)
66. Do you synchronize information with external sources? (URL, feedback of citizens and collegues)	Yes (57%); No (21%); Don't know (21%)
67. Do you disseminate new knowledge internally as needed?	Yes (28%); To some extent (57%); No (15%)
68. To what extent does Staff communicate to public servants what it considers most valuable in the corporate culture?	Never (36%); Seldom (28%); Sometimes (14%); Quite often (7%); Always (0%); Don't know (15%)
69. To what extent are public servants satisfied with the information they receive about the changes that take place?	Never (21%); Seldom (35%); Sometimes (7%); Quite often (15%); Always (0%); Don't know (21%)
70. To what extent do you effectively use all your knowledge to create a social service value?	Never (28%); Seldom (14%); Sometimes (21%); Quite often (7%); Always (7%); Don't know (21%)

Qu	estion	Replies
71.	To what extent do your emotions amplify or diminish the value of your personal capital?	Never (7%); Seldom (21%); Sometimes (35%); Quite often (14%); Always (7%); Don't know (15%)
72.	Do you implement strategies, methods, policies, and metrics for using knowledge? If yes, which one(s)?	No (57%); Don't know (14%); Yes (28%). Management, colleague or citizen estimated satisfaction
73.	Do you associate knowledge with specific job roles or tasks? If yes, which one(s)?	Yes (57%); No (21%); Don't know (21%). Legislation and organisational policies.
74.	To what extent is attracting the right type and amount of staff for successful new services?	Never (7%); Seldom (14%); Sometimes (50%); Quite often (7%); Always (0%); Don't know (21%)
75.	To what extent is the strategy of the public organization influenced by the knowledge obtained in the relationship between officers and the public organization?	Never (0); Seldom (7%); Sometimes (42%); Quite often (21%); Always (15%); Don't know (14%)
76.	Do you have assessment programs, policies, and procedures relative to measurement criteria?	No (78%); Yes (22%). General impression, some quantitative data.
77.	Are civil servants motivated to contribute in knowledge management activities (such as knowledge generation, knowledge transfer, knowledge use)?	Never (35%); Seldom (21%); Sometimes (7%); Quite often (14%); Always (7%); Don't know (14%)
78.	To what extent do public servants learn on the job?	Never (0%); Seldom (14%); Sometimes (21%); Quite often (28%); Always (36%)
79.	Are the questions from citizens in relation with the new e-services answered?	Never (0%); Seldom (7%); Sometimes (36%); Quite often (28%); Always (14%); Don't know (14%)
80.	To what extent are public servants extra rewarded if they come up with new or more useful ways of doing things?	Never (21%); Seldom (14%); Sometimes (28%); Quite often (14%); Always (0%); Don't know (21%)

# **Appendix B: Forms for Intra-Community Supplies and Acquisitions Recapitulative Statements**

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Figure 48 - Form for Intra-Community Acquisitions Recapitulative Statement

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### Figure 49 - Form for Intra-Community Supplies Recapitulative Statement