Author(s): Savvas, Ioannis; Pimenidis, Elias; Sideridis, Alexander
Title: Translating stakeholders needs to application requirements for e-government development projects
Year of publication: 2008
Citation: Savvas, I., Pimenidis, E., Sideridis, A. (2008) 'Translating stakeholders needs to application requirements for e-government development projects' Proceedings of Advances in Computing and Technology, (AC&T) The School of Computing and Technology 3rd Annual Conference, University of East London, pp.79-90
Link to published version:
http://www.uel.ac.uk/act/proceedings/documents/ACT08.pdf

TRANSLATING STAKEHOLDERS NEEDS TO APPLICATION REQUIREMENTS FOR E-GOVERNMENT DEVELOPMENT PROJECTS

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Abstract. Most public organizations nowadays undertake implementations of e-government projects. Such projects are usually the organization's response to its operational needs. Sometimes though, they are linked to a wider perspective or central planning initiative sponsored by a government and involving a large number of public service organizations. In their majority e-government projects aim at addressing citizens' and businesses' needs in their interaction with public authorities. Thus such projects directly reflect public administration's mission as it is defined with reference to its external environment. In addition public administration stakeholder requirements are examined, with compatibilities and / or conflicts and their effects on the design of e-Government implementations identified. This can be used in resolving conflicting requirements at a higher level before the design and implementation of individual components of a system that correspond to tasks and procedures are affected.

Keywords: Goal Oriented Requirements Engineering, E-government projects, E-government stakeholders, Public Organization operations/procedures.

1. Introduction.

The emergence of e-government (e-Gov) as a concept and practice is a significant development for public administration during the past decade. The main objective of e-Gov is the development of user-friendly and efficient services for citizens and businesses. Their potential impact on social, economical and political issues is extremely significant leading to a "knowledge based government, in a knowledge based economy and society". Thus e-Gov service provision is in the centre of interest for all stakeholders involved in public administration.

A public organization needs to identify and satisfy all stakeholders when setting off to implement an e-Gov initiative, if this initiative were to succeed.

In the case of the European Union (EU), national goals have to be achieved within the EU framework for development and the relevant EU directives. Thus a further level of goals expressed by the EU as a stakeholder is introduced. The requirements that define individual procedures followed by PA should be compatible to the specific goals of PA but also linked to the wider more abstract high-level goals such as those of the EU. In mapping such goals e-Government system designers must be able to link stakeholder goals to individual procedure and sub-system requirements.

There are though goals that are far more general to be satisfied by individual procedures. Goals such as transparency of operations or control of corruption can only be addressed when PA is considered in its entirety as a system that operates at two distinct levels of decision-making, a

centralised and a decentralised one. Such analysis of PA can provide a means for identifying bottlenecks and thus enable designers to improve the design of any e-Government system from strategic down to the application level.

2. The problem outlined.

Public organizations should adjust to the new era of e-government. Yet, they are neither isolated nor independent. They belong to an administrative environment, they are accountable to political offices, both national and supranational, they defend institutional principles and they serve citizens and businesses that belong to their spatial or thematic territory.
Apart from horizontal activities that pervade public administration, responsibility for projects suggestions and implementations lies on the organization itself.

2.1 Scientific background

Electronic government can be defined as anything from online services only to any use of information and communication technology used by government (Gil-Garcia & Pardo 2006).
While government is a dynamic mixture of goals, structures, and functions that serve multiple and diverse constituencies, electronic government initiatives incorporate technology to improve the way it serves those constituencies (Pardo 2000).
E-government can be described as arising from the interactions between three separate sets of forces, each of which has gone through its own evolution: ICT, management concepts and government itself.
Over the past decade the concepts of government and governance have evolved and undergone dramatic transformation. This has occurred not only due to increasing pressures and expectations that the way governance is exerted should reflect current notions of efficiency and effectiveness, but also due to calls for governments to be more open to democratic accountability (Westholm & Aichholzer 2003). In order to cope with such challenges, it is necessary to renew and enhance management, organisation, task performance and working procedures at all levels in the public sector.
Requirements engineering is increasingly becoming a dominant activity in systems development. Design and construction can be generated or outsourced, but in any case requirements that adequately reflect the stakeholders' desires and needs are indispensable.
Goals are organized into AND/OR refinement-abstraction structures where higher-level goals are in general strategic, coarse-grained and involve multiple agents, whereas lower-level goals are in general technical, fine-grained and involve less agents (Dardenne et al 1993, Darimont & Lamsweerde 1996). Yue was probably the first to argue that the integration of explicit goal representations in requirements models provides criteria for requirements pertinence and completeness (Yue 1987). While the AND/OR structuring of goals, their operationalization, and their association with agents were fairly familiar notions in artificial intelligence (Nilsson 1971, Mostow 1983), Feather was probably the first to provide a precise semantic foundation for goal responsibility assignment in multi-agent systems (Feather 1987).
In the international context for requirements engineering (RE); issues of culture and localisation become critical. Social, cultural, global, personal and cognitive factors are finding their place in requirements engineering.

