Implementation of e-Government at the local level in underdeveloped countries

The case study of AP Vojvodina

Milan Paroški

Autonomous Province of Vojvodina, Office for Joint Affairs of Provincial Bodies, Novi Sad, Serbia

Zora Konjović

Faculty of Technical Sciences, University of Novi Sad, Novi Sad, Serbia, and

Dušan Surla

Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

Abstract

Purpose – The purpose of this paper is to collect and articulate experiences acquired in implementation of e-Government in Autonomous Province of Vojvodina (Serbia) aimed at speeding up diminution of the gap in the level of local e-Government development when compared to the developed countries, while taking into consideration the main constraints that are attributable to underdeveloped countries.

Design/methodology/approach – Contemporary methodologies were used for the project design and implementation of the communication and information infrastructure, accompanied with international and domestic good practices related to the development of e-Government.

Findings – Based on the strategic recommendations related to ICT policy and standards, and annual operating plans, in the first five-year period (2005-2010) the level of the ICT deployment in the operation of AP Vojvodina Assembly and Government was achieved that is close to the level of e-Government in the developed countries in early 2006. The computer communication network was developed in the buildings of AP Vojvodina Assembly and Government and electronic communication was fully embraced within that network (2007). All activities pertaining to sessions of the Government of AP Vojvodina are conducted electronically, without paper documents (2007), and the electronic voting system was implemented in sessions of the AP Vojvodina Assembly (2009). Several public electronic services were implemented: Library (2006), Portal APV (2007), Records and Archives Office (2010), Legal Regulations and Judicial Practice (2009), Distance Learning (2009) and Access to Records from Sessions of AP Vojvodina Government (2010). Another important result is development of the system aimed at improving IT literacy for all employees in provincial administrative bodies. The results indicate that the creative leadership, careful planning and strict management of implementation plans which are based on precise goals could facilitate a speedy development of e-Government even under severe constraints in financial and technical resources.

Originality/value – Recommendations were made for the development of e-Government at the local level, to ensure interoperability with subordinate and superior e-Governments. Recommendations contain models of computer communication networks, software architectures, programme platforms and the strategy for implementation of e-Government.

Keywords ICT, E-government, Strategy, Implementation, Online services, Serbia, Information technology

Paper type Research paper
1. Introduction
The ongoing phase of the human society development is the knowledge based society. It has been pointed out that the knowledge based society is an innovative society of a life-long learning and that knowledge is used to capacitate people and make them culturally and materially rich, as well as to develop a sustainable society (Pálinkás, 2011). None of these can be reached without exchange of information. The source Wikipedia (2011) points out that the information society is the society in which the creation, distribution and use of information are becoming a significant economic and cultural activity.

Thus, the two key elements that are considered a basis of the future progress and more sustained development of the entire human society are:

(1) Knowledge as the key resource of development.

(2) Information-communication technologies (ICT) as the resources that provide technical and technological support to knowledge development and management.

Development of the information society and/or knowledge based society is an important part of the European Union’s economic and social development policy (The European Council, 2000). Activities of this development are implemented at two levels, one being the level of EU, and the other being that of its member states.

Common goals and principles are defined at the European Union level (The European Commission, 2000, 2005a, b; The European Council, 2002) and significant resources are assigned to finance and provide expert support to the information society development programmes, in particular to candidate countries for the European Union membership (The European Commission, 1999-2006). These include also the financial and organisational efforts invested by the European Union in the research pertaining to ICT development through various programmes financed by joint EU funds (The European Commission, 1998-2002; The European Commission, 2002-2006).

Principles of ICT application in member states are based on the EU main principles and adaptations made to meet the needs and possibilities of individual countries which refer to the following aspects:

- background of information society development;
- the level of the e-Government development;
- legal framework;
- public electronic services;
- delegation of competences; and
- available infrastructure.

Certain documents (The European Commission, 2005a, b; Chevallerau, 2005) provide a systematic overview of the information on all of these aspects. These aspects are also the subject matter of numerous scientific research papers. Hereafter, the papers which had the greatest influence on the concept of e-Government implementation in AP Vojvodina are presented. The subject matter of the survey in the paper by Ndou (2004) is development of e-Government in the developing countries. The obtained results may contribute to preparation of strategies and action plans for the development of
e-Government in these countries. Singh et al. (2004) consider the maturity of e-Government in countries, based on the GDP effect on ICT infrastructure, human capital and management. Based on the information obtained from authoritative sources, it was stated that ICT had the greatest effects. The paper by Moon and Norris (2005) presents a survey of the effects of managerial innovativeness on the development of e-Government at the municipal level. The subject matter of the paper (Ebrahim and Irani, 2005) was to provide an integrated architecture framework for e-Government. This framework represents the compliance of IT infrastructure with management business processes in the public sector organisations. The paper provides a classification of obstacles that could obstruct the implementation of the proposed architecture framework. In their paper Andersen and Henriksen (2006) suggest a reorientation of e-Government to end users, as crucial actors for the future development of e-Government. This proposal is based on the extension of the model by Layne and Lee (2001). Guijarro (2007) presents the results of a survey of the policy and guidelines, in the field of interoperability, developed by agencies for e-Government. An overview was provided, based on two criteria: the interoperability frameworks and the enterprise architectures, and this paper has described and compared the most relevant tools proposed in Europe and the USA.

