X-Gov: crossmedia for government services

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ABSTRACT

This paper discusses the application of the crossmedia concept to government services. We present some advantages of this approach, as well as the challenges to using this new interaction paradigm. A framework is proposed to provide a technological foundation that assists the development of crossmedia governmental applications and maintains the consistency expected in government services.

Keywords

Crossmedia, government, media transition, framework.

1. INTRODUCTION

Trends in the use of media in developing countries signal that the adoption of information and communication technology is changing the paradigm of communication between government and citizens. In Brazil, services in which person-to-person communication was the only way to accomplish a government service have been gradually swapped into electronic services that allow citizens solve their problems at home or at workplace, saving time and money, both for themselves and for the public administration.

Internet services have led this process in our country as well as in many other places in the world. However, this approach has several drawbacks. The biggest one is that internet does not reach as many people as TV and cell phones do. Despite the growth in the number of internet users in Brazil, internet is still less representative in citizen's life as television and cell phones. This fact can be interpreted as indicative that electronic government in Brazil cannot be based primarily on the internet but instead, must explore other communication media. Also, people can easily use cell phones and TV sets, much better than they use computers and browsers.

Of course, this situation is expected to change in time. The digital native generation is already experiencing citizenship and the compulsory relationship to government. This generation has grown up using several technologies for communication, learning and entertainment.

Here, we advocate the usage of crossmedia as an approach to e-government. We claim that this is a good option for both the digital excluded population and digital natives. We present challenges and opportunities of this approach as well as the architecture we have designed as a solution.

This paper is organized as follows.

In section 2, we discuss current implementations of e-government in multiple media. In Section 3, this paper presents a brief conceptual approach to crossmedia and x-gov. Section 4 is devoted to the discussion of the challenges and opportunities of this interaction concept. In Section 5, we show an architecture that has been designed to meet the proposed challenges. Finally, section 6 discusses the proofs-of-concepts which have been developed to assess the architecture feasibility.

2. E-GOVERNMENT SERVICES AND MULTIPLE MEDIA

E-government (or shortly, e-gov) has been defined as "the use by government agencies of information technologies (such as Wide Area Networks, the Internet, and mobile computing) that have the ability to transform relations with citizens, businesses, and other arms of government" [16]. There are many benefits to e-gov: transparency, efficiency and citizen empowerment, besides reducing delivery and management costs compared to maintaining people as public officers. We add accessibility and social inclusion, especially important in developing nations like Brazil.

Allan et al. [1] have surveyed research and professional literature about e-gov, covering G2C (Government-to-Citizen), G2B (Government-to-Business) and G2G (Government-to-Government) interaction. We notice that the expression "e-gov" is commonly used to define the interaction using the internet media to access services, web portals and others applications mainly provided by internet.

In this paper, we use the more comprehensive e-gov concept. We understand that besides the internet, other communication and information technologies like digital television and mobile computing have proved efficient in delivering government services.

Devices like PDAs, laptops, cell phones and tablet PCs have brought the mobility concept to government services. M-government (or shortly, m-gov), as defined by Trimi and Sheng [17] is the strategy and its implementation for providing information and services to government employees, citizens, businesses, and other organizations through mobile devices. Today, several m-gov cases are available in different countries, like Canada Mobile Government [1] and Singapore e-Citizen [2].

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[1] http://www.canada.gc.ca/mobile/wireless-eng.html

Another alternative for government service delivery is t-gov, that is, the delivery of e-gov on television. The importance of t-gov is due to the influence of TV in citizens´ life. TV is a communication media installed at almost a hundred per cent of homes of developed and emerging countries. As TV goes digital, it becomes more and more interactive. Unexpectedly, the t-gov is still restricted to a few cases. The United Kingdom is one of the few places around the world that have experienced initiatives like DigiTV[3] that offers interactive content for citizen about jobs, transportation news and local information.

Internet-based e-gov, m-gov and t-gov are solutions that have been conceived and implemented to broaden citizens´ access to services. They are usually developed as independent solutions for an isolated medium-user interaction.