The overall needs of a socio-technical system are the ones that RE has to fulfil. The basic idea is to capture high-level organizational needs and to transform them into system requirements, while redesigning the organizational structure that better exploit the new system (Bresciani et. al. 2004).

2.2 Other related work

Object-oriented modelling languages such as UML have been developed for modelling software systems, not application domains. There is no formal account or analysis of the connection between the *intentions of the different stakeholders (human, social or otherwise)* and the system-to-be. The work on AUML (Cimatti et al 2000) is an example of work suffering from this kind of problem (Bresciani 2004).

The main problem to overcome in using object-oriented IS design languages for conceptual modelling is the lack of meaning of language constructs such as 'object', 'class', 'attribute', and 'operation' when used to model application domains (Evermann & Wand 2005).

The KAOS method (van Lamsweerde 2001 & 2005) has been applied in industrial projects, in a wide variety of domains, to engineer requirements for fairly different types of systems. The method has also been used to build goal oriented models for various strategic planning and business process reengineering projects, to reengineer unintelligible requirements documents, and to generate calls for tenders and tender evaluation forms in a large international organization.

Ontologies (Swartout & Tate 1999) have long been used and accepted as a means to perform conceptual domain modelling in the knowledge engineering community.

In the TROPOS methodology Bresciani et al (2004) and Castro et al (2000), propose the following five main development phases are: Early Requirements, Late Requirements, Architectural Design, Detailed Design and Implementation.

During early requirements analysis, the requirements engineer identifies the domain stakeholders (and their goals) and models them as social actors, who depend on one another for goals to be fulfilled. Through these dependencies, one can answer why questions, besides what and how, regarding system functionality. Answers to why questions ultimately link system functionality to stakeholder needs, preferences and objectives. Actor diagrams and rationale diagrams are used in this phase (Giorgini et al 2005).

TROPOS adopts the i* (Yu 1995) modelling framework for analyzing requirements. The ultimate objective of requirement analysis in TROPOS is to provide a set of functional and non-functional requirements for the system-to-be. Forward and backward reasoning is supported in TROPOS by the goal reasoning tool (GR-Tool). Basically, the GR-Tool is graphical tool in which it is possible to draw the goal models and run the algorithms and tools for forward and backward reasoning (Giorgini et al 2005).

REF is a requirements engineering framework explicitly designed to support the analysts in reasoning about socio-technical systems, and transform high-level organizational needs into system requirements. By adopting concepts like Actors, Goals, and Intentional Dependency, and introducing an essential graphical notation, REF claims to be a very effective and usable tool. In addition, "REF supports the analysts in dealing with complex and system/organizational design related issues, such as shared and clashing stakeholders' needs, by introducing some specific

analysis-oriented notations to allow an early marking and detection of such situations" (Donzelli & Bresciani 2003).

3. The proposed framework.

To facilitate decisions about introduction of systems that promote e-Gov and provide solutions to public administration's operational needs, first e-Gov stakeholders' dependencies and their goals are analyzed.
The proposed solution that follows differs from the ones presented in the above mentioned frameworks in the following:

- It considers/identifies stakeholders and their requirements in an upper, domain level (regardless of procedure) allowing depiction of all of them in an analytical manner.
- It allows the consideration of public administration as a whole. Public organizations and units are instantiations of public administration. Entrusting a public service to one of them might be occasional and the rationale that led to it might be revised.

