

# Paving Roads Towards eGov Inclusion: A Portuguese Inter-municipal Case Study

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**Abstract:** This paper presents a Portuguese inter-municipal project - Vale do Minho Digital (VMD), framed by the Digital Cities and Regions (DCR) initiative. The project aims to contribute to the Inclusive eGov roadmap providing an integrated ICT solution that spans five sparse municipalities in North Portugal. Taking an orthogonal view of the VMD building blocks, from the communication infrastructure to the citizen-centric services, the discussion highlights the challenges and strategies of the VMD project design. Key development aspects and good practices to foster multiregional eGov projects implementation, deployment and success are also discussed.

## 1. Introduction

Following a worldwide trend toward e-globalization, the Portuguese Government has put a strong commitment and endeavor regarding the deployment of a national plan for broadband Digital Cities and Regions (DCR). While the economic, educational and demographic levels of major cities contribute to facilitate eGov initiatives and ICT massification, deploying DCR projects in regional deprived areas brings additional challenges to a successful outcome.

These regions are precisely one of the main focus of European Commission i2010 eGov Action Plan [1], where improving social inclusion and widening opportunities for more disadvantaged communities is a major objective and expectation within i2010 agenda, where no citizen should be left behind [2] [3].

In this context, this paper debates the DCR initiative - Vale do Minho Digital (VMD), which aims to contribute to the Inclusive eGov roadmap providing an integrated ICT solution that spans five sparse municipalities in North Portugal.

Aspects such as the development of regional strategies and policies for Information Systems (ISs) and Geographical ISs (GISs); the co-operation with other national DCR projects, involving exchanging expertise and project outcomes; and a well-coordinated project management model among project partners, make of VMD project a relevant case study for future eGov initiatives.

The remaining of this document will focus on: (i) the analysis of the VMD project and its factors of differentiation; (ii) the identification of the characteristics and particularities of the region, which may influence the project's design, outcome and success; (iii) the discussion of the project building blocks, highlighting major design options and initiatives within each block, regarding conceptual and operational aspects; and (iv) the learned lessons and recommendations facing the project difficulties and benefits.

## **2. Objectives**

The present study takes an orthogonal view of the challenges and strategies of the VMD project design, from the communication infrastructure to the citizen-centric services, highlighting key deployment aspects and good practices to adopt.

After presenting an overview of the spatial and temporal context of the VMD project, this paper identifies the project building blocks, discussing the underlying key aspects, which may impact on the global eGov solution's efficiency and effectiveness. Attending to the region specificity, the debate is focused on the required steps to implement broadband communication infrastructures, security issues, service offerings and corresponding access platforms both for the internal public sector entities and for customers. In addition, the action plan to increase community-awareness of available facilities and promote their usage is discussed.

This paper also intends to bring awareness of the major hurdles and business benefits that may face a multiregional eGov initiative.

## **3. VMD Case Study**

The Vale do Minho region has a population around 65 000 inhabitants, distributed among five municipalities covering a total area of 813 sq.-km. Currently there are no cities in this inter-municipal community. Within a rural environment, the main economic activities include: construction, food and retail, service sector and tourism, mostly through micro enterprises and SMEs.

VMD project is part of a national DCR plan, which includes 28 projects funded by the Portuguese Government and FP6 program. The project, running from January 2006 to June 2008, consists of 23 sub-projects, gathering 17 partners. These partners include five municipalities and the Association of Municipalities (responsible for nearly 75% of a 6ME budget), graduate and higher education schools, enterprise associations, public companies and cultural organizations.

Several aspects make VMD an interesting and challenging eGov initiative. The environment in which the project has been developed is still far from factors typically pointed out as enablers to the success of DCR projects. The region exhibits a low level of education and ICT adoption, sparsely distributed population, and lack of regional communication infrastructures. In addition, the municipalities suffer from limited networking facilities, digital illiteracy, lack of an internal and regional IS consistent strategy, and shortage of ICT qualified personnel. This scenario makes difficult the implementation of municipality-wide solutions as well as the integration of legacy IS.

## **4. Project Methodology**

The characteristics and dimension of VMD DCR project, involving fast-changing technologies and applications to be implemented in multiple municipalities/partners with their own particularities, made difficult the adoption of a strict planning-execution methodology. Therefore a dynamic planning and a high capacity to adapt project actions to adversities were required.