The subject matter of the survey in the paper by Kumar et al. (2007) is the reason and manner in which citizens use the Government web sites, along with their general preferences regarding the acceptance of e-Government. A conceptual model of e-Government was proposed, which puts the user as a central point in the strategy for e-Government development. A paper by Halaris et al. (2007) gives an overview of main components of the model that may be used for a continuous monitoring and measuring of the quality of public electronic services. From this perspective, the correlation was considered between the following components: back office process performance layer; site technical performance layer; site quality layer; and customer’s overall satisfaction. All these papers influenced our approach to e-Government development from the strategies preparation and implementation points, as well as form the architectural point.

Qiang et al. (2009) considered the architecture for web service integration. This kind of interaction of the levels of portals, business flow, business services, data services and interface platform is significantly improving the business operations of e-Government. The subject matter of the survey presented in a recent paper, is the development and testing of the adoption model of the required technology for electronic services, such as smart cards for citizens’ identification and access to e-Government. This model was used to identify eight external factors, namely: consciousness, help, practicality, self-efficiency, trust, avoidance of personal interaction, flexibility and compatibility. The relevance of these factors was indicated regarding the adoption of required technologies in e-Government. The subject matter of the survey in this paper is relevant for the development of e-Government in the AP Vojvodina, to the extent that, at the end of the five-year e-Government development period in the AP Vojvodina, the need has also emerged for the integration of the introduced web services and selection of technologies for electronic services. A systematic overview of research activities in the field of e-Government within the FP6 programme has been provided in the study titled “Bringing Together and Accelerating e-Government Research in the EU” (The European Commission, 2008).
The general aim of this study is to present the features and accomplishments of e-Government research, which has reached maturity. This means projects which are nearing or have achieved completion and therefore have produced their basic results and have settled on a robust methodology enabling them to fulfil their declared mission. The document contains an exhaustive analysis of the projects’ characteristics, similarities and differences categorised under the following general areas: user-related issues: response to needs, acceptance, creation of value; Open source software related issues; Integration and Interoperability for e-Government services, processes and applications through web services and service oriented architectures; Speech recognition and related technologies to ease interaction between citizens and administrations; Comprehensive knowledge modelling and development of ontologies in the government domain; ICT-aided parliaments; Legal support systems; Privacy and security, including identification, authentication and related issues; Services delivery via mobile technologies; Democratic participation; Research and policy issues; Technological and socio-economic trends. Although this study dates back to 2009, when the implementation of our e-Government system had already reached a mature phase, it is interesting that the first three aspects (User-related issues, Open source software related issues and Integration and Interoperability for e-Government services, processes and applications) were also identified in our approach, as bearing special significance for the development of the e-Government system in Vojvodina, already in the initial project phase.

The papers describing the experiences related to the introduction of e-Government in certain countries, such as (Gonzalez et al., 2007) in Spain (Colesca and Dobrica, 2008) in Romania and (Lin et al., 2010) in China, provided us with the valuable results that have been used as control points in the process of developing e-Government in AP Vojvodina.

The rest of the paper has been organised as follows. Section 2 describes the initial (existing) situation concerning the information and communication infrastructure in APV in 2005. The initial strategic projects for e-Government development in APV are described in section 3. The remaining sections describe the implementation of e-Government development in the period 2006-2010 with concluding section briefly presenting the attained level of e-Government in APV within the given five-year period and our recommendations for local e-Government development. Along with description of activities and achieved results, the data about financial investments are given.

2. Initial situation in AP Vojvodina in 2005
The Autonomous Province of Vojvodina (APV) is an autonomous territorial community in the Republic of Serbia. It is situated in the northern part of Serbia covering the area of 21,506 sq. kms, which is approximately a quarter of the total area of Serbia. The territory of Vojvodina comprises the territories of 45 municipalities and the population of more than two million people, which is a bit more than 27 per cent of the total population in Serbia. The APV is a multinational community in which six languages are officially used.

Towards the end of 2004, the Republic of Serbia adopted a document titled Public Administration Reform Strategy in the Republic of Serbia. One of the primary tasks of this document is to modernise public administration by applying the achievements of the contemporary information and communication technologies, i.e. by introducing e-Government. Implementation of e-Government is conducted through the E-Vojvodina
Programme, as one of the programmes of the Integrated Regional Development Plan of Vojvodina. The E-Vojvodina Programme Implementation Plan was adopted in the second half of 2005. The following bodies are responsible for the implementation of the E-Vojvodina Programme:

- Provincial Secretariat for Science and Technological Development – runs and coordinates the implementation of E-Vojvodina Programme.
- Professional Service for Implementation of AP Vojvodina’s Integrated Regional Development Plan – in charge of monitoring and financial support to the Programme implementation.
- Department for Information Technologies, Office for Joint Affairs of Provincial Bodies – in charge of implementation, maintenance, exploitation and operative development of e-Government.