3.1 e-Gov stakeholders' dependencies

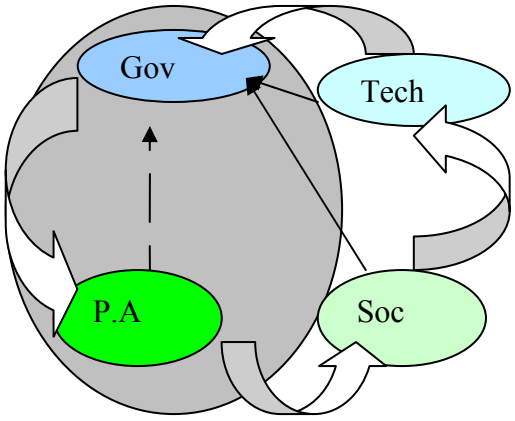

Figure 1. E –Gov life cycle

In figure 1, stakeholders in *e-Government life cycle* are considered. Both national and supranational authorities are included, with national government goals relating to e-government or public administration modernization and the EU goals to a unified European aspect.
In public administration, goals of public organizations (public administration entities) and goals of public servants coexist as entities of an administrative universe of discourse. Society includes goals from citizens and businesses. Technology is regarded as a stakeholder meaning that scientists that promote research are interested in real world cases and that exploitation of contemporary and documented solutions is a guarantee of success and efficiency.
E-government is a means of adjusting governance to the current socioeconomic requirements. I doing so, the current status of laws and institutions as frameworks in

which any e-gov initiative should evolve are considered.
Thus e-Gov is the vehicle, which starts as a vision, concept and template from the government and follows the next steps in order to be implemented (block arrows). In these steps needs and constrains are added. The direct receiver of the political-economical view is public administration. Its procedural nature and its constitutional principles filter through the political-economical vision.
Two additional filters are considered:
A) Societal. This relates to the current status of needs, wills and behaviours of social entities. Citizens and businesses add their specific needs to the template on stocks.
B) Vested technology following current trends and subject to constraints.
Clockwise, technology oriented solutions has been tested, but it is not possible for them to provide working results. For example, for interoperability issues there is the option of the implementation of governmental intranets, but to exploit full dynamics of an interoperable linkage it is better to define involved administrative units and procedures. Additionally interoperability may be restrained by security issues.
Similarly, simply following citizens' and businesses' wills is unwise since P.A also defends constitutional principles and legitimacy that lie beyond these wills. The state serves citizens and businesses through public administration and receives their messages for readjustment politics through various channels. Society cannot directly *affect procedures* that public administration follows. This is the P.A.s' managers and executives' privilege

3.2 Stakeholders' goals

The following stakeholder requirements have been deduced using formal documentation and surveys.

3.2.1 Current e-Government strategies in the EU. *Concerning vision and objectives for e-government in the EU's fifteen older member states, the following two dominant trends have been identified (Savvas et al 2007):*

- The empowerment of democracy through an open, transparent and participatory society (social state model)
- Achieve financial benefits through cuts in state expenses or benefits based on raise of competitiveness and on increase in job offerings by businesses. Citizens obtain additional gains through tax reduction. (Market driven model)

Components of the first model are, a) participation and b) transparency, while those of the second model are identified as efficiency, effectiveness and money savings.

The Greek government like any other member state's government belongs to this environment imitating good practices and being influenced by other members' strategies.

3.2.2. EU goals/requirements. For the EU, e-Government is expected to help public administrations to realise good governance ('e-governance') in terms of an administration that is: (COM (2003) 567, 26 Sept 2003)

- Open and transparent, i.e. democratic and accountable
- Inclusive, i.e. provides services for all
- Efficient and productive, i.e. provides maximum value for taxpayers' money.

These are goals identical to the one mentioned above for the governments of the

EU member states. The same, to an extend stands for the new i2010 e-Government Action Plan that defines five priorities (The new European strategy for Information Society i2010):

1. No citizen left behind:
2. Making efficiency and effectiveness a reality—significantly contributing to high user satisfaction, transparency and accountability.
3. Implementing high-impact key services for citizens and businesses
4. Putting key enablers in place
5. Strengthening participation and democratic decision-making

In addition the European Union focuses in three groups of issues for e-Government beyond 2005:

1. The first set of issues is about the challenge to move towards more profound modernisation of public administrations with the help of ICT, organisational change, and improvement of human resources in public administrations, in order to deliver sustainable benefits.
2. The second set of issues addresses the challenge to achieve innovation in government services and governance in order for public administrations to realise their full potential as key contributors to economic and social development. Governance meaning the rules, processes and behaviour, that affect the way public administration functions.
3. The third perspective focuses on contributing to European e Government Objectives: the emergence of pan-European e-Government solutions, contributing to a European public asset of e-Government building blocks, implementing European policies and increased cooperation at European level in order to better address e-Government at all levels.

