The Bottom-up Design of e-Government. Development Methodology based on a Collaboration Environment

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The Bottom-up Design of e-Government. The Development Methodology of a Collaboration Environment for Public Servants

ABSTRACT

In this paper the development methodology of a collaboration environment for public servants is presented. The methodology defines the importance of the specific environment for both the delivery of non-automated public services through one-stop e-Government portals and for the self-maturation of Public Administration in digital transactions. The use of the collaborative environment can establish the bottom-up design of e-Government, supporting the discovery, evaluation, improvement and delivery of public services. On the other hand, the installation of a collaborative environment in Public Administration has many requirements – presented in this paper – such as the development of a proper legal framework for guiding cooperation and service execution. The use of the environment can support the diffusion of e-Government to both citizens and civil servants, while it can succeed in the modernization of Public Administration.

Keywords: e-Government, virtual organizations, CSCW, digital services, development methodology, collaboration, participatory design, knowledge collection
1. INTRODUCTION

According to the OECD (OECD, 2001), e-Government has to do more with “Government” than with the “e”. Governments worldwide realize e-Government is the means to modernize public Administration and to achieve social participation. This can be understood by analyzing the strategic plans developed by some Governments (Chadwick, May, 2003): the U.S.’s (FEA Working Group, 2002), (Federal Chief Information Officers Council, 2004), (US Federal Government, 2002), the U.K.’s (UK Cabinet Office, 2000), (UK Cabinet Office, Office of the e-Envoy, 2002), the EU’s (eEurope 2005 (European Commission, 2002) and recently i2010 (Reding, 2005)), Canada’s (Government of Canada, 2001), Germany’s (German Federal Government, 2003) and Singapore’s (Ke and Wei, 2004), all of which have focused on the definition of primary targets for the modernization of Public Administration. Those targets relate to social phenomena influenced by e-Government, such as economic growth, the improvement of everyday life, the closing of the Digital Divide etc.

Strategic plans have set the primary targets for e-Government, while e-Commerce-based solutions and work-flow applications are currently the means for their success: an association between digital public services and life events is established and public information is delivered to citizens at four stages: simple access to public documents, communication with Public Agencies, one- and two-way public transactions. Although some digital public services profit both citizens and Public Administration in time and cost savings (Cap Gemini Ernst & Young, 2003), further surveys show that citizens evaluate digital public services (Accenture, 2005) (ACSI, 2005) and seem to turn back to traditional methods for public transactions (Horrigan, 2003). The following survey findings can substantiate this citizen attitude: a) citizens expect more customized services (ACSI, 2005), while on the other hand b) citizens seem to prefer the involvement of civil servants in public service execution (Anthopoulos, Tsoukalas, 2005). E-Government’s further evolution will be based on public
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acceptance and on the installation of tools and methods in Public Agencies that will succeed in service improvement and modernization.

In WCIT 2004 and EEE05 (Anthopoulos, et al. 2005) the eGG system, a collaboration environment for civil servants, as a means for diffusing e-Government in the Public Sector and for offering non-automated public services on-line was presented. The eGG (from the initials e-Government Groupware) is a groupware system that is expected to facilitate the bottom-up design of e-Government.

The involvement of civil servants in e-Government design can lead to the “bottom-up” design of e-Government, which can be regarded as the procedure whereby different participants (end-users, public seniors, politicians) participate, share knowledge, and support Administration modernization. The “bottom-up” design, is a method defined in detail by educational terms (Jongersen, 2005), where participants consider e-Government as a hierarchical system consisting of multiple elements (sub-systems) that need to be identified, combined and analyzed – from multiple perspectives – in order for the whole system to be realized. Participants start by setting out their expectations with regard to e-Government systems, digital public services and their simplification, and the smooth transition from traditional to ICT-based procedures. The “bottom-up” design requires Administration involvement in modernization: the addressing of their needs – together with the codification of empirically created knowledge and experience – in the e-Government era. The “bottom-up” method comes in contrast to the “top-down” procedure, which has been followed during the design of most known e-Government initiatives. The “top-down” procedure is defined in detail by educational terms too (Jongersen, 2005), where an instructor presents the general concept of a system and proceeds to its subsystems. In e-Government initiatives, the instructor is the Government – usually with the support and knowledge of special consultants invited from the private sector – which plans, initiates and monitors multiple projects. The
“bottom-up” design -in contrast to the “top-down” method- can establish improvement of public services via collecting and using the knowledge held by the civil servants, while on the other hand it can encourage the end-users to trust e-Government initiatives.