Towards the end of 2005, a detailed analysis was conducted of the existing situation concerning the ICT in the AP Vojvodina Assembly and Government, employing approximately 1,300 people in 30 provincial administrative bodies. It was found that prior to 2006, the implementation of ICT in provincial administrative bodies was poor, without any coordination of human resources. Professional development in the field of ICT was not organised. The total number of employed ICT professionals on 1 January 2006 was 12, i.e. 1,5 per cent of the total number of employees. They had various qualification degrees, professional titles and were experts possessing various (very often insufficient) levels of professional and organisational knowledge. As far as of end 2005, they had neither developed stronger connections, nor established the appropriate level of cooperation and exchange of professional experiences and knowledge. The overall result was lack of internal eServices as well as eServices intended to support citizens’ and business entities’ needs in the Province.

This situation analysis suggested that, at that time, the state of affairs concerning the e-Government in the APV lagged behind a great deal in all of its segments, when compared to the situation concerning e-Government in the EU countries.

3. Initial e-Government projects in the APV
Implementation of e-Government within the E-Vojvodina Programme started in December 2005 through initial projects presented in Table I. The task of the specified projects was to submit a proposal of the e-Government development in the APV, with the aim to achieve the e-Government level close to the level of e-Government existing in the EU at that time as soon as possible, and thereby substantially reduce the future difference in the e-Government development level when compared to the EU countries. Since the goal to be reached by these projects was clearly defined, they were finalised within the envisaged time frame (90 and 120 days). IT experts from the University of Novi Sad (located in Capital of Vojvodina and being the second largest university in Serbia) were entrusted with the implementation of these initial projects.

The main results of these projects include the following:

- Drawing up the strategic document “Policy and Standards for the Use of Information Communication Technologies in Provincial and Municipal Institutions of AP Vojvodina for the E-Vojvodina Programme”. This project provides an overview of e-Government development process in the European
Development aspects of e-Government following the European Union methodology were analysed. The analysis included the following aspects of e-Government development: background of information society development, electronic public services, delegation of competences and infrastructure for e-Government.

The first e-Government development strategies were adopted in the second half of 1990s and 2000 in most of the EU countries, while the new EU member states adopted their first e-Government development strategies in late 1990s and early 2000. These strategies, along with the measures for e-Government development, often needed to be modified and changed in order to come up with better solutions for e-Government development. Considering that implementation of this strategic document in AP Vojvodina took place in early 2006, it was generally decided that the project should define the strategy and measures for the introduction of e-Government in the Autonomous Province of Vojvodina, which would lead to attaining the e-Government development level similar to the level attained in the EU countries at the time. This decision may facilitate the achievement of the envisaged development level, already attained in majority of the EU countries, using less resources and within a shorter period of

<table>
<thead>
<tr>
<th>Project title</th>
<th>Date of contracting</th>
<th>Implementation timeframe in days</th>
<th>Cost (€)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Drawing up the strategic document “Policy and Standards for the Use of ICT in Provincial and Municipal Institutions of AP Vojvodina for the E-Vojvodina Programme”</td>
<td>14 December 2005</td>
<td>90</td>
<td>4.541</td>
</tr>
<tr>
<td>2. Preparation of the project and technical documentation for the Computer Communication Infrastructure of E-Vojvodina Phase 1: Local computer network of the Executive Council and AP Vojvodina Assembly buildings Phase 2: Base project of the network of provincial administrative bodies</td>
<td>14 December 2005</td>
<td>120</td>
<td>8.692</td>
</tr>
<tr>
<td>3. Drawing up the project “Software Architecture for E-Vojvodina”</td>
<td>14 December 2005</td>
<td>90</td>
<td>12.692</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>120</strong></td>
<td><strong>40.431</strong></td>
</tr>
</tbody>
</table>
time. Based on the experience and good practice in the EU countries, chapter 4 of the document proposed the global strategy for the e-Government development in the APV. Competences of the Province and local self-government have been suggested in respect of all aspects of e-Government. Organisation of these competences at the provincial level has also been considered.

- **Preparation of the project and technical documentation for the Computer Communication Infrastructure of E-Vojvodina.** This project gives a model of the logical architecture for the e-Government network, which integrates standard logical elements, such as addressing, naming and isolation of network domains, with other elements required for further logical extension of the network to external users. The proposed architecture of the logical network of the APV e-Government enables an easy internetworking with municipal computer networks in the territory of the APV, as well as with e-Government computer network of the Republic of Serbia and other international networks. Centralisation of the external access administration was adopted for the purpose of increasing the network administration efficacy and quality, particularly regarding the security requirements. The proposed model is sufficiently flexible, to be used, if slightly modified, for connection of different categories of external users.

