The Lifecycle of Transactional Services

Costas Vassilakis
University of Peloponnese, Greece

George Lepouras
University of Peloponnese, Greece

INTRODUCTION

Electronic government can be defined as the use of information and communication technologies in government for at least three purposes: providing public services, improving managerial effectiveness, and promoting democracy (Gil-Garcia, 2004). This definition recognizes transactional services (i.e., services that involve filling-in, submission, and processing of electronic forms) as a vital component of e-government, since public service provision and interaction between citizens and government is mainly modeled through such services (eEurope, 2000). It is worth noting that among the 20 public services included in (eEurope, 2000) as "first steps towards 'Electronic Government,'" 18 of them (90%) are transactional services, with the remaining two being informational services (information search and retrieval). Similar ratios hold for electronic services worldwide: for instance, the government of Dubai analyzed *all* services it offers and has concluded that 1,200 of these services are transactional, out of a total of 1,500 services (AmeInfo, 2004) (80%; again, the remaining services are informational). Historically, governments have first implemented informational services (provision of information related to the procedures and regulations related to governmental services), then proceeded with downloadable forms which can be filled-in and submitted manually (one-way interaction), subsequently moved to providing the ability to

Figure 1. Expected benefits for electronic service users

Table 1. Development of e-Government in the EU

|	Oct 2001	Oct 2002	Oct 2003
Services fully available online	20%	35%	45%
Services available online	45%	60%	67%

online submit forms whose data were processed later with human intervention (two-way interaction) and finally reached full electronic case handling (Cap Gemini, 2004).

In the past few years, governments are systematically working on realizing e-government policies and frameworks, which include the delivery of transactional services for enterprises and citizens. Citizens and enterprises expect that provision of rich spectrum of transactional services will to result to a number of benefits, as reported in (Top of the Web, 2003) and illustrated in Figure 1.

The progress of these works have been quantified and evaluated in reports; notably, the reports (Cap Gemini, 2003; Cap Gemini, 2004) have targeted the e-government development status in the European Union and have produced results showing the developments and trends in the EU countries. Some interesting findings from these reports are shown in Table 1.

Note that services available online includes services a portion of which has been made available online, and some other portion is still carried out manually; services fully available online are fully processed in an online fashion and have no manual portion. A similar quantification approach is taken by the UN Global E-government Survey (UN, 2003), which identifies five stages of service delivery, namely, emerging presence, enhanced presence, interactive presence, transactional presence and networked presence, with interactive presence and transactional presence being the counterparts of online availability and full online availability (networked presence refers to a government-to-citizen framework based on an integrated network of public agencies for the provision of information, knowledge, and services). In this report, the average service online availability indicator for the top 15 countries is computed to be 63.8%, whereas the average service full online availability indicator is 20.2%[1].
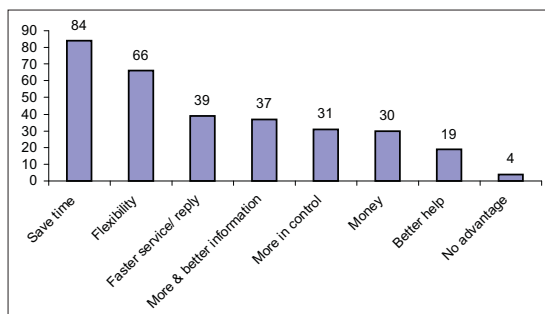
The results of the studies presented above clearly indicate that despite the users' high expectations from transactional services and the governments' will and support for their development, the progress achieved insofar lags behind the desired levels. First, in the time frame of approximately one decade (governmental services have appeared on the Web in the mid-nineties), even the basic online services are not fully covered; moreover, the *growth speed* towards the full coverage is dropping (15% for the period 10/2001 to 10/2002 against a mere 7% for the period 10/2002 to 10/2003). Second, for services that do have a point of presence on the Web, full electronic case handling is provided only for the two thirds of them, while the remaining one third includes (at least one) stage that is performed manually. From the users' point of view, some pessimism can be identified in the issue of *better help*.

BACKGROUND

The roots of the shortcomings identified in the previous section can be traced back to a number of challenges and particularities that pertain to the management of transactional services:

1. The domain knowledge needed for development of electronic service is highly complex (e.g., administrative legislation, tax regulations) and in many cases it is possessed by domain experts employed in the pertinent organizations in the form of *tacit knowledge* (Lam, 2000), which cannot be easily communicated to systems analysts that traditionally extract and catalogue the requirements for software systems.

2. The legislation and regulations governing the electronic services are volatile and subject to frequent changes. Such changes impact portions of the electronic services, which must be rapidly identified and adapted to meet the new regulations. Once components are adapted, the service should be redeployed.

3. The front-end accessed by citizens should be connected to the organization's back-office system, in order to provide fully automated services (Jupp, 2001).

4. The task force that is involved in service development is quite large and with diverse skills. This task force will consist (at a minimal basis) of domain experts, systems analysts and developers, user interface experts (necessary because the electronic service is targeted to people with little computer experience), HTML coders and security specialists (citizens and enterprises will be reluctant to use a service if they are not sure that their data will be safe (Vassilakis, Lepouras, Fraser, Haston, & Georgiadis, 2005). Cooperation and coordination in such a group is inherently difficult, not only because of the large number of the members, but also because of the different "languages" spoken by its members.

5. The users of the transactional services do not generally possess a high level of domain knowledge regarding the legislation and requirements of the business process that the services model. It is thus imperative that extensive help (explanatory texts, examples, and FAQs) is provided, especially for complex transactional services (e.g., tax return forms). It is worth noting that such "help items" are generally produced in the phases of user requirement analysis (while domain experts explain to system analysts the tasks that the software has to carry out), but they remain recorded as internal project documentation, rather that being made available to users for reference.

Note, that some of these challenges (especially 3-5) may apply in other contexts of transactional services (e.g., business-to-citizen services [including e-commerce]) or business-to-business services. In these contexts, however, the situation may be less complicated due to a number of reasons: for example, in e-commerce the required domain knowledge is much simpler, while in business-to-business services the users are usually trained personnel. In this work, we will limit our discussion to e-government transactional services, which appear to be the most demanding case.

Currently, transactional services are handled as "typical" software artifacts and are developed and managed using traditional software engineering paradigms, including the spiral model (Boehm, 1988), the waterfall model (Schach, 1999) and the rational unified process (Kruchten, 2000). All these paradigms include a user requirements analysis phase followed by software design, development and testing/evaluation before the final deployment. Different methodologies allow for iterative execution of various phases, for the purposes of modifications or refinement due to feedback from subsequent phases.

For the phases of development and deployment, in particular, a number of products have emerged in the past few years, showing that the software industry recognizes both the potential of the transactional services and the challenges related to their lifecycle. Commercial products include Adobe Acrobat e-forms (Adobe, 2004), PureXML E-Form (PureEdge, 2004) and Oracle E-Business Suite 11i™ (Oracle Corporation, 2004). These tools are however mainly addressed to personnel with IT expertise, and their main task is to relieve IT personnel from the burden of writing "routine" code that handles the interaction be-

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