In the next section, we show that integrating these alternatives in the crossmedia paradigm can be a better approach for enhancing G2C interactivity.

3. CROSSMEDIA AND X-GOV

Crossmedia systems are applications that deliver content by orchestrating multiple media, in such a way that the user interaction is directed to different communication channels, fully exploring the potential of each one.

According to Boumans [4], crossmedia has emerged on early nineties, when the television program Big Brother appeared in Holland, bringing a shockwave on broadcast industry. The crossmedia feature was the delivery of the content in a combination of analogue television, interactive cable TV, Internet and mobile telephony, supported by magazines and newspapers.

On the referred report, Boumans listed five characteristics of crossmedia. They are: (1) Crossmedia should involve more than one medium; (2) Crossmedia aims at an integrated production; (3) Content is delivered on multiple devices: PCs, mobiles, TV, iTV; (4) More than one medium is needed to support one message/story/goal; (5) The common message/story/goal is spread on the different platforms and the supporting interaction can take place on these different platforms. Besides Boumans, other authors such as Dena [7,8], Barkhuus et al. [3], de Haas [6] and Antikaainen et al. [2] also support the former crossmedia definition.

The crossmedia concept is founded on three important elements:

-a set of media, each one contributing with its own particularities in terms of preferred formats, languages, target public and interactiveness;

- the content, that is associated to the message that will be delivered; the content is the main narrative and all its complements. Content may have to be adapted to the medium;

- the transitions, that are the means by which users are directed from one medium to the other in order to follow the narrative path. Transitions are composed by a call-to-action (which is equivalent to the label in link) and an associated technological mechanism that performs the exchange (which is equivalent to the HTTP fetching a new page).

Hayes [11] identifies four different styles (or generations) of crossmedia delivery. Crossmedia 1.0 is equivalent to the COPE concept (create once, publish everywhere): the same content is adapted to several media. Crossmedia 2.0 introduces "extra" content, that is, complementary content that adds to the mainstream narrative and that can be deployed in other media than the main one. Crossmedia 3.0 introduces the concept of bridges, which are specially designed transitions that calls the user to act and change to different platforms. Crossmedia 4.0 combines the three previous levels and allows the user to create his/her own content and bridges, in a collaborative environment.

There are several applications of the crossmedia concept in marketing, entertainment and education [4] in all levels defined above. Games and advertisement explore the amusement embedded in the media exchange to create an atmosphere of investigation; news industry use the diversity of formats to convey a richer experience for those interested in a deeper knowledge about something. Also, publishing content in diverse media can be a means of capturing users of different profiles and habits.

Based on the crossmedia concept, x-gov is defined as the delivery of public services across multiple media, in which G2C communication is supported by several media alternatives, each one directing the citizen to the next step in the interaction process and to the more suitable media for that step.

While the e-, m- and t-gov services support the one-user-one-medium paradigm, a crossmedia service reaches citizens through multiple media, providing a richer experience through the variety of content formats and relationships. In this research, we restrict applications to G2C, even though we acknowledge the potential for cross-media in G2B and G2G applications.

Regarding the three elements of crossmedia applications:

- media: governments already use several communication channels to send their messages to citizens: the internet, in desktop or mobile versions; telephone, SMS, fax, banners, outdoors, newspapers, magazines, TV and many others. All of them can be used to deliver part of a government service.

- content in government services is usually informative, such as announcements on government decisions, facts and accomplishments as well as numbers that demonstrate a country situation. Content can be transactional, that is, exchanged between citizens and government.

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[2] http://www.ecitizen.gov.sg/mobile/index.html

[3] http://www.digitv.gov.uk

- transitions are almost inexistent in present applications, except for call-to-actions that imply manual accomplishment of the change (for instance, an outdoor announces the telephone number of a service)

4. OPPORTUNITIES AND CHALLENGES OF THE X-GOV APPROACH

X-gov applications are different from other crossmedia applications in some aspects, which implies in special requirements. In this section, we explore some opportunities and challenges of x-gov applications.