This led to the adoption of a two-level planning methodology: (i) at a top level, the macro plan established the project phases and (ii) at a fine-level, the execution plans detailed the actions to carry out during the execution of each of the defined phases. In more detail, the macro plan, elaborated after an initial contact with the project partners to appraise their ICT state regarding the project planned outcomes and the reality of their institutions, identifies the project major phases, their inter-dependencies and sequencing. Facing partners feedback, the project outcomes, actions and acquisitions were corrected.

Each execution plan starts with the definition of a working group involving technical staff from each municipality. The objective of this involvement is threefold: (i) bring in to the decision process the know-how of each institution's reality and needs; (ii) validate and improve the commitment of municipalities with the technical decisions; and (iii) foster project implementation and deployment. The execution of project actions follows a common approach: identification of major vendors; presentation of the problem to vendors; analysis of their solutions; selection of vendors; elaboration of the implementation chronogram.

## 5. Project Planning and Technology Description

Facing the challenges of VMD project context, described in Section 3, the present section highlights relevant strategic options for the design of VMD project and corresponding building blocks.

### 5.1 VMD project planning

To foster VMD project implementation, deployment and success, several strategic options were considered in its planning phase. These key strategies, developed in more detail in the section below, are summarized as follows: (i) to involve municipalities in the decision-making process; (ii) to adopt similar technologic solutions across municipalities; (iii) to consolidate technologic platforms; (iv) to develop a broadband communication infrastructure for the region; (v) to joint-develop regional strategies and policies for IS and GIS; (vi) to co-operate with other national DCR projects, exchanging expertise and project outcomes; and (vii) to address eInclusion.

### 5.2 VMD project building blocks

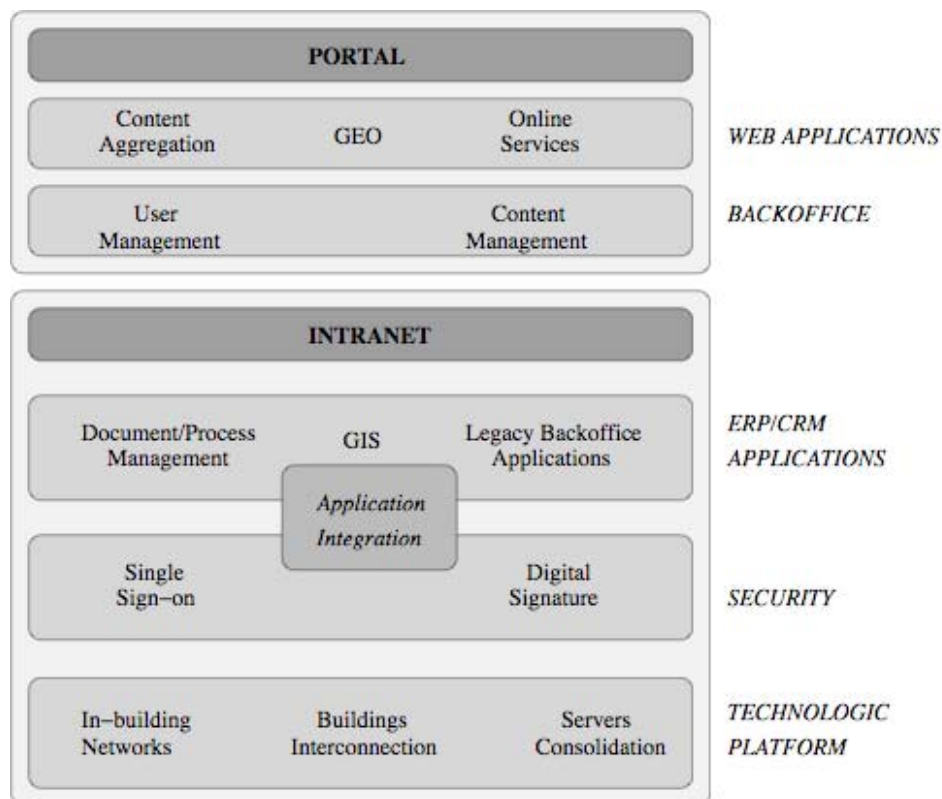


Figure 1: VMD building blocks

The regional VMD portal offers municipal customer services, business services and job market offers, cultural and tourism information, educational information and services, and social services. While municipal customer services, and cultural and tourism information

are available through the Municipal Portal, the remaining services are other partners' responsibility, being available in the corresponding portals.