EU goals follow those of national governments because EU guidelines are not mandatory.

3.2.3 Citizen and business goals. Citizen and business requirements are reported in many studies held by various institutions throughout Europe. The majority of these studies are not focused on satisfaction of users but they might assess people needs as a means for varied purposes. In this frame many recent studies (eGEP 2006), (Capgemini 2006) held for European Observatories for Information Society revealed/detected the goals beneath. Additionally studies that have been held for Greek citizen and businesses (The "KAFKA" Plan 2006), and for Greeks and foreigners that live in Greece (EDET 2005), revealed their requirements as Problem categories: 60% of problems concern red tape and complicacy of procedures and the long expectance for the processing of the requests of citizens and businesses. 38% concerns vague legal framework that is the lack of an unvarying explanation and the complexity of the issue. 21% concerns the shortage of forms which have to be fulfilled, the number of the copies needed, the administrative language used and the inconsistent demands. 6% of the complaints concerns electronic (e-Government) services (The "KAFKA" Plan 2006).

3.2.4 Public organizations' goals. The authors' own experience of Greek public administration routines and practices and from the interaction with managers and executives it was detected that the main objective for public organizations in relation to the others is collaboration. This is divided in two parts: The ability and the will for collaboration. The ability refers to technical matters like system interoperability along

with organizational and semantic issues. Will refers to people.

3.2.5 Public servants' goals. Apart from financial requests public servants unions have repeatedly stated their goals for better working conditions along with a set of sub goals. ADEDY is the bigger labour union of public servants in Greece. From the various documents that it produces and distributes some main goals were elicited.

3.2.6 Technology goals. Technology requirements result both from technological evolution and evolution on project management and managerial decisions, related to the use of applicable and sustainable systems. They also refer to cost evaluation and other economical matters. They are also led by scientific and technological progress as identified in best practices cases.

Figure 2 below depicts the overall framework representing stakeholders and their primary goals