When compared to e-gov, x-gov presents many advantages. The first one is the potential to reach citizens. In a developing country like Brazil, the Internet approach has the disadvantage of depending on computers which are not possessed by the population, despite of the increasing efforts by governments and the civil society to provide computer in schools and other public locations. Providing for delivering content in alternative media can be more interesting than independently offering services in one single media, because of increased coverage. Also, users can reach government anywhere, anytime.

A second benefit is the possibility of moving electronic interaction beyond the point where it gets interrupted today: electronic transactions give place to person-to-person interaction when the main medium is unable to handle the message– for instance, a paper document is needed or a payment must be made and the citizen´s bank is not integrated to the government network. In both cases, cross-media could help citizens providing an alternative means of communication, including the fax, for instance.

Third is benefiting a diversity of users: people with some kinds of disabilities could communicate with government using the most suitable channel, according to personal preferences or skills. In this case, content can be deployed in different formats in alternative media – while interacting with a computer, the deaf user can have additional explanations in sign language in his or her TV set; blind users who are not skilled with screen readers and keyboards may prefer accessing a service by telephone instead of using a computer.

Fourth, modern life presses on cross-media language: we send an e-mail at the same time we talk on the phone and check news; we download internet music while watching the show on TV. Why shouldn't we file an electronic form with a cell phone, following instructions and options presented on the television?

Fifth, the x-gov approach may help promoting the government services. A former field study [9] has revealed that the population is unaware of electronic government services. The crossmedia approach is very effective in promoting the services and in developing the necessary meta-communication that is required to create the self-service culture, without which all investment in e-gov becomes useless.

Finally, x-gov has a distinctive characteristic from other crossmedia applications. Although a deep planning study is needed to decide what content should be on which medium, unlike communication industry, government content has persistence and do not need to be renewed frequently. This makes costs of crossmedia production more palatable for governments than for private companies.

Despite the many advantages, there are points of concern too. We present them in three groups. The first group contains challenges that refer to crossmedia technologies, which are still incipient. The second group collects challenges respective to the government domain issues. The third group discusses challenges respective to x-gov users.

4.1 Crossmedia technology challenges

Content management. Two crossmedia content elements can keep three different relationships: **corroborative**, if both elements represent one single message, that may be different in format but the same in meaning. In this case, they can be distributed in different media; each one will confirm the message delivered by the other. Content elements can be **complementary**, when both are needed to deliver the full message. Finally, two elements can be **concomitant** of they are needed at the same time to deliver the meaning. Crossmedia content management is an important issue, because content elements can easily become redundant and contradictory, if spread over multiple platforms, destroying the message that would be conveyed.

The patchwork effect. An unplanned development of government applications using crossmedia will lead to several interaction models, as each different application may develop its own. For instance, one service may allow payment using the cell phone, and another one will require a faxed receipt to complete the payment task. Inconsistent interaction models will be seen by citizens as confusing patchwork, from which they will not be able to develop a mental model.

Seamless transitions. A crossmedia service must integrate media and offers transition possibilities to make a media or device handover. X-gov applications require simple and efficient media transitions. While transitions are not a big issue in games and entertainment applications, in e-gov applications one can expect a difference in user motivation and mood, easy to understand if one compares a citizen that is asked to change media, for instance to pay a tax or communicate a problem, to someone else having fun while responding to an advertisement. Some of the call-to-actions, that send the citizen from one media to the other, will require a special handling, because the user will be expected to continue the dialogue. However, crossmedia-specific technology is still not available.

4.2 Government challenges

Cost-effectiveness. Services are delivered at a certain cost. Internet-based government is anchored in a cost distribution that considers that if the user does not possess the computer, he or she will have access from digital

inclusion centers, schools or work. Adding communication channels to this scenario means to add new players to this equation.

Conversion rates. Crossmedia antagonists argue that crossmedia applications are not effective in terms of conversion rates because it is not possible to follow users in their movements. In internet applications, the server that provides the application can manage conversion rates.