In this paper the implementation methodology of the eGG system together with step-by-step examples describing the collaboration procedure between civil servants of different Agencies are presented. The methodology is inspired by a web information system’s implementation plan (Vidgen, 2002), it contains some major considerations concerning the design of an e-Government system and it is used to define eGG aspects and benefits. The eGG system will initially be implemented in e-Trikala, the first Digital City in Greece (Anthopoulos, 2005), as a pilot project, during the second half period of 2006.

In section 2 of this paper, the necessity for collaboration executed among public servants is described, while the contribution of the eGG system to e-Government is explained, together with the differences that it has in comparison to other work-flow and groupware environments. In section 3 the development methodology of the eGG system is presented. Finally, in section 4 the bottom-up design of e-Government that is achieved via the eGG is explained.

2. CONSIDERATIONS ON E-GOVERNMENT: THE INSPIRATION OF THE EGG

According to the eGov project (eGov Consortium, 2000), a formal definition of public services suggests that “independent public services are legally grounded business of public organizations in an economical sense”. They represent the development and delivery of products and services of an organized unit to the public. Public services are analyzed into a numbers of steps that are followed, according to a legal framework, in order for a citizen or business affair to be handled. Different e-Government projects around the world consider
public services as procedures oriented to specific life events and business situations. These procedures are categorized into *simple* –when they are executed by a unique organization– and *composite* –when more than one organizations are involved in service execution–. Moreover, public services can be *fully-automated* –when their execution procedure is clear (such as *tax form filling*)– and *non-automated* –when the execution procedure is not specific, is influenced by law codification or relates to custom conditions (such as *urban planning* and *long stay visas*)–.

Fully automated digital public services are currently implemented by e-Commerce-based procedures, transformed and parameterized to Administration needs (Lawry, 2002). This approach has high risks for Governments (Peters, 2004), (Schorr, 1998), because they become dependant on specific Information and Communication Technology (ICT) solutions. On the other hand, work-flow systems have been proposed (Podgayetskaya, Stucky, 2004) to execute non-automated public services. These systems establish vertical and horizontal integration among different agencies, but they retain the Weberian hierarchical structure of Public Administration (Galbraith, 1973), (Ho, 2002). In many cases this structure places various restrictions on information flow and it does not result in service simplification, which is one of the primary e-Government targets.

Additionally, these e-Government projects demand huge funding of infrastructures (such as broadband networks and servers) and they have succeeded in providing only a few digital public services (Kaufmann, 2003), (Schorr, 1998). Furthermore, only some of the available public services are slated to be made digital – only 45 percent in Europe (DG The Information Society, 2004) – due to the complexity of most of them.

Moreover, e-Government projects seem to result in discrete virtual organizations, which work in parallel with traditional Agencies, executing simple public services – such as *tax form filing* – for collecting and delivering data to public Administrations.
The above findings led to the concept of a system that could succeed in achieving the following targets:

a) Delivery of all public services through one-stop e-Government portals.

b) Low cost for development and maintenance, and avoidance of creating dependencies of Public Administration on specific ICT solutions.

c) Involvement of civil servants in service execution, in order for their knowledge to be collected and evaluated.

d) Cross-border interconnection of different Public Agencies, without demanding re-designation of internal procedures.

e) Improvement of public services and modernization of administration.

The system that is proposed to achieve in above targets is the eGG: a web-based collaboration environment with similarities to common work-flow applications. The eGG requires the participation of four (4) civil servants, independently of the Agencies they belong to, to play specific roles of cooperation. Participants collaborate asynchronously and execute common steps for all public services according to an explicit scenario. The scenario was inspired by common acts which occur in traditional transactions in public service execution (Anthopoulos, et al. 2005).