- **Drawing up the Software Architecture for E-Vojvodina project.** The project defines conceptual model of the general software architecture of the e-Government system in APV, and provides an analysis of the current and forseen treatment of the OpenSource software solutions deployment in systems of e-Government. Relevant OpenSource solutions (operating systems for workstations and server systems, office software packages, application servers, web servers and database management systems) were analysed. Experiences of European countries in this field are presented, along with the reasons for acceptance/non-acceptance of OpenSource solutions and other software strategies adopted in particular European countries and at the European Union level, pertaining to further development of the e-Government system and the role of OpenSource software in these systems. Based on the analysis and experiences of other countries, chapter 3 of this project provided recommendations for the selection of software components for the APV e-Government architecture in which OpenSource plays an important role.

- **Drawing up the Specification of Information Requests of Public Services in the E-Vojvodina System project.** The project contains a detailed analysis of the system of electronic public services, proposes the system of public electronic services (standard set of services and the software architecture of the public services system), as well as the methodology for their design and implementation within the framework of e-Government in the APV. The proposed set of services, architecture and implementation methodology rely, respectively, on the system of electronic public services for citizens and business entities in EU countries and experiences related to implementation methodology and best practice mainly from countries that joined EU in 2004.

- **Drawing up the Specification of Information Requests of the Intranet System in the Executive Council and Assembly of Autonomous Province of Vojvodina project.** This project proposed the methodology for development of Intranet
The project has identified the main criteria that the document management system should meet, in order to be applied in the e-Government projects. The international standard ISO IEC 82045 was used in the process of identifying the criteria. A comparison was made between the existing open-source document management systems from the perspective of the specified criteria. According to the adopted methodology, an example of the real business process specification was created that should be used as template for further design and implementation.

Apart from the projects listed in Table I, in September 2006, the Assembly of AP Vojvodina passed a Decision on the Provincial Administration Reform and Development Strategy, which established modernisation as one of the pillars of the provincial administration reform. E-Government plays an important role in development of the Province, being a basis for modernisation of work and improvement of the provincial bodies’ work quality. Principles of e-Government in the AP Vojvodina are based on the Republic of Serbia Information Society Development Strategy and the specificities of the AP Vojvodina.

Based on the specified projects concerning the development of e-Government in the AP Vojvodina, the following mechanisms have been adopted: legal grounds and development policy, expert support and implementation.

The legal grounds and development policy of e-Government in the AP Vojvodina are implemented through the E-Vojvodina Programme and e-Government Strategy of Provincial Bodies. Additionally, some other relevant strategies are used to define the development policy for e-Government in the AP Vojvodina.

Expert support to the implementation of e-Government is exercised through a number of temporary and standing bodies at the provincial administration level. On 15 June 2005, the Provincial Secretariat for Science and Technological Development established the Council for Implementation of E-Vojvodina Programme. The Council comprises experts from university and scientific institutions and representatives of the Government of AP Vojvodina. On 12 October 2007, the Government of AP Vojvodina founded the Commission for the Management of the E-Government Strategy of Provincial Bodies, headed by the President of AP Vojvodina Government. Subsequently, in the course of implementation of each of the projects, services and applications that served as the basis for e-Government, special commissions were established, whenever necessary, for implementation of a particular public procurement procedure and the coordinator of activities was appointed each time. A team of proven foreign experts was hired to assist in drawing up the strategic document titled “E-Government Strategy of Provincial Bodies”. They helped to clearly define the vision of e-Government, as well as action plans for the following five years.

Implementation includes projects, ICT infrastructure, applications and services, coordination and co-operation. The ICT infrastructure comprises technical and technological infrastructure, composed of the communication and server infrastructure, security infrastructure and human resources infrastructure.

The following chapters describe details of the infrastructure implementation (communication, server, security and human resources) and e-Government application software.
4. The communication infrastructure
The finalisation of the second project given in Table I was followed by setting up the local computer network in buildings of the Assembly and Government of AP Vojvodina. After that, a local computer network was built in one of the remote buildings. This network represents a basic communication infrastructure of e-Government in the APV. Table II depicts activities undertaken to put the communication infrastructure in operation.

The computer network for e-Government in APV, with capacity of almost 3,000 connection points, is one of the three largest networks in AP Vojvodina, developed to serve for the period of ten year at least. Despite many difficulties, the computer network was established within the planned time frame (105 days). So far, local computer networks were established in all remote business and residential buildings of the AP Vojvodina Government in the territory of Vojvodina. Finally, all networks are integrated into APV e-Government private network by L2VPN technology.

5. The server infrastructure
After launching the computer network, the ICT infrastructure was upgraded with the appropriate server infrastructure, in order to facilitate the implementation of services and applications of e-Government.