Expertise. A crossmedia project needs a multidisciplinary team that develops systems for multiple platforms. Given the need of expertise in those different platforms, it may be hard for the government analyst to keep up-to-date knowledge about every different technology and device that can be used for interaction. Government teams usually have little time to learn new concepts and applications; innovation is often compromised by the need to deliver reliable applications in the shortest time, at the lowest cost.

Interoperability Government services usually connect different public departments and levels. Frequently, each instance of government has its own technological platform. In order to deliver crossmedia services, an interoperability standard must be defined. Brazilian government has a federal initiative to standardize the operation between online services [5], which will have to be extended to multiple media environment.

4.3 User-related challenges

User identification Some government services require citizen identification. The identification can be a general attribute for example the location, time, age, gender, etc, or personal attribute as name, identification number, etc. Identification is needed for several purposes. In crossmedia environments, identification may require information about preferred media (in order to increase service accessibility, for instance) but also the identification of user's interactive resource location – telephone number, for instance – so that transitions can happen and information is pushed on the citizen (for instance, sending a SMS message).

Cost distribution Usually, in cross-media applications, costs are usually shifted from the sender to the receiver. This should not be the case of a public service. If the user needs a fax to send his piece of documentation, fax service should be available for all citizens. A business model must be defined so that using a crossmedia application is economically feasible for the population.

These points of concern have been addressed by the proposal of a framework for crossmedia applications, in which reusable components can be aggregated to deliver a *family* of x-gov applications. Next section presents this solution.

5. THE X-GOV FRAMEWORK

The x-gov framework is a technological infrastructure that aggregates reusable components for cross media interaction to support government services.

A framework can be defined as "a skeleton of an application that can be customized by an application developer" [12]. It is the result of a domain abstraction that can be reused in several applications. The framework dictates the application architecture and predefines design parameters so that the application designer or developer can concentrate on the specifics of his application. A framework provides a standard for components to handle errors, to invoke operations on each other, and to exchange data [12]. Flexibility is provided by hotspots, which are framework elements that can be customized for specific requirements.

The X-Gov Framework has many architectural decisions that support the crossmedia and electronic government domain. It intends to offer managers and developers a tool for overcoming some of the challenges described in the previous section, making easier the description and implementation of x-gov services.

In this section, we first present a quick view of the architecture and how it is used. In sequence, we present the architectural decisions, in the light of the challenges we want to address.

5.1 A quick view of X-Gov architecture

The X-Gov application can be described as an orchestration of components performed by a server that is capable of handling a crossmedia session. The Service Manager is this server, which distributes the narrative by media components, according to the prescribed service sequence, and performs the transitions from one medium to the other. The Service Manager has also the capability of dealing with crossmedia content and interfacing with legacy government systems. Figure 1 depicts in a quick view the skeleton of an X-Gov application.
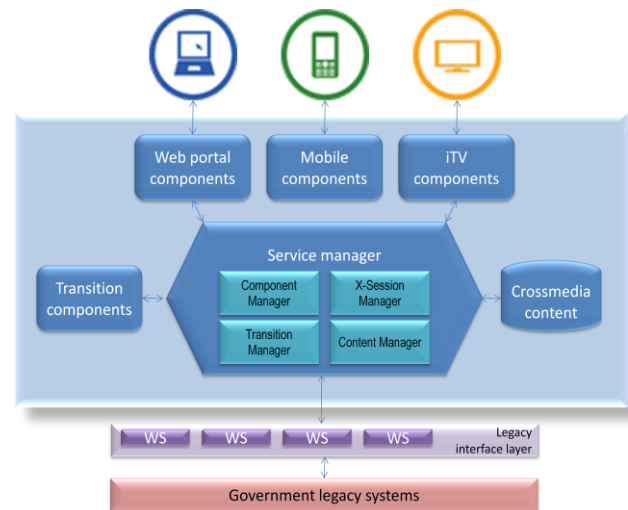

Figure 1- Overview of an X-Gov application

As in any framework, reusability is consequence of a domain analysis. For X-Gov, we have analyzed both the crossmedia domain and the G2C services domain. Our analysis of the crossmedia domain has been focused on understanding what makes crossmedia different from other multimedia applications and these are the crossmedia

transitions. We have investigated practical examples of crossmedia applications to obtain characteristics of transitions and their technological infrastructure.