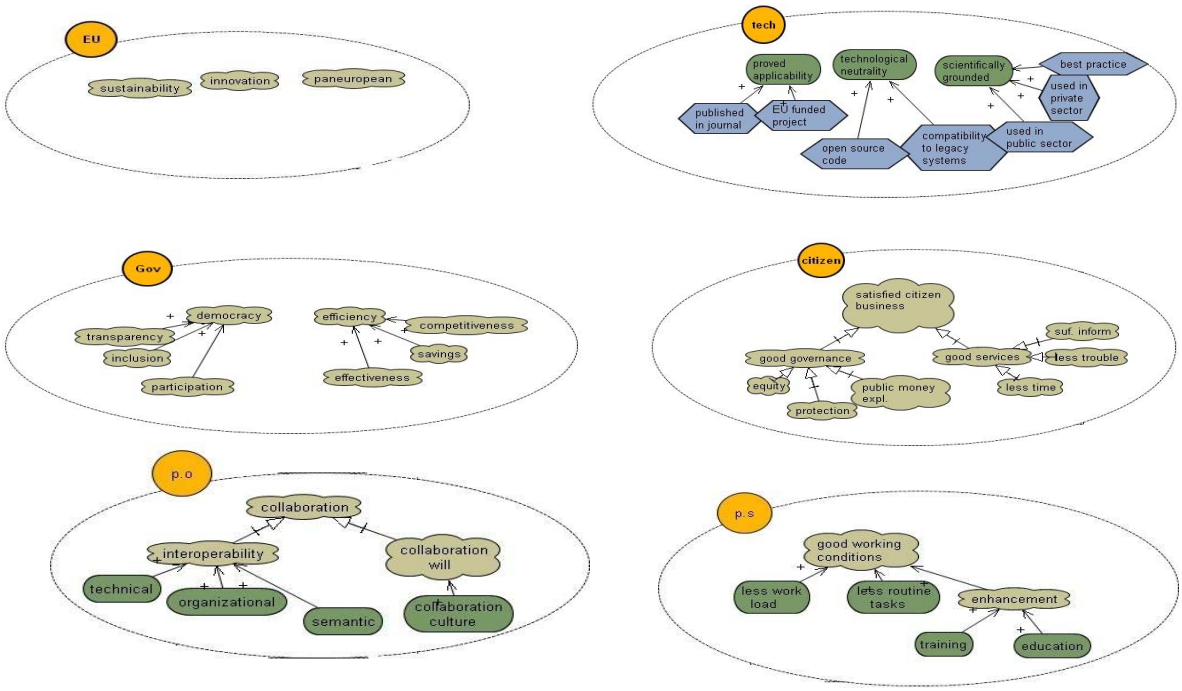

Figure 2. The overall framework with an elementary goal analysis

In any case the quotation of goals is indicative. It is meant to give an abstract picture of stakeholders' goals. Exhaustive presentation and analysis of goals is within the scope of this work but beyond the scope of this paper.

In some cases it is essential to notice the European dimension. Thus we included member states governments' view and European Commission's view too. In others national aspect is mainly consulted.

Representation of interactions between stakeholders' goals is achieved through the use of e government life cycle. Conflicting goals are rejected before reaching the final implementation. Still goals like "less time", which are restricted by legitimacy moderate by others.

4. An e-Government service example.

To give an example of the potential use of the framework suggested a case of an introduction of an e government system for the Greek Regional Administration is being used beneath. In the Region of Central Macedonia and especially in the Directory of Planning and Development, an electronic system (portal) is going to be installed.
The system will inform the potential investors for the opportunities of investments that exist within the geographical boarders of the region and will manage issues concerning implementation and integration of investment activities.
The system will eventually lead to the creation of a "one stop shop" for investors old and new.
The system will consist of two functional parts:

- Data management and back-office environment
- Management and provision of information through the Web and through telephone calls (call center)

A further analysis of the call for tenders revealed the following depiction of goals:

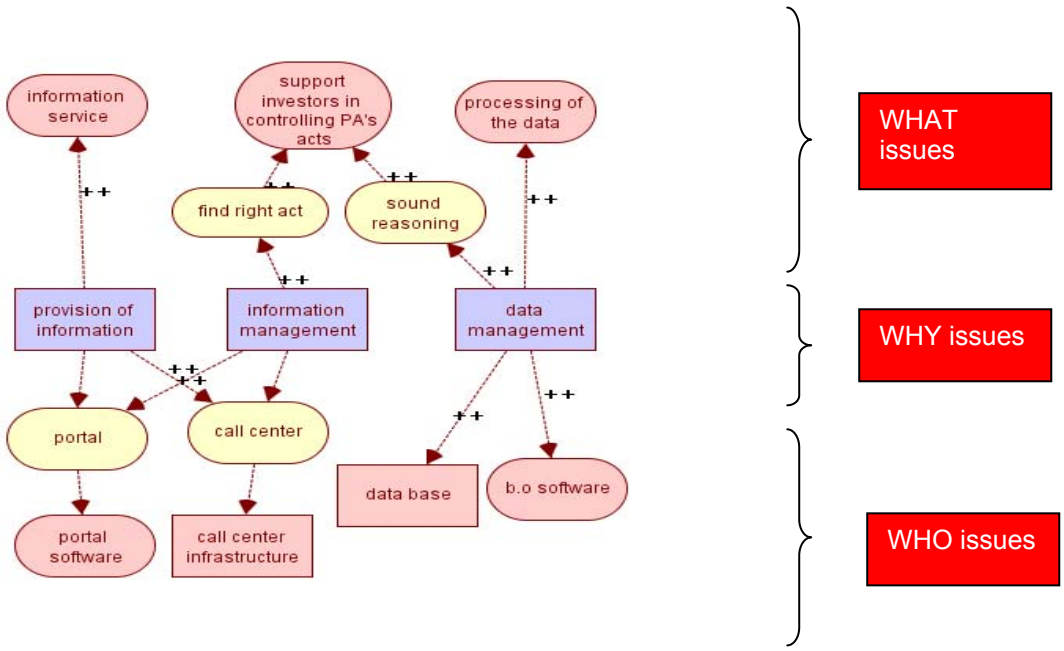

Figure 3: goals for a "Portal for potential investors"