The main architectural difference between the eGG and other work-flow and collaboration environments (Boehm, 2001), (Craven, 1995), (Dommel, 1999) is that the explicit scenario is mapped on an XML document (named the contract document), while XPath commands control the collaboration. Additionally, participants work on an XML document (named the target document) –guided by the contract document–, to which they add information according to the role they have and their knowledge with regard to the issue at hand. Furthermore, the scenario contains an initial task which will be carried out before the beginning of service execution: in cases where they are not aware of the procedure they have
to follow, members will participate in the designing of the public service. Participatory
design will develop XML documents (called the procedure documents) that will contain the
procedures of public service execution. Those documents (target, procedure) will constitute
the knowledge of the Public Administration and will be available for statistical analysis, re-
use, evaluation and improvement. The eGG system can be installed and used easily, while it can operate stand-alone or cooperate with other e-Government infrastructures already installed in the Public sector. Furthermore, it can be considered as the means to succeed in the bottom-up design of e-
Government: it can establish cross-border interconnections among different agencies without
keeping the Weberian hierarchical structure of the Administration. The eGG can be a useful “tool” for making public servants partners in e-Government development and the modernization of Public Administration, by making them participants in digital service execution and by using their knowledge collected during participation for service discovery and improvement. Civil servants will feel “owners” of the result service and useful in e-
Government era. Furthermore, after a certain duration of operating time, a useful inventory of service execution plans will have been developed, enabling Public Administration to determine methods for treating custom citizen affairs.

The eGG can contribute to e-Government acceptance by both citizens and civil servants. Civil servants will offer their knowledge, participate in the streamlining of public services and realize that e-Government does not threaten their jobs. By the same token, citizens will be able to apply for all digital public services through one-stop points of access, they will be aware that civil servants are addressing their affairs and they will be able to monitor the service execution.
3. THE DEVELOPMENT METHODOLOGY OF THE EGG SYSTEM

The development methodology of the eGG system was inspired by a web information system’s implementation plan (Vidgen, 2002) and it contains some major considerations concerning the design of an e-Government system. These considerations compose an implementation model that can be followed during the development of similar e-Government applications, but are not the only ones. The model can be easily extended and incorporate extra considerations (eg. economic or political perspectives), according to individual situations.

3.1 Organizational Perspective: Involving civil servants in the execution of digital public services and developing a cross-border Public Administration

The involvement of civil servants in e-Government has already been proposed: in the e-Gov project (eGov, 2000) the existence of a moderator who supervises the execution of automated services has been considered. Other approaches (Kaliantzoglou, 2004) consider public executives at the end-point of the e-Government procedure, where applications for public services are delivered. The eGG’s approach relates to the dynamic involvement of civil servants in digital service design and execution. This approach is easily applicable to public Administration since it involves civil servants on tasks that they daily undertake in their offices. Moreover, the eGG offers complex, non automated public services, which cannot be executed on common e-Government systems. By that means the eGG does not conflict to other e-Government platforms, while it can share and use information held on other infrastructures.
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The eGG system can be accessed by both citizens and executives via a common portal application. When a citizen applies for a fully automated public service his request will be directed to software engines (such as those proposed by the eGov (eGov, 2000) and the SmartGov (Georgiadis, Lepouras, Vassilakis, Boukis, Tambouris, Gorilas, Davenport, Macintosh, Fraser, Lochhead, 2002), (Vassilakis, Laskaridis, Lepouras, Rouvas, Georgiadis, 2003) projects – if these engines have been installed – or it can be served through the use of specific “execution templates” by the eGG system. The execution of a custom or non-automated service will be fully handled by a team of executives, according to an explicit scenario (Figure 1).

Organizational perspective will facilitate the eGG system’s achieving the following objectives: a) consider human resource of the public administration as a unit, b) allocate work to proper executives and c) consider all executives equal for the allocation. Additionally, it will optimize the Public Sector’s operation by allocating service requests to executives who are not busy or unavailable.

On the other hand, the Public Administration is a network of distributed knowledge hosted by public executives (Traunmüller, 2002). The execution of a public service by traditional means is undertaken by civil servants who are experienced in the specific affair or who are aware of the legal framework.

The traditional procedure is simulated by the eGG system, since the execution of the public service will be handled by a team of public servants who will be automatically selected from a digital storage containing information on the human resources of a given Public Administration.

The eGG system establishes a horizontal integration of public agencies by categorizing all civil servants into four specific roles, independent of the organization to which they
belong (*Figure 1*). Categorization makes borders between different authorities invisible and simplifies the allocation procedure.