The set of crossmedia transitions has been implemented in a corresponding set of components, which can be customized for the X-Gov application. This architecture implements crossmedia in Hayes' level 3, by providing planned bridges, which are the crossmedia transitions. Level 4, in which citizens can contribute in providing content and new bridges, is planned as an evolution of this work.

On the other hand, the analysis of e-gov domain has been focused in looking for common elements that could express the G2C communication. We have represented the result as a set of 18 task patterns. They express information retrieval tasks, citizen-government relationship tasks, documentation-related tasks and transaction tasks. X-Gov task patterns are listed in Figure 2 and have been described in a previous work [14].

Figure 2- X-Gov task patterns

Task patterns are realized by user interface task components, developed for different media: mobile, web and iTV. Because each medium has interaction restrictions and qualities that must be considered, the implementation of a task pattern is different for each platform.

Each task requires specific information to be accomplished. The task pattern "Pay fee/tax" requires, for example, information on the specific tax, the contributor identification, tax value and due dates. This information must be served by the government service legacy system, which is interfaced with the crossmedia layer by a set of web services. The bottom layer is representative of government existing service implementation, or technological infrastructure that is able to execute the service requirements.

Other crossmedia content that may be needed by task components, such as audio descriptions, movies and text are stored locally within the application and handled by the crossmedia content manager.

5.2 A quick view on the use of the framework

The crossmedia application development process has some distinctive activities that must be included in the usual software development process.

In order to make easier the task of building X-Gov applications, the X-Gov framework offers building tools. The application skeleton is produced from the description of the government service using a two-step application builder and can be later customized by the developer, as Figure 3 shows.
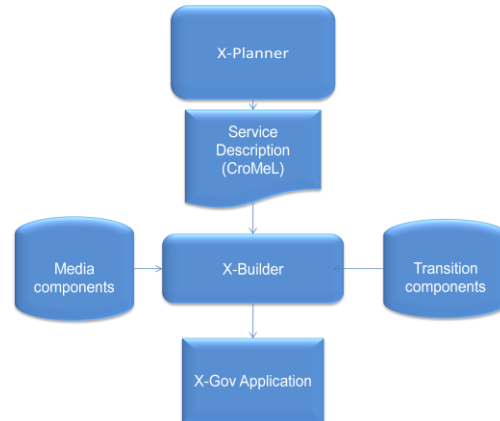

Figure 3- Building an X-Gov application

The crossmedia application development starts with the government process modeling, using the description tools. This first step is supported by the X-Planner tool. Its user is the Government Service Analyst, a person who knows the government service and is able to describe it as a business process. The Government Service Analyst may not be able to write code; however, she can specify which activities will have to be performed by the citizen, which activities will have to be executed by the government legacy systems and in between, which are the activities executed by the crossmedia application. She uses the X-Planner graphical tool to sequence task components and crossmedia transitions, as well as custom activities, using a modified Business Process Model Notation. Given the interactive profile of each conversational step, a crossmedia planning algorithm [10] will suggest the best medium for the step. The X-Planner tool produces, as a result, a service description in a domain-specific language, CroMeL.

The application builder tool, X-Builder, assembles the skeleton application by interpreting the CroMeL script and setting appropriate configuration of the Service Manager server. X-Builder instantiates service components from the framework's repository of media and transition components.

The resulting application can be modified by the Government Application Developer, who is able to program the framework hotspots. This means writing any complementary code needed to customize the resulting

application: setting technical parameters as servers and database locations, writing specific rules and defining interface design style so that the crossmedia application is compatible with the government agency visual identity, such as colors, background, logo and font styles.

The application configures itself as a crossmedia interaction layer to the government services. It is responsibility of the government legacy systems to execute the transactions. Thus, next step is the infrastructure configuration. The government legacy systems are connected to the framework by the development of a set of web services that will provide and request necessary information to the crossmedia layer. The SOA approach gives flexibility to connect the crossmedia service to any technologic platform.