However, after only two years of exploiting the server infrastructure, it turned out that the server capacities were insufficient, so the previously mentioned equipment was fully replaced by the new technology – virtual infrastructure (five blade servers with additional equipment and HP SAN Storage and VMWARE software), resulting in about forty virtual servers providing considerable advantages of virtualisation in power consumption, space, dynamic capacity, backup at the file-image level, etc.

An Overview of the server infrastructure implementation is given in Table III.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Contract date</th>
<th>Time frame in days</th>
<th>Price in EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Construction of the local computer network in buildings of the Assembly and Government of AP Vojvodina</td>
<td>4 September 2006</td>
<td>105</td>
<td>621.155</td>
</tr>
<tr>
<td>2. Purchase and installation of the CISCO WORKS – software for computer network monitoring and management</td>
<td>25 December 2006</td>
<td>120</td>
<td>12.666</td>
</tr>
<tr>
<td>3. Detailed design of the local computer network in the remote building of the DTD</td>
<td>22 June 2007</td>
<td>90</td>
<td>1.522</td>
</tr>
<tr>
<td>4. Construction of the local computer network in the remote building of the DTD – liabilities</td>
<td>26 September 2007</td>
<td>90</td>
<td>25.640</td>
</tr>
<tr>
<td>5. Construction of the local computer network in the remote building of the DTD – assets</td>
<td>20 November 2000</td>
<td>90</td>
<td>23.970</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td><strong>684.953</strong></td>
</tr>
</tbody>
</table>

Table II. Activities undertaken to put the communication infrastructure in operation
6. Security
Security of the information communication resources is expensive, but remains the main prerequisite of secure communication between all actors in e-Government (G2G, G2C, G2B). Therefore, a lot of attention has been paid to this segment. Table IV provides an overview of all activities pertaining to security.

7. Applications and services
After the basic communication infrastructure had been set up, the conditions were met for deployment of the e-Government software applications and services. The outsourcing model was applied for software development and deployment (procurement of software through public procurement procedures), combined with internal service (12 ICT staff) that is also responsible for the further application exploitation. Table V provides a list of the most important e-Government applications deployed during the period under consideration.

The text which follows presents details concerning the implemented applicative solutions.

<table>
<thead>
<tr>
<th>Infrastructure component</th>
<th>Contract date</th>
<th>Time frame in days</th>
<th>Price in EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Six (6) physical servers with additional equipment and tape storage</td>
<td>29 November 2006</td>
<td>45</td>
<td>31.163</td>
</tr>
<tr>
<td>2. Thirty (30) laptops for supporting the electronic sessions of the AP Vojvodina Government</td>
<td>22 December 2006</td>
<td>7</td>
<td>31.215</td>
</tr>
<tr>
<td>3. Five (5) blade servers with additional equipment and HP SAN Storage</td>
<td>2 December 2008</td>
<td>45</td>
<td>49.995</td>
</tr>
<tr>
<td>4. VMWARE software for virtualisation</td>
<td>11 September 2009</td>
<td>45</td>
<td>88.577</td>
</tr>
<tr>
<td><strong>Total:</strong></td>
<td></td>
<td></td>
<td><strong>200.950</strong></td>
</tr>
</tbody>
</table>

Table III.
Server infrastructure implementation
facilitates working with documents in electronic format, management of business processes and control of business flow. It is used for the following activities:

1. Preparation of documents for sessions of governmental/assembly bodies and Government of AP Vojvodina.
2. Electronic management of sessions of governmental bodies and commissions.
3. Electronic participation in sessions of AP Vojvodina Government.

Internal messaging system, automatic generation of records and a powerful search mechanism for document and metadata search have been provided by the application.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Contract date</th>
<th>Time frame in days</th>
<th>Price in EUR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antivirus AND anti-spam (antivirus solution for all computers and servers in the period of four years) – with annual maintenance</td>
<td>20 February 2007</td>
<td>5</td>
<td>50,796</td>
</tr>
<tr>
<td>Main project for video surveillance</td>
<td>25 June 2007</td>
<td>21</td>
<td>4,366</td>
</tr>
<tr>
<td>Software for creation of backup data copies and operating system in servers</td>
<td>26 December 2007</td>
<td>15</td>
<td>46,046</td>
</tr>
<tr>
<td>Software for help-desk and user support automation</td>
<td>9 June 2008</td>
<td>15</td>
<td>16,443</td>
</tr>
<tr>
<td>Software for remote inventory of computers and servers (Tivoli Provisioning Manager Express for inventory 4.1.1.)</td>
<td>11 June 2008</td>
<td>30</td>
<td>18,224</td>
</tr>
<tr>
<td>Software for remote management and administration of the Windows system (Dameware utilities 6.7.0.8)</td>
<td>17 June 2008</td>
<td>15</td>
<td>1,676</td>
</tr>
<tr>
<td>Initiation of e-Signature in the work of provincial bodies – pilot project</td>
<td>15 December 2008</td>
<td>60</td>
<td>17,128</td>
</tr>
<tr>
<td>System of video surveillance of the Executive Council and Assembly of AP Vojvodina buildings – Phase II</td>
<td>16 December 2008</td>
<td>45</td>
<td>429,007</td>
</tr>
<tr>
<td>Project of the system for registration and record of working hours and access control of employees in the Assembly and Executive Council of APV</td>
<td>23 December 2008</td>
<td>60</td>
<td>7,580</td>
</tr>
<tr>
<td>?cunetix (SW for web site security checkup) and GFI (set of administrative tools)</td>
<td>21 January 2010</td>
<td>30</td>
<td>10,589</td>
</tr>
<tr>
<td>Microsoft – premier support</td>
<td>30 July 2010</td>
<td>3 years</td>
<td>139,321</td>
</tr>
<tr>
<td>Microsoft licences for software packages used at the AP Vojvodina Government</td>
<td>25 August 2010</td>
<td>3 years</td>
<td>572,128</td>
</tr>
<tr>
<td>ISO 27000 – Initiation of the quality system from the 27000 standard series</td>
<td>28 February 2011</td>
<td>1 year</td>
<td>22,016</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1,483,753</td>
</tr>
</tbody>
</table>