Inspired from the Straus model (Koch, Moslein, 2003), where four civil servants cooperate to produce an official digital document, the proposed groupware system requires four necessary participant roles to execute public services:

- **A Dispatcher (D)**, who is responsible for the service’s dispatch.
- **A Legal Expert (L)**, who considers and applies legal restrictions.
- **A Financial Expert (F)**, who executes possible payment obligations.
- **A Supervisor (H)**, who signs the service.

### 3.2 Technical Perspective: the architecture and the operation model of the eGG

The Technical Perspective refers to both the eGG’s architecture – necessary software modules (*Figure 2*) and the hardware that “hosts” them – and the data flow amongst the various participants.

#### 3.2.1 The architecture of the eGG

The eGG system is considered as a part of the global e-Government architecture, and transacts with other systems (*Figure 3*). According to the technical consideration, the eGG is a component of the global e-Government architecture, which is n-tier and it is analyzed into five (5) discrete logical layers:

a) **The portal layer** contains a portal application used by citizens as well as civil servants. Citizens will use the portal to access content and services, while public servants will use the portal to access the eGG system and execute digital services. Citizens will select a
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fully automated public service from a UDDI catalogue. The execution of the service will be directed to applications contained in the second layer.

Moreover, when a citizen requires a non-automated public service, he has to fill in and submit an application form. The *application form* will be a web-based software module hosted by the portal. Its interface will offer tools –such as wizards– and options –such as pre-filled drag able web form- designed to support citizens in describing their needs by dragging & dropping pre-constructed web or XML forms.

The portal will be used by civil servants too, and provide them with access to the necessary eGG interfaces –those, containing tools for the service execution–.

b) The second layer contains other e-Government **software modules that execute fully automated public services**. Citizens will be directed to those components when they apply for such a service.

c) The third layer consists of **a banking system** executing e-Payment transactions.

d) The fourth layer refers to the **ICT infrastructures for the civil servants**, such as PCs located in their offices, local networks and local directory systems.

e) The **fifth layer consists of the eGG software and hardware modules**. The necessary hardware infrastructures are 1) a *demilitarized zone* (DMZ) data farm to store records and documents created during transactions; 2) a server system hosting a meta-directory synchronized to distributed local directories; 3) an application server hosting all software modules. The necessary software modules consist of 1) citizen and public executive authentication components and 2) software modules for the collaboration environment.

### 3.2.2 The service execution procedure

Citizens will describe their needs via the *application form* module, and application data will be delivered in XML format to the *service metadata description* module. Both modules
are software engines, which are able to manipulate XForms, to access XML Document Object Model (DOM) (www.w3.org/DOM) and modify the structure and data of the XML documents. The operating procedure of all software modules is presented in section 4.3.4.

Submitted data will be stored in the temporary service store, which is a RDBMS able to host XML data. Necessary documents accomplishing the service will be requested upon service execution by the citizen. Documents will be marked with the unique ID of the service and stored in the Distributed File System (DFS). Necessary documents will be delivered by citizens through general purpose public offices – such as Greece’s Citizen Services Centres (KEP) (www.kep.gov.gr) – and will then be digitized and submitted to the eGG system.

3.2.3 The collaboration team’s construction

When the application form is submitted to the eGG, the work team extractor software module will query the Government Meta-directory system to extract the team of civil servants for service execution: Dispatcher (D), Legal Expert (L), Financial Expert (F) and Signer (H).

A directory system (IBM, 2004) (Simmons, 2001), will host Public Administration human resources, including personal information and roles (D,L,F,H) that executives can play in collaborations. Distributed directories will collect the human resources of local Agencies and a meta-directory will gather distributed information with peer-to-peer and Gateway replication methods (IBM, 2004). Both distributed directories and the meta-directory will have the same structure. Synchronization methods will extract Directory content in DSML format (IBM, 2004) (Simmons, 2001), so that it can be incorporated into the availability database, which is a RDBMS simulating the Government meta-Directory. Additionally, the availability database collects information about civil servants’ allocations to services and about their days off.
Using relational-modelling terminology, the information that the availability database contains will be modelled as follows: a relation $E$ will maintain necessary information about the executives: role (D, L, F, or H) and e-mail address. Another relation represents the tasks that members of the $E$ relation have been assigned. The notion that an executive is assigned a task is represented through a relationship between the relation of tasks and relation $E$. The relationship has an additional field that corresponds to the time interval (comprising the begin- and end-time) that each assignment requires. The aforementioned modelling is presented in (Figure 4).