5.3 Facing challenges

Section 4 has presented some challenges for x-gov applications. In this section, we discuss how the X-Gov Framework can help address these challenges.

Content management

Because of complex relationships that may occur between crossmedia between content elements, it is interesting that crossmedia content is represented as components. The X-Gov framework considers that a content element may have alternative format and aliases and that it may be related to other content elements by the corroboration, complementation and concomitance relationships.

Thus, when the Government Analyst associate content to a task component, X-Builder places the content and its metadata in the Crossmedia Content Repository and orchestrates a service to retrieve it when needed. When the X-Gov service is executed, the suitable component element is retrieved by Content Manager and presented in the most suitable format.

The patchwork effect

The X-Gov framework is based on components which have been derived from task patterns. Each task pattern embeds its interaction model, in terms of its signs and features. We expect that the level of reuse provided by task patterns and components seduce government analysts to keep customization in the parameter level, preserving the interaction model. This would reduce the patchwork effect in a family of applications. In maintenance, inconsistency is avoided because updating the component result in updating all derived services.

The framework is flexible to allow changes in components; consequently, the interaction model can be adapted if needed.

Seamless transitions

De Hass has expressed the concern about the need of seamless device switching [6]. Yet there is no solution to automatic handover. The framework provides resources to make changes between devices an easy movement, because citizens' motivation to the use of crossmedia in government services is not the same as those who are enjoying a crossmedia game or advertisement.

Transitions can be performed manually, when the user inserts the address of the service in the next medium (for instance, the user reads in a magazine that he may find more information about the e-gov service in a certain website; he opens his browser and keys in the URL). This kind of transitions does not need to be supported by the framework.

In some cases, the citizen can use some technological aid to switch from one medium to the other. One example is the automatic phone call that could be started by a click at web page or TV interactive application. This mechanism is named *click to dial* or *click to call* [15]. Another interesting transition mechanism are 2D barcodes as QRCode or DataMatrix.[13] These barcodes can encode long text, URL addresses, and phone numbers. A camera, which can be coupled to the mobile phone, capture these barcodes, which are decoded and automatic redirect the device to the encoded URL. Existing solutions such as those mentioned above offer more comfortable transitions for the user; however, from the technological point of view, those transitions require platform integration. Because prospection and integration of many transitions can be a hard work for the developer, the X-Gov framework incorporates available solutions as components.

Some transitions between media do not count yet with technological solutions. We are presently working on implementing new components for transitions from voice portals to web and from iTV to cell phones.

Conversion rates

The X-Gov framework has addressed the question of conversion rates in the X-Session manager. This element of the architecture is responsible for handling the user session, regardless of the media in use. Thus, it makes possible to track citizens' transitions from one medium to the other, as well as any other session parameters.

Government expertise

The X-Gov framework must require the minimum programming effort possible; must be easy to learn and operate. It has been conceived to reduce the effort in crossmedia application development process. The use of a graphical tool in X-Planner and the opportunity of describing components orchestration using a DSL are examples of effort reduction in the service description level of application development.

Reusable components accelerate the writing of code. In particular, reusability and maintainability is reinforced by the configuration parameters. The Component Manager is responsible for dynamically providing parameters for each component instantiation, either for tasks or transitions. For example, suppose a task component that implements the

citizen's need to follow up a certain issue, given a tracking number (this is the TrackAProcess task pattern). Suppose the tracking number is composed by six numeric digits. This is stored as a configuration parameter. Modifications of business rules could change the tracking number format to one alphabetic character and seven digits. This customization will imply only in changing the component input parameters instead of source code.

Interoperability

The X-Gov framework is a service-oriented architecture. Service oriented architecture (SOA) represents a model for distributed computing. Its advantage is the loose coupling between elements. SOA was selected also because it has been the choice of many governments to interoperability. In particular, web service technology is viewed as an appropriate solution to the needs of interoperability in an environment of heterogeneous platforms, in which reading and writing messages in XML format to allow flexibility for the exchange of messages between different subsystems.

e-GIF (e-Government Interoperability Framework) is one of the major references of interoperability standards for e-gov. The British government framework, already in its sixth edition, can be used for exchange and management of data and metadata [18]. Brazilian government's interoperability standard, e-Ping [5] also suggests web service technology.