Table IV. Activities implemented to increase security of the information system
This application was tested and put in operation in April 2007. The first electronic session was held on 3 September 2007. Nowadays, the application is used by 300 users. Until present, the total of 216 electronic AP Vojvodina Government and 945 Governmental/Assembly bodies (commissions and committees) sessions have been held, having discussed electronic material prior to AP Vojvodina Government session. So far, the total of 3,997 core documents have been electronically processed in Autonomous Province of Vojvodina Government sessions, while 21,148 enclosures, opinions, additional acts, reports and records have been processed in the sessions of
working bodies and commissions. During the four-year period of its use, the application has been upgraded with new functions and modules in order to adjust it to the users’ needs.

*Portal of the Autonomous Province of Vojvodina public services* – As a single access point for all public services implemented within the public service system of AP Vojvodina, the Portal integrates a number of public services. This portal was implemented in April 2007.

Project of the software system model for managing submission and execution in competitions (for award of fundings) in provincial administrative bodies – The project has defined a software model (UML) for managing submission and execution in competitions for award of funds, implemented in practice by provincial administrative bodies and organisations. The project documentation, in addition to software system model, contains a reference implementation based on components of the open code software. It serves as a basis for the eCompetitions application, whose implementation has been described in the text which follows.

*Application for management of the fleet vehicle* – This application facilitates optimisation in the organisation of travel and transport, thereby reducing the costs, improving the efficacy of the fleet vehicle, increasing the control, reducing the administrative costs. The exploitation of the application began in May 2009.

*eRecords and Archives Office* – *Software for document digitalisation, entry and management*. This application facilitates the creation and preparation of electronic documents for the Records and Archives Office of provincial administrative bodies. The system facilitates an electronic coverage of documents, their electronic distribution, exchange, centralised entry and storage and efficient search. The application supports the digitalisation of analogue documents by means of fast scanners. External users are able to check the status of their documents using the internet and SMS. The application was put in operation in September 2010.

*An Interface software for legal regulations and judicial practice of the Ministry of Justice of the Republic of Serbia service* – The electronic database of regulations and judicial practice is the first official state database of laws and regulations and is one of the essential components of the extensive judicial reform and court modernisation. Provincial bodies pass legal regulations at the level of Autonomous Province of Vojvodina. All legal acts passed by these bodies are published in the Official Journal of the APV. There is a need to enter these documents into the electronic database and make them accessible and searchable in this format by users. The implementation was completed in April 2009.

*Application for managing exams organisation and electronic examination* – *e-Learning system* – It provides a simple and quick access to information and teaching materials, for the purpose of achieving a high-quality transfer of knowledge to employees and external users in various fields. The system supports users’ profiles, facilitates the use of forums and chat-rooms, aimed at interactive exchange of information and discussions on particular topics. The system supports an independent knowledge testing by solving pre-tests that are appraised by the system itself, providing, thus, the automatic monitoring of the user’s progress. The application was put in operation in November 2009.

*e-Competitions* – *Software system for managing submission and execution of fund award competitions* – The eCompetitions software system supports the services for
submission and monitoring, i.e. the overall process of preparation and processing of competitions documents, establishment of commissions and criteria for evaluation, automatic selection of the best bids, preparation of contracts and electronic monitoring of contracts’ execution, as well as closing the competitions (for award of funds).

The application was implemented in two phases. The first phase was finalised in July 2010, while the other was contracted in November 2010.

Software system of public regulations and judicial practice. In provincial bodies, various software systems of legal regulations and judicial practice were used, intended for legal and economic departments, public bodies and other public institutions, where the knowledge of legal and financial regulation is required in everyday activities. The application aimed at accessing the documents of public regulations and judicial practice was deployed in May 2010.