In this case the querying procedure of the database, which allocates available members to a public service, will have the following structure:

for each of the roles (D, L, F, or H)

retrieve all members of the executive relation $E$ that

a) have this role and

b) will be available at the time when the task currently under examination will start.

The last criterion will “extract” executives who are not assigned to a task, with a time-interval parameter, which includes the starting time of the currently examined task. The procedure presented above will succeed in equal assignment of tasks to executives: the number of the tasks that each executive has been assigned so far can also be retrieved (from the information recorded in relationship assign). Therefore, from all available executives for each role, the one will be chosen who has the lowest number of past assignments. In this way, executives are assigned in a round-robin fashion, rendering task allocation equal.

To optimize the performance of the previously described searching procedure in terms of execution time (this factor is important, since the procedure is repeated frequently), current database management systems can be extended to offer temporal functionality. Such
extensions include indexing mechanisms that support searching tasks with respect to time-interval conditions.

3.2.4 Components responsible for service execution

When the work-team is constructed, automatically generated e-mail messages will be submitted to the participants inviting them to execute the service. Participants will access the eGG from their office. The following software modules will be used during service execution:

1. **An authentication system** for public executives. The system will verify each executive’s identity and their levels of access according to combinations of PINs and passwords or on PKI architecture. The implementation of the authentication system and its operation is beyond the purposes of this paper.

2. **The temporary service store** is an RDBMS system able to store XML documents (Chaudhri, Rashid, Zicari, 2003) created by the service execution environment (SRE) until the completion of the service.

3. **The permanent service store** is an RDBMS system able to store XML documents (Chaudri, et al. 2003). This store will retain the final version of documents constructed during the service execution.

4. **The Service Execution Environment** is a web-based application that will be used by the work-team members to carry out each step of the service. The module will be built on a program language that can manipulate XForms, access the XML DOM and modify the structure and data of XML documents. The module will help participants to compose XML documents and store them in the temporary service store. Members will use the service execution environment to retrieve, view and edit XML documents, following restrictions related to their roles: the dispatcher can edit only the main body of the document, the legal
expert only the legal rules and the financial expert only the payment obligations. On completion of the last step, Signer will end the process by signing the target XML document and storing it in the Permanent Store, “locked” from further alterations.

Additionally, a subsystem called the Legal Information Store is considered part of the general e-Government environment, interconnected and communicating with the eGG. This store contains information of legal aspects of all public services. It will be a RDBMS system retaining data that follows LegalXML (www.legalxml.org) or LexML (www.lexml.de) schemas.

3.3 Informational perspective

During the execution of a public service in the eGG system, data is produced, stored, altered or deleted: identities of the participants (citizens, executives), encrypted authentication information, documents accomplishing a public service, information produced by the participants and information retrieved from other stores (such as the Legal Information Store).

3.3.1 Participant identities

Citizen identities are kept in Public Agencies in different forms. Citizen authentication is a critical aspect in almost all e-Government projects (Federal Chief Information Officers Council, 2004). Usually, the authentication procedure is based on municipal catalogues. Combinations of PINs and passwords or PKI authentication will occur according to municipal data. Citizen authentication procedure is beyond the purposes of this paper.
Information about the civil servants who participate in service execution will be kept in Directory Systems, as described in the previous section. The work-team extractor will produce a recordset – containing participants’ data –, which will be stored in the work-team store. An XML document can easily be extracted from the work-team store, as evidence of the service execution.

3.3.2 Service description

Citizens will describe their affair with the use of web or XML forms offered by the application form module via the portal. Drag-and-drop options will support citizens so that they can easily select from both pre-constructed and un-structured objects (web or XML forms) and create an XML document. A toolbar of forms will be available to citizens for this purpose.

Forms will not be fully unstructured, but will contain some necessary information such as: citizen information, required in specific format (surname field, first name field etc.), and information about the public affair (category of the service – selected from relevant life events, or described in free text – geographical area of the service, time stamps etc.). Some information will be added to the application form transparently, with the use of hidden forms (such as the ID of the authenticated citizen, ID of the service and time stamps). All above information will be collected by the service meta-data description module and will be stored in the temporary service store.