The X-Gov Framework has been implemented in a service oriented approach in two layers. The communication between the x-gov application and the legacy government services and databases is standardized by a set of web services which are responsible for data exchange. WSDL interfaces provided in the framework description reduces the effort of interfacing existing systems to the crossmedia interaction layer.

The second case is the internal communication, within media components. Because each medium has its own technological platform, web services are suitable for flexible integration. This decision intended to increase flexibility in case of adding new components to the framework. RESTful web services have been chosen instead of SOAP web services because the data transmission can use lightweight message formats, e.g., the JavaScript Object Notation which reduces the processing overload.

User identification

Watson's and his colleagues' uniqueness concept in ubiquitous marketing [19] can be applied to the crossmedia government services. This refers to the media and devices used by unique person. The mobile phone is the best example because users rarely share them: each person has his own device and number that provide uniqueness. Learned preferences and location are also features that can add to this uniqueness concept.

Besides the need of identifying the citizen in authentication procedures, user identity recognition is needed because automatic transitions must push data on user's devices.

User identification is provided by the X-Session manager in the X-Gov framework. The X-id is the user identification in this system and is an extension of the v-card concept. X-id incorporates governmental personal identification such as social security numbers or, in Brazil, the CPF or RG identification. X-id holds information about how to reach a given citizen: his mobile telephone number, iTV set identification, e-mail and surface address besides personal preferences such as favorite format or media.

Cost effectiveness and cost distribution

The framework can reduce the development cost but does not address operation and delivery costs. In our work, we still have not defined a cost model. New players in a crossmedia service are the telephone operators and iTV distributors. Because these players are looking for prospective markets, crossmedia government services may bring up their interests.

6. PROOFS-OF-CONCEPT

The X-Gov framework has been developed by an iterative process based on proofs-of-concept (POC). Each POC has been preceded by a SWOT analysis in which we identified the relevant research questions to be addressed in that cycle. So far, three POCs have been developed.

POC #1 intended to clear the concept of crossmedia and to improve the team's expertise in technologies involved in developing applications for mobile computing and iDTV. We departed from the crossmedia planning algorithm in [10] and planned a service for enrollment of children in schools. After a paper prototype, a first version of the service was developed for web, mobile and iTV. As a result of POC #1, development platforms were defined and the planning algorithm was refined.

POC #2 was intended to explore the concept of task patterns and crossmedia transitions. The same service of children enrollment was thus refactored, this time using components which implemented the task patterns for each medium and transition components.

POC #3 intended to identify the best architecture to orchestrate several components and at the same time, to allow for coupling the framework with legacy government systems. The target service for POC #3 was a hospital facility for image exams, involving the citizen's appointment and result delivery. This POC implemented the SOA approach to the architecture. Another important achievement has been the definition of Service Manager, like X-Session and Component Manager, that allowed seamless transitions of the user from one media to another. Finally, the DSL CroMeL and the graphical modeling tool have been added to the X-Planner application toolkit.

POC #4 is under specification to date and is addressing the content manager and legacy government systems interface.

CONCLUSION

This paper has presented x-gov, the concept of crossmedia in government services, extending the concept of e-gov framework for x-gov applications. We advocate that crossmedia, being a new interaction paradigm, based on the coordinated usage of multiple media, can enhance G2C communication.

We have proposed the X-Gov framework as a technological solution to promote the development of crossmedia applications and benefit of many opportunities. We claim that the reusability capability of the framework can stimulate the usage of crossmedia in government services.

X-Gov reusability has been based on architectural elements: the task patterns have captured common behavior in citizens' use of government; crossmedia transitions implement seamless exchange of media; a SOA approach guarantees that the framework can be connected easily with e-gov legacy systems, besides providing an expansible architecture.

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