Requirements engineering (RE) is concerned with the elicitation of the goals to be achieved by the system envisioned (Figure 3) (WHY issues) (Lamsweerde 2000): promotion of information to businesses and new potential investors, information management, data management the operationalization of such goals into specifications of services and constraints (WHAT issues): provision of information to potential investors, processing of the data imposed for a business plan, support to the investors on monitoring PA's acts (new service in the new era – the same procedure exist for a PA service and is used through

telecommunication channels for a new service to citizens)
And the assignment of responsibilities for the resulting requirements to agents such as humans, devices and software available or to be developed (WHO issues): data base, back office software applications, software for portals, infrastructure and applications for call centers.

The system is placed in the middle of the overall framework represented in figure 2 and its goals have to be interlinked with the analyzed goals of the stakeholders.
Thus this system's goals are mapping to stakeholders' goals as follows
Provision of information in an electronic way to potential investors:

- competitiveness, savings, transparency (government)
- less time, less trouble, sufficient information, justice/equity (citizens)
- less work load, not iterative tasks (Public servants)
- organizational and technical interoperability (p. Organizations)

Support to the investors on monitoring PA's acts:

- transparency, (government)
- sufficient information, justice/equity (citizens)

Processing of the data imposed for a business plan: as the processing of the data is going to be in a automated way, this could guarantee a more precise, transparent and fair way of operating in PA. So:

- competitiveness, savings, transparency, (government)
- less time, sufficient information, justice/equity (citizens)
- less work load, not iterative tasks (Public servants)
- organizational and semantic interoperability (p. Organizations)

Moreover from technological aspect there is some information about hardware but software is going to be developed after the supplier will be chosen (multiplatform).
Additionally the provision of a bilingual site reflects a pan European dimension but mainly confronts social inclusion issues. Apart from the above mentioned administrative practices/procedures become accessible to citizens and businesses
This service is amongst the goal-services of e-Europe 2005. Thus it has to be implemented for every public organization. However this certain call for tenders might lack provision for certain matters that may lead to an improper implementation.
Finally in relation to hardware although contemporary technologies are requested, there must be a provision regarding legacy systems as well.

5. Discussion and Conclusions.

Electronic government is far more than a lofty, idealistic notion. Nearly every country in the world—from the poorest to the richest—has considered and most have implemented some form of it, and the extensive literature on the subject continues to grow. Considerable evidence suggests that even the most technologically advanced countries aren't getting the full return yet for their e-government investments. Poorer nations fare even worse. (Ruth and Doh 2007)
This paper argues that to get the full return of the e-government investment it is critical to consider all stakeholders and their goals. Satisfying these goals is a sine qua non condition for a project's or an initiative's success. Thus the authors propose a framework in which an undertaken initiative could be tested. The system is placed in the center of this framework and its goals are

"operationalised" on one hand and "technicalized" on the other. The ability of mapping these goals to stakeholders' goals reveals proper or insufficient provisions, allowing revisions in the early design stages.
Mapping system's goals to stakeholders' ones could be made through wider goals/strategic objectives like the ones below. These are not formally marked in the diagrams:
National interoperability standards, exploitation of ICT in promotion of information, access to Internet, simplification of administrative procedures that leads to reduction of administrative cost for businesses therefore to a reduced production cost and raise of competitiveness (Government). Access to governmental sites and to their content (EU)
Other national administrative goals in the Greek case are: discovery of the suitable/right public organization for each service, provision of all services suggested from EU, implementation ability in a 3/4 level according to existing legal framework, accessibility from all 7 prefectures of the region.
The introduction of the system in the case discussed here addresses the communication and the formulation of the document that will have the decision about the subsumption of the investment proposal to the provisions of the law for the development in Greece and more specifically in the RCM. Thus there are two different levels of administrative operations that this e-government project tackles.
The automation of the processing phase contributes to the creation of a fair decision and thus it easies the formulation of the act ("performative" document). So it fulfills less time requirement, sufficient information plus a set of principles of the administrative law, that specify good governance sub goals, like justice and protection of public interests.
Collaboration between public organizations should lead to the dissemination of such good practices in all Regions and other public organizations that conform to the development law. It also refers to citizen businesses coping with front office. Thus multi-channel approach (provision for a call center) secures social inclusion, improved transparency and reduced time wastage for both the service providers and the public.

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