3.3.3 Service execution information

Participants will access the eGG to execute a public service. The group of civil servants is a virtual team (Powel, Picolli, 2004) and, moreover, a virtual organization (Godart, Saliou, Bignon, 2001) drawn from a Public Administration. The collaboration procedure –at least
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until the eGG becomes a “mature” environment—will be an explicit scenario (Godart, Saliou, Bignon, 2001), because public servants have to participate using unfamiliar methods.

The explicit scenario requires asynchronous participation of the involved members and consists of specific discrete steps. The scenario will be described in XML form and will be presented to the participants via a web-based interface. This XML document has the power of contract to the participants and will be used to present multiple options to them, such as current step, number of steps followed etc. This XML document will be called the contract-XML.

Moreover, the web-based interface of the service runtime environment will offer usable toolbars with web-form objects in order for the data needed at every step of the scenario to be described. Some forms will be structured--those which describe common data used in public services, such as legal framework, payment obligations etc.-- and others unstructured to cover special cases of public affairs.

Data produced during collaboration will comprise the target XML document, which will be the result of the service execution. The Target XML document will play the role of an official certificate. Its content will be stored in the temporary service store during service execution and, finally, in the permanent service store, locked from future alterations. The scenario for collaboration within the eGG system is presented below (Figure 5):

1. The Dispatcher will be the first who enters the groupware system, studies the application form data, considers the necessary documents to accomplish the service and creates an XML document containing: information about the different steps of the service and attached documents. The XML document will be located in the temporary service store. Necessary documents will be requested and delivered by the citizen.

2. The Legal Expert will receive a notification from the dispatcher to follow up the execution. The Legal Expert will enter the eGG, study the XML document and match
requirements to legal rules retrieved from the legal information store. The legal information store is a RDBMS containing data in LegalXML LEXml or SGML format. Information about legal rules will be added to the document, together with a mark of permission to execute or not allowed description. Then he’ll submit a notification to the Dispatcher.

3. The Dispatcher will review the document and follow the Legal Expert’s marks. If legal rules are followed he will post a notification to the Financial Expert to go ahead with the procedure. Otherwise, he will notify the Signer to finalize the execution.

4. The Financial Expert will review the target document and will verify financial obligations related to the execution of the service. Requirements regarding payment will be posted to the citizen. The Citizen will have to make all necessary payments in order for the execution to proceed. When the payments have made, the Financial Expert will be notified by the e-payment system, will mark the XML document and submit a message to the Dispatcher.

5. The Dispatcher will post a notification to the Signer who will sign the document and mark the end of the execution. A copy of the resulting XML document will be stored in the permanent service store for future use, locked from further alteration, and both a digital and a printed copy will be posted to the citizen.

Future thoughts will consider options that could involve more than one civil servants in each of the four participant roles, to support the execution of composite services. Additionally, methods are under investigation, which could allocate the supervision of the whole process to the public Agency, which is officially responsible for the service execution. Moreover, thoughts will consider the submission of the target document data to the Responsible Public Authority, while record updates of legacy systems will occur via web service applications.
All procedures described above will occur via the service execution environment. Time stamps will mark the begin- and end-time of every step, values that can be used to calculate the duration of each step and each participant’s involvement. This information can be compared to empirical values set for the duration for service execution and can evaluate civil servants’ responses to service execution requests. The whole evaluation process has been presented by (Anthopoulos et al., 2005). The eGG system allows each member to be involved only in specific steps, as described, and participants can add information only in target XML fields that are supposed to fill in.

Moreover, a participatory design pre-execution session is proposed in order to handle cases where civil servants will not be aware of the service procedure. This session will be requested by the Dispatcher, applied by the Signer, and all members will be obliged to participate. During pre-execution session, participants will do brain-storming and will negotiate the execution procedure. In cases where the team cannot conclude to the procedure, the Signer will request support from the Public Agency officially responsible for service execution. The duration of the pre-execution session will be limited by the eGG system. The procedure discovered in the session will be mapped on the procedure XML document, describing the execution procedure and it will have the power of contract among participants.

Pre-execution phase will be optional, and will cover cases where the teams are unable to execute a public service. The participatory design phase will add value to the eGG system since it will make participants “owners of the service product” and they will cooperate conscientiously.

3.3.4 The use of XForms for data description

The procedure presented above is for the use of web or XML forms by users to describe information: citizens who fill in application forms and executives who construct the target
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and the procedure XML documents. Forms will be offered via the web interfaces of the application form or the service execution environment modules.