The public electronic service for accessing records from the AP Vojvodina Government sessions. This public electronic service provides the transparency of work of administrative bodies (providing the public with an insight into the work of administrative bodies). The service provides for downloading records, carry out the basic or advanced search of records and some basic reports delivery. The service was put in operation in December 2010.

In addition to all specified activities, the Electronic voting system was implemented for purposes of AP Vojvodina Assembly sessions. All deputies (120 in total) vote by means of smart ID cards. The system was implemented in two phases. Electronic control of a quorum, voting and automatic generation of reports provides the full transparency of the AP Vojvodina Assembly’s work. Technically, the system is fully connected to the system of Radio Television of Vojvodina. The use of the electronic voting system commenced in September 2009.

All applications were purchased through open procedures of public procurement. Because of the variety of suppliers, the obligatory prerequisite for each application included the following:

1. Interoperability with other platforms through open standards.

2. For server and client sides of the applications an open-source based alternative is highly recommendable.

All applications are successfully used and have significantly contributed so far to the quality and efficiency of the Government and public administration in AP Vojvodina.

8. Human resources infrastructure

Civil servants have always resisted the e-Government and introduction of new technologies. Management may play a significant role in creating a positive atmosphere when it comes to changes, by ensuring the adequate training and rewarding those who support changes towards e-Government. For this reason, the activities in the field of human resources were focused on enhancing the civil servants’ ICT capacities. Table VI provides an overview of activities aimed at enhancement of human resources.

The time frame was determined for implementation of the training, step by step. A survey was conducted in all provincial bodies and it was concluded, based on the job description and activities performed, that the total of 878 provincial civil servants are required to use computers and have basic knowledge of ICT.
At the Executive Council session (13/02/2008), it was decided to list the ECDL start or ECDL core, as mandatory prerequisite for posts requiring computer skills, in the job positions documents of all provincial bodies, directorates and services. It was also decided that the first exam taking will be financed by the Government of AP Vojvodina, whereas the candidate will have to cover the costs of any subsequent exam taking if he/she fails any module.

Therefore we launched the ECDL training and certification. The Office for Joint Affairs of Provincial Bodies became the testing centre, which adapted and equipped the classroom for the ECDL training using their own resources. The User Notification centre was established (a special web site was designed on the Intranet, dedicated to the ECDL, which contains all the necessary information and knowledge database used for most frequently asked questions and answers provided by the administrator). The ECDL page was put in operation on the intranet in January 2008. The use of e-learning system was provided, with the database containing the information about courses, trainees and examiners. The application was installed in June 2009, while full operation started in September 2009.

In the period from the start of ECDL training until present, the total of 820 provincial civil servants and employees have attended the training. The passing rate of trainees has been 91.9 per cent. So far, the total of 2778 modules have been taken as exams.

### 9. Coordination and cooperation

For the purpose of coordinating the activities concerning the introduction of e-Government, the Government of AP Vojvodina has co-operated with:
- competent ministries of the Republic of Serbia;
- local governments in the territory of Vojvodina;
- business entities from Vojvodina; and
- scientific and research institutions from Vojvodina.

In addition to cooperation with the previously-mentioned institutions, cooperation was also established at the international level, through the project titled Secure,
interoperable, cross border m-services contributing towards a trustful European cooperation with the non-EU member Western Balkan countries (SWEB) from the FP6 Programme.

10. Conclusion

This paper presents an approach to implementation of e-Government, which was verified by the case of introducing e-Government in AP Vojvodina. Based on the analysis of the situation existing in the APV in the first half of 2005, it was concluded that the level of e-Government development in APV was lagging behind significantly, when compared to the development level of e-Government in the EU countries. Following the example of these countries, in the second half of 2005, the APV e-Government implementation plan was adopted, titled e-Vojvodina as is one of the 14 programmes within the Integrated Regional Development Plan of AP Vojvodina.

The first step in the e-Vojvodina programme was to develop the base projects, as defined in late 2005. The task of these projects was to give a guidelines, but also sufficiently concrete proposal of e-Government development in the AP Vojvodina, aimed at achieving the e-Government development level close to that of EU countries in early 2006 which should create significantly better conditions for future e-Government development. This goal was supposed to be achieved within five-years period and under severe constraints related to existing technical and financial restrictions.

Two competent faculties from the University of Novi Sad – Faculty of Technical Sciences and Faculty of Sciences – played the main role in the develop of these initiation projects. The projects have defined the following aspects of e-Government development:

- Policy and standards for the use of information-communication technologies in the e-Government of Vojvodina.
- Computer and communication infrastructure for the e-Government in AP Vojvodina.
- Information requirements for public services of e-Government and internal administrative services of e-Government in Vojvodina.
- Software architecture for e-Government of AP Vojvodina.

The goal of the initial projects was to ensure:

- Quick implementation of a computer and communication infrastructure capable for serving the administration needs for a longer time period.
- Standardised methodology for specification of e-Government information requirements.
- Infrastructure of standards and software architecture aimed at achieving interoperability and easy integration of the existing and future e-Government software solutions.
- Organisational model for e-Government development.