The relevant building blocks to sustain the services available through the Municipal Portal are illustrated in Figure 1 and briefly described above. As shown, two major components can be identified in the municipal perspective of the VMD project. The internal component, oriented to the municipality employees and to the organization functionality, consists of several building blocks organized to provide specific services' availability through the municipal Intranet. This internal component supports the component responsible for the interaction with the citizen, which provides citizen-centric services through the Municipal Portal.

*5.2.1. Technological Platform - Developing a broadband communication infrastructure and consolidating servers infrastructure*

Attending to the poor existing technologic infrastructure and ICT resources, the physical/passive infrastructure has been planned in two steps. In a first instance, geographical regions are interconnected through ISPs ADSL service. The following step, sustained by an approved project resulting from a partnership among the five municipalities and local SMEs, aims to provide broadband facilities through owned fiber [4].

The motivation for this migration is threefold: (i) to create a region-wide optical fiber infrastructure and act as a local communications carrier; (ii) to foster the regional communications market; and (iii) to promote broadband communications to support SMEs e-business and home market. As a side effect of this project, the municipalities will be able to: (i) extend and enhance the range of services supported among them and (ii) have more cost-effective communications.

Within each municipality, most of the municipal buildings had obsolete or inexistent network infrastructures. The implanted new networks (in-building networks) allow gigabit connection to the desktop, have Power over Ethernet (PoE) on most ports (configurable at patch panel level) and are ready for IP telephony integration, when needed.

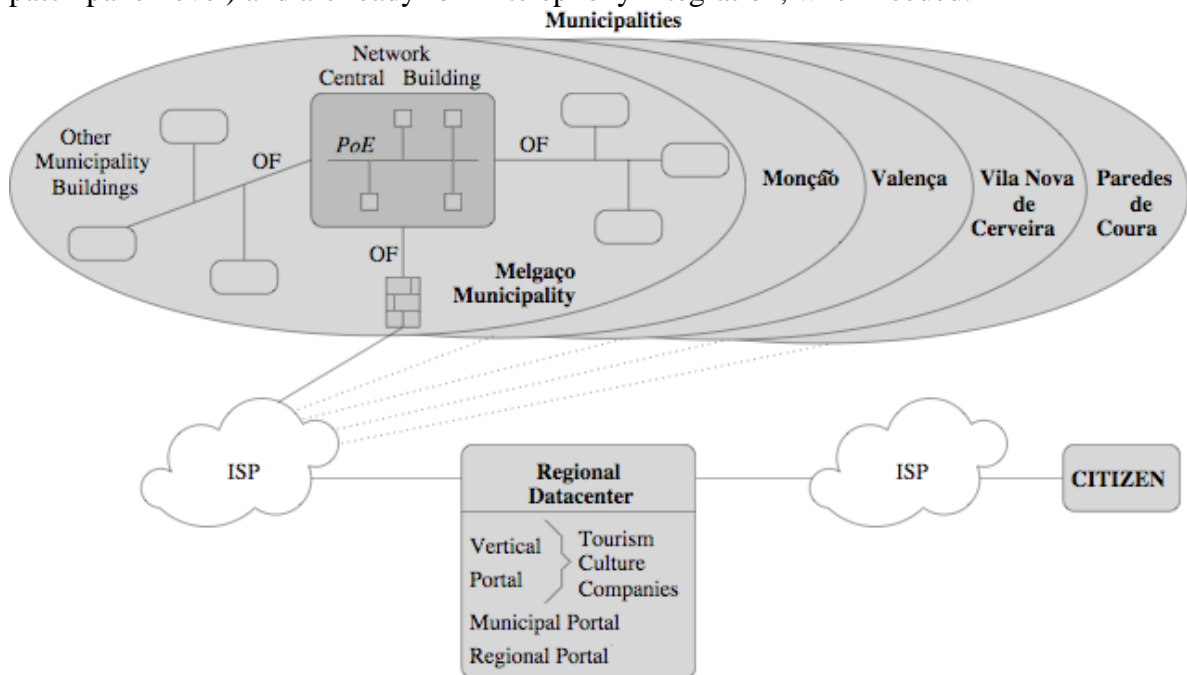


Figure 2: VMD Generic Architecture

As illustrated in Figure 2, all municipal buildings were fully interconnected into a single network (buildings interconnection), providing access and connectivity to municipal employees. The core network was based mainly in optical fiber (OF) installed through

specific-purpose pipes, water pipes and sewage drain, and, in few cases, wireless infrastructures. The internetworking equipment (switches and routers) and IS resources (database and application servers, active directory, security and backup systems) are owned and managed per municipality.