These forms must be programmed intelligently, in order to support both citizens and civil servants in describing information necessary for service triggering and execution, such as citizen personal data – in specific format – while they will be able to recover from communication losses or other errors. Moreover, forms must ensure data persistence even in cases where a citizen does not submit all necessary data.

Additionally, forms must be handled easily, even by users with limited or no ICT experience, and for this reason presentation, data and the logic of the data must be discrete entities. Furthermore, the same forms must behave in similar ways when they are accessed through different communication channels (PDAs, 3G cell phones etc.).

The eGG will use XForms technology (http://www.w3.org/MarkUp/Forms) in order for all above pre-requisites to be satisfied. XForms refer to forms based on XML documents (which can follow specific XML schemas) – they separate data from their presentation and they are cross-browser and cross-platform.

XForms will be extended under the eGG because novice users must be able not only to fill in forms, but to edit them as well. The procedure that will be followed during the filling in of application forms is presented below:

1. Both application form and target XML documents are empty and initially in editable status.

2. Citizens and civil servants will enter fields they consider necessary to describe their affair, via dragging and dropping forms from toolbars contained in the application form or in the service execution environment module – or with the support of wizards included in those modules. For instance, when users have to describe citizen identity (<CitizenIdentity>, which can include fields such as <ID>, <surname>, <firstname> and <address>), the XForm will be
updated with the proper user interface controls. Data format restrictions will be retrieved from proper templates of the eGG. Some forms will be pre-defined and others will be unstructured.

3. Users follow the above procedure until they construct necessary documents.

4. Users can add information in selected forms. Especially in the case of the target XML document, the XForm will select proper fields to be presented to the proper participant with the use of XPath queries automatically. Moreover, the service execution environment will be “rendered” properly, in order for only the proper forms and fields to be presented in the user interface. The XForm customization and the “rendering” procedure are beyond the purposes of this paper.

5. When application form or service execution environment modules need to interact with other software modules (such as the legal information database, the banking system or other legacy systems), XForm architecture is combined with web service architecture.

   When the XForm of the application form or the service execution environment is structured by the user, its “instance” data (an XML document containing necessary data) can be submitted to the proper RDBMS stores – via HTTP post, get methods or web service procedures – as presented above.

3.4 e-Government Perspective

   The eGG system follows e-Government principals. It will support the modernization of Public Administration by providing digital means for mapping and maximizing human resource potential, and will comprise a cross-border collaboration environment for knowledge exchange. Members will supervise each other during service execution, without being aware of other members’ identities, offering transparent transactions.
Each member will be authorized to edit only the specific information that relates to the role he can play in the groupware. Versioning mechanisms will mark the identity of each member on the target XML document, providing the opportunity for complaints made by citizens to be investigated. Citizens will be able to monitor the execution process, which will make them feel confident about e-Government procedures.

Additionally, public executives will be involved in digital transactions and will be encouraged to improve their skills and support the diffusion of e-Government. Methods for public administration evaluation have already been proposed (Anthopoulos et al., 2005) and could be applied, while civil servants will be aware of the evaluation procedure and will be motivated to improve their efficiency. Furthermore, Public Administration will improve its “public image” by taking care of all citizen needs and keeping civil servants’ jobs.

The eGG system is based on open ICT standards (such as XML and RDBMS), it will not create dependencies between Public Administration and specific ICT products, while it will enhance scalability and interoperability with the other e-Government applications and infrastructures.

3.5 Ethical perspective

Although the eGG system is proposed as a means of offering all possible public services, a lot of ethical aspects must be investigated. A critical point is that information about a public affair will be exchanged among many organizations. Let us consider data kept in the Ministry of Finance. All public services related to financial obligations are executed in Agencies belonging to this Ministry. The eGG system will share sensitive, private information with civil servants who belong to other organizations. Citizens who apply for
such a service must be aware and must have the option to agree to this fact in order to proceed, while an appropriate legal framework must cover the whole procedure.

Moreover, trust is a critical parameter covering all group collaborations. The eGG plays the role of a “trusted third party” for all public Agencies and citizens. It will mark all data produced during transactions with signs referring to the Authority which is responsible for this service, thus resolving “ownership” issues (Dawes, Prefontaine, 2003). Additionally, trust can be established through relevant legislation protecting each member’s contribution, personal information and data violation.