The results that are achieved based on this approach indicate that the creative leadership, innovative approach and precise goals facilitate speedy development of e-Government.
Based on the initiation projects, the implementation of e-Government in the APV was promptly started. The achieved results in e-Government implementation are as follows:

- The Council for Implementation of e-Vojvodina Programme was established on 15 June 2005, while the Commission for Management of the E-Government Strategy of Provincial Bodies, headed by the President of APV Government, was established on 12 October 2007.

- Backgrounds were created for a parallel development/deployment of different applications of e-Government based on the standardised model of information requirements’ specifications, infrastructure of the software and communication standards, and the adopted software architecture of e-Vojvodina system.

- A high-quality computer and communication infrastructure has been developed, designed to serve e-Government needs for, at least, five to ten years was built in only 105 days time frame. This facilitated the overall replacement of the paper-based internal communication with electronic communication in September 2007. This was the first “externally visible” result of the e-Government introduction process.

- It took 15 months to deploy two representative e-Government services characterised by the service level same as the corresponding one in EU countries. These are the first public e-Service – library service- that was put in operation in late 2006, and the application for management of AP Vojvodina Government sessions, first internal service supporting business process in paperless manner, which was put in operation in March 2007. Afterwards, a numerous public and internal e-Government services have been introduced and the process continues thus increasing the scope and quality of provincial e-Government.

- From September 2008, following the Government’s approval to include the ECDL as a prerequisite for posts requiring computer skills in all provincial bodies, directorates and services, until the end of 2010, the total of 820 employees completed the ECDL training (80 per cent of the total number of the employed) with impressive passing rate of 93,5 per cent.

- The ICT use in administrative bodies has significantly increased at all levels.

- All achievements have been reached within the total budget of 3.5 million EUR.

The results indicate that appropriate managerial and technical backgrounds, careful planning, competent and strict management of implementation plans which are based on precise goals lead to speedy development of e-Government even under the severe financial constraints.

In the course of e-Government implementation, the AP Vojvodina Government co-operated with:

- Competent ministries of the Republic of Serbia, and local governments in the territory of Vojvodina, which participated in planning process.

- Local software industry which took part in the e-Government implementation.

- Domestic scientific and research institutions which have provided support and guidelines for the e-Government development.

- Foreign partners within the framework of the FP6 SWEB project, aimed at advances in e-Government solutions.
The results indicate that the cooperation helps in better understanding of needs and available resources for private-public partnership thus facilitating a speedy development of e-Government that will bring benefits to all partners.

Acknowledgements
This paper is part of the research project “Infrastructure for Technology Enhanced Learning in Serbia” supported by the Ministry of Education and Science of the Republic of Serbia (Project No. 47003).

References


**About the authors**

Milan Paroški holds the degree of MSc in Telecommunications obtained from the Faculty of Technical Sciences Novi Sad. From 1988-2000 he held the position of Senior Telecommunication Engineer in Electrical Power Industry of Serbia at Novi Sad; from 2000-2003 he worked in Public Enterprise for Production of Thermoelectric and Heating Power Novi Sad as assistant to the head manager for quality and information affairs; and currently he is with Administrative and Technical Services Office of The Government of the AP of Vojvodina, where he is taking the position Head of Sector for Information Technologies. His professional experiences cover managerial and technical skills in IT. He published over 60 scientific and professional papers.

Zora Konjović has held the Full Professor position at the Faculty of Technical Sciences, Novi Sad since 2003. She received her Bachelor degree in Mathematics from the University of Novi Sad, Faculty of Science in 1973, Master’s degree in Robotics from the University of Novi Sad, Faculty of Technical Sciences in 1985, and PhD degree in Robotics from the University of Novi Sad, Faculty of Technical Sciences in 1992. From 1973-1980 she was with the Faculty of Science in Novi Sad, and since 1980 she has been with the Faculty of Technical Sciences, University of Novi Sad. She participated in five scientific and more than 30 professional projects; in five she was the project leader. She has published more than 170 scientific and professional papers. Zora Konjović is the corresponding author and can be contacted at: ftn_zora@uns.ac.rs

Dušan Surla has held the Full Professor position at the Department of Mathematics and Informatics, Faculty of Science, Novi Sad, Serbia since 1991 and in 2010 he was given the title Professor Emeritus. He received his Bachelor degree in Mathematics from the University of Novi Sad, Faculty of Philosophy in 1969, Master’s degree in Robotics from the University of Novi Sad, Faculty of Mechanics in 1976, and PhD degree in Robotics from the University of Novi Sad, Faculty of Technical Sciences in 1980. Since 1976 he has been with the Faculty of Science in Novi Sad. He has participated in 14 science projects; in eight of which he was the project leader. He has published more than 200 scientific and professional papers.

To purchase reprints of this article please e-mail: reprints@emeraldinsight.com
Or visit our web site for further details: www.emeraldinsight.com/reprints