Until recently, each software/system acquisition included a server to support the new system. This practice led to the accumulation of servers with corresponding licensing, power, cooling and maintenance needs. The new architecture for the IT platform, equally designed for each municipality, has a database server, two application servers, a backup system, an active directory system and a centralized anti-virus solution. All software vendors should map their applications' needs into these systems (*servers consolidation*).

All equipment acquisitions have benefited considerably from municipalities aggregation in bulk equipment purchases and direct dealing with major industry players.

### 5.2.2 *Addressing security issues*

User access and security are critical issues in eGov implementations. These issues have been addressed both from an inner (staff) and an outer (customer) perspective. Integration with the Portuguese Citizen Card, currently under rollout phase, is planned.

Within the scope of each user's responsibilities, the user has access to a minimum of five sub-systems that require password, each of which with its own rules, validity and change requirements. The need to simplify the usage of this growing number of password protected systems led to the adoption of a single sign-on system complemented by digital *signature* support.

### 5.2.3 *ERP/CRM Applications*

Every institution, and municipalities are not an exception, needs two core applications: (i) to manage customer information and provide a better support to the relationship management - Customer Relationship Management (CRM); and (ii) to manage internal information about its resources - Enterprise Resource Planning (ERP). Besides the already existing ERP/CRM applications, the VMD project implemented a document management system and a geographical information system (GIS) at the core of every municipality's IS.

The document management system was implemented at two different levels: one that only manages documents and records their flow through the administrative process without further knowledge - document management; and the other that has the knowledge about the processes and their workflow so that, once a document is classified as belonging to a certain process type, the system knows where to move it to and controls all document handling - process management.

At each municipality, the geographical information system allows the production and maintenance of municipal geographical information. As an example, this information is used for urban planning or portal's interactive maps accessible through GEO;

Legacy back-office applications are a needed-evil as they represent old applications that do not conform to the new architecture and rules but cannot be put apart as they support some of the core ERP/CRM functions of the municipality. In the long term, they will tend to disappear as a consequence either of their respective upgrades or of a system change.

### 5.2.4 *Defining service offerings and corresponding access platforms*

One of the main objectives of a DCR project is the creation of online access to local government services. The selection of online services to implement needs to take into account an in-depth incursion on the region's living and business concepts, and on process models of the public sector, always under a citizen-centric perspective [1]. This analysis has led to the following service design goals: (i) to meet perspectives, expectations and needs of customers (citizens and companies); (ii) to be oriented and structured according to life-

events and business-events; (iii) to provide high-usability through a user-friendly interface developed in accordance to W3C recommendations for usability [6]; (iv) to support service integration, hiding from customers services' fragmentation and implementation issues; (v) to allow for context-aware and ubiquitous services with mobility support.

To support online services the Municipal Portal resorts to the back-office and Web applications components. In more detail, (i) the content management is the central component of a portal that allows the publication of contents by non technical staff; (ii) the user management allows to manage the services, information and preferences of portal's users, namely registration, information requests, newsletter distribution; (iii) the content aggregation gathers information from other websites, connecting to those websites or their data sources and receiving information from them; (iv) GEO provides the interactive maps with information about several categories of points of interest (PoI) in the region and provides the possibility of generating routes between those PoI.

An important task has been a prioritization of service deployment attending to their relevance and usage rating, preparing the corresponding back-offices for online service integration.

A multi-platform service delivery has been considered an important strategy. Nevertheless, the communication technologies available in the region and the lack of off-the-shelf solutions for multi-platform integration limit the options for service access, which is mainly carried out using Internet Portals and mobile telephones (SMSs). Extending and enhancing services availability through a large variety of technologies and devices, such as digital interactive TV, are a further motivation for deploying a broadband communication infrastructure.