Furthermore, personal ambitions of civil servants could cause problems in collaboration. Today, public servants consider their empirical knowledge as “personal strength” in their post. This consideration could lead them to invoke lack of experience for service execution. Evaluation methods –as those described above– for public servants could deal with these phenomena and could motivate civil servants to offer their knowledge to the collaboration. Moreover, civil servants will be aware of the whole procedure and of the versioning options of the eGG system.

4. THE CONTRIBUTION OF THE eGG TO THE BOTTOM-UP DESIGN OF E-GOVERNMENT

The eGG system can complement current e-Government initiatives, since it can provide non automated and complex public services via one-stop e-Government portals. The eGG can work either stand-alone or it can cooperate and exchange data with other e-Government platforms, fact which shows that it is easily applicable to public Administration.

Moreover, the eGG can succeed both in the self-maturation of Public Administration in e-Government and in the “bottom-up” improvement of public transactions. In countries
like Greece, Public Administration officials do not have precise data regarding the number of services currently offered. Furthermore, specific methods do not exist for the execution procedure of many public services; the execution of many public services is based on civil servants empirical knowledge. The eGG involves civil servants in digital service execution, following a method that has many similarities to the traditional service execution: a group of civil servants offer their experience for service execution. This fact can succeed in “a smooth migration” of the Public Administration to the e-Government era. Civil servants will feel that they are still “owners” of their knowledge, that they support Administration’s modernization and that they can trust e-Government systems. Moreover, the eGG collects knowledge held by the civil servants and provides a global view of the public services daily offered, and of the different methods followed for their execution, to the central Administration.

The execution of all public services via specific digital procedures is a challenge for Public Administration. According to eEurope 2005, 18 primary public services will be transformed to digital by the end of 2006 for all member countries. On the other hand, data coming from the KEP project (www.kep.gov.gr) show that over 85 different cases were treated via the KEP offices during the year 2004. The eGG will support the discovery of all different cases served by Public Administration. XML documents containing the execution procedure that was followed in similar cases will be collected over a period of time. Statistical methods applied in the inventory of XML documents could result in the following conclusions: a) the identification of the total number of different services, b) the optimal methods for treating similar public cases.

5. FUTURE WORK
Although the eGG system offers many advantages to both citizens and Public Administration, its installation has some requirements. First of all, the proper framework for the authorization of the eGG and for the validation of documents being produced must be legislated.

Moreover, Public Administration does not respond to changes as quickly as the Private sector does. Changes are difficult to effect in Public Administration. A survey was carried out in Greece in the area of Trikala, under the e-Trikala Digital City project (Anthopoulos, 2005). All local Public Agencies (40) participated in the survey. The heads of all Agencies were requested to fill in a questionnaire containing two categories of questions: **general purpose questions** collecting information on the experience record of the head and **special questions** related to a) whether heads would offer their human resources to execute services for which other organizations are responsible and b) whether they would accept the contribution – in human resources – of other organizations, for the execution of public services for which the head is responsible. Both of these two special questions refer to the eGG’s collaboration procedures. The results of the survey were encouraging: 85 percent of those questioned said that “they would offer their human resources for collaboration”, but only 42 percent would authorize the contribution of other organizations. The latter result indicates Public Administration lack of confidence in cross-border transactions. **Trust** is a critical parameter in successful collaboration (Black, Cresswell, Luna 2002) and will be established during a period of trial and error.

The eGG will be installed in the area of Trikala ([www.e-trikala.gr](http://www.e-trikala.gr)) as a pilot project which will be funded by the Greek Information Society Framework Program ([www.infosoc.gr](http://www.infosoc.gr)). The project will apply the eGG to five (5) local Agencies and to all municipal Agencies. It is estimated that after a period of time, a “critical mass” of civil servants and citizens will support the eGG system and that its benefits will be acknowledged.
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The eGG is instantly applicable, because it does not make many technical demands on Public Administration and does not require high-level ICT skills from civil servants. Moreover, it does not require immediate, wholesale redesigning of public procedures. The eGG’s operating requirements are the existence and updating of Government Directories – which usually already exist over government networks such as the Greek SYZEFXIS (www.syzefxis.gov.gr)– and basic ICT infrastructure for civil servants.

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