#### *5.2.5 Implementing promotion actions*

One of the major obstacles to the project divulgation and usage impact was the low level of education and of ICT adoption of the region's citizens. Therefore, in addition to common promotional tasks, itinerant promotional teams are expected to exemplify the use of portals and available facilities throughout the region, with emphasis in highly populated areas, schools, exhibitions, and municipal events. The VMD project has also included informative actions along its development to keep citizens motivated and well-informed.

## **6. Major Hurdles**

This section highlights the most important hurdles to overcome so that a fluid deployment of the VMD project is achieved as planned. The major difficulties have been identified as follows:

- Lack of documentation about the municipalities' infrastructures – no matter how odd it may seem, in many cases, the layout and characteristics of municipal networks (e.g. sewers and rain drain) were only kept, by memory, by some older employees. Therefore, at the time of the optic fiber network planning, it was very difficult to identify possible routings between the desired network points. In addition, when defining in-building networks, the buildings' footprints could not be found in the archives;
- Diversity of ICT solutions and legacy applications - the VMD project has effectively started more than one year after the project proposal has been submitted. During that period, several municipalities have adopted their own ICT strategies and started ICT acquisitions, autonomously. Additionally, the old development paradigms of existing and acquired legacy applications have been a major barrier to systems' integration;
- Delays in the decision making process - most of the project actions require direct involvement of municipalities' decision makers. However, in small municipalities with scarce human resources, this need represents an enormous overload to the already

overloaded chiefs of service division. This shortage of time availability for gathering and deciding tended to delay the project's progression;

- Large number and interdependency of project actions - the amount of actions of VMD project and the dependencies among them have made the project rather sensitive to delays. This has been particularly notorious: (i) during the networks implementation phase, where a shortage of components induced a delay of several weeks; and (ii) in the servers' supplier late delivery of equipment. The resulting delays have forced alternative rescheduling plans to cope with the project deadlines;
- Bureaucracy in administrative acquisitions' process – VMD is a project co-funded by EU and the Portuguese Government. Both entities have strict rules regarding how money is spent and how suppliers are chosen. Therefore, acquisitions within the project had to be done in accordance to the Portuguese public acquisitions' regulation. This regulation allows direct negotiation with suppliers listed in the directory of government suppliers. This procedure revealed to be a major problem as the European Commission recommended that the use of that directory should be avoided. As consequence, every acquisition above a pre-defined ranking cost has to be done through specific calls, which inevitably bring additional bureaucracy to the process.

## **7. Business Benefits**

The amount of investment and change (in the working procedures in local administration) that a DCR project involves has the potential to produce many direct as well as indirect benefits [7]. It's up to the partners to reap indirect benefits and convert them into added value. It is our belief that in VMD case, the municipalities show evidence of having reached this state. In fact, there are several circumstances that support this statement, namely:

- Equally designed and configured networks that allow easy interconnection when the regional network starts its operation;
- Major savings in the negotiation acquisition processes due to the group acquisition strategy;
- Sharing of knowledge among municipalities as a consequence of similarities of their IS platforms;
- Major decrease in the time required for deploying new systems. As a consequence of the similarities between the IS platforms, vendors can tune the deployment of a new solution in one of the municipalities and then, rapidly, repeat the process on the others – this strategy has been used successfully during the project implementation;
- High capacity to foster competitiveness and dynamism in the region due to the adoption of a broadband network infrastructure strategy;
- Cross-fertilization among other national DCR initiatives.

## **8. Conclusions**

This paper has presented and discussed a DCR initiative – the VMD project, involving five sparse municipalities in North Portugal. This initiative is considered a valuable case study in the 2010 eInclusion context, as it highlights and debates important aspects towards planning and deploying eGov solutions in deprived regions.

Although it is early to claim the success of the VMD project, several aspects revealed to be determinant key enabling factors: (i) the strategy of involving municipalities in the decision-making process; (ii) the joint-development of regional strategies and policies for IS and GIS; (iii) the inclusion of a technical team in the project management structure; (iv) the co-operation with other national DCR projects, which has been an innovative and crucial approach to reduce the risks, and accelerate the project implementation.

A roadmap of future developments and upgrades to foster mobility of local government (mGov) and civil society, promoting context-aware and seamless services across municipalities, will be matter of future attention.

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