Exploring e-Services Development in Local Government Authorities by Means of Electronic Document Management Systems

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Abstract. Estonia is a well-known example of a tech-savvy nation, especially when it comes to e-governance. Here, the government provides its citizens with public services online. Within a decade, the level of pervasiveness and technology acceptance reached a point where interaction between government and citizens is perceived to be a given. An integral part of the e-state is the digitalization of the public sector and, in particular, its basic routines that involve processing of documentation with an enormous amount of data. In this paper, we examine aspects, activities and outcomes of the development of e-services in local governments based on the use of electronic document and records management systems and their further co-existence. We provide an example of one of the Estonian local governments where the implemented conceptual interoperable framework has been validated. Moreover, we elaborate on interoperability solutions.

Keywords: e-services · EDRMS · Local government · e-government · Interoperability

1 Introduction

The foundation of any e-governance initiative presupposes the existence of a sufficient governance structure that operates within a transparent legal and policy framework. The governing entity has policies, processes, and procedures that enable electronic governance to take place – all supported by transparent laws. E-governance is relevant to many different areas such as e-democracy (including human rights, freedom of speech, freedom of information and knowledge) and e-commerce (building opportunities for the private sector). The focus of e-governance in this research is on the process of automating the delivery of efficient and effective government services to citizens. The main focus is on the digitalization of the internal processes of local governments by the implementation of appropriate technological tools that facilitate e-services delivery, increase their quality, cost- and time efficiency, and improve of e-government in general.

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Technological solutions are an increasingly dominating factor in the move towards e-governance realizations. Electronic Document and Records Management Systems (EDRMSs) were among the first software platforms to facilitate the transformation of records management into a digital form. The use of EDRMSs allows to shift the processes inside the institution online and, therefore, is one of the most popular intergovernmental services in e-government projects [1–3]. Putting paperless management as the foundation of e-governance, the digitalization of the work processes of an organization should be an initial step in the transition process. This approach is expected, firstly, to increase the efficiency of work routines in local governments; secondly, to transform services and give current traditionally rendered services a new form; thirdly, to make it easier for organizations to adapt to technological changes.

This paper describes government processes that are digitalized by means of EDRMS tools, which in turn helps to create effective e-services. We will refer to good practices of e-government solutions in Estonia and its regions, where local governments have been successfully integrated into the digital environment by a conceptual implementation of EDRMSs. Within this setting, it will be shown that digitalization of public service activities is closely interconnected with electronic service provision. A concrete example of Estonian local government will serve as a summary of the most important key points and lessons learned.

Already in 2015, document exchange was digitalized to a degree of 97%. This has been the outcome of a survey that has been conducted in order to assess the acceptance of EDRMSs [4].

We proceed as follows. In Sect. 2, we draw the scene by explaining the prerequisites for EDRMSs. Section 3 givers an overview of existing local government EDRMS functionalities. Section 4 explains the importance of interoperability in the operation of governmental online systems by providing an example of EDRMS integration in Rapla County, Estonia. In Sect. 5, we describe the obstacles in the implementation process of EDRMSs. We continue the paper with a discussion in Sect. 6 and finish with a brief conclusion in Sect. 7.

2 Identifying Necessities for EDRMSs

The connection between information governance and the management of organization processes and workflows, along with digitalization, has been a clear trend in recent years. Electronic document management plays an important role in contemporary e-government applications and technologies. The main aim of it in the public sector is to store, manipulate, diffuse, and preserve knowledge in order to achieve the effectiveness of e-governance. Moreover, a flexible and adaptable document management system is needed in order to cope with the modern challenges that authorities and decision-makers are facing. These include issues such as increasing efficiency and quality while decreasing the duration of government processes and providing structure and organization in documentation and related activities of authorities [5]. Document management systems are also used to ease the communication between different parties: citizens, officials, contractors, decision-makers, and others [6].

There is a significant importance of defining standards and regulations in this field in order to maintain the efficiency and transparency of administration activities. Estonia's Government Office has defined regulations on standards, procedures, methods, and products to assist the modern IT-evolution processes [7]. These standards are set to ensure the development of wholesome, authentic and reliable document management and information systems. In addition to Estonian regulations, the European Union project, "Model Requirements for the Management of Electronic Records" (MoReq) defines basic requirements for document management [8]. The list of requirements is very detailed and based on the ISO 15489 standard [9]. In addition to the requirements, MoReq defines criteria for document functions, e.g., workflows, email and electronic signatures. In the case of Estonia, there are many regulations (Public Information Act, active since 2001; Personal Data Protection Act, active since 2003; General Procedural Actions Act, active since 2001; Administration Procedure Act, active since 2002 [10–13], which coordinate the use of electronic document management systems.

It is necessary to mention that now, with the introduction of EU GDPR and the eIDAS regulation, countries are obliged to take necessary measures in order to comply with new rules. This, in turn, directly affects the sphere of electronic document management and related elements and requires a thorough revision of the entire process of data gathering, processing, exchanging, storing, etc. It is expected from all involved parties to align their policy, legislation, rules, and procedures to these regulations; which is expected to lead to the creation of the digital single market, a harmonization of data privacy laws.

2.1 Using EDRMSs for Facilitation of e-Services Delivery

As a part of the transition to e-government, shifting public services to the digital environment has undoubtedly been an integral process. Going further, paperless management provides transparency to both transition processes and decision-making processes. Linking the development of e-services with the work processes of EDRMSs has been a logical step, as according to the Public Information Act, all authorities have to maintain their documents registries electronically. In recent years, EDRMSs have become more important as an informational environment for activities and decisions of organizations. In our Estonian example almost, all cases of service provision presuppose the preparation of an administrative legislation for a specific application [14]. In the past, decisions for a service provision request have been made entirely outside the EDRMS, so that only the final decision could be submitted and notified, e.g., the issuance of a building permit. Today, the entire request processing, from initiation to completion, is handled within an EDRMS.

While moving towards e-services and paperless management, the traditional ways of providing public services to citizens should remain available, as we will never reach a level of full digitalization where citizens communicate with authorities exclusively online. Multiple ways of accessing services from the government should be offered. However, if we yet again speak about delivering a service to a citizen offline, the part of the process that is being carried out on the side of the government should be digitalized.

Looking at e-services in a wider perspective that captures not only the public but also private sector, a difference in the approach to the design, implementation and delivery of services can be discovered. The digital environment has opened an enormous range of opportunities for service providers and manufacturers to bring services and products along with a new quality, value and experience. The domain of customer relations and customer satisfaction has come in front as an essential factor of influence. Shankar et al. defines two types of customer satisfaction both for online and offline environments, which are service encounter satisfaction and overall satisfaction. The first one is transaction-specific and the second one refers to a relation-specific one, mainly having a cumulative nature [15]. Both of the types are applicable in the sphere of public e-service provision and each attribute of service delivery will reflect on the overall level of citizens' satisfaction and in turn will have a long-term effect on the success of e-government.

2.2 Re-engineering Business Processes in Local Governments

The aim of a process optimization is to resolve complex challenges and improve a product, service or a process [16]. Relatively little is known about the application of business process modeling concepts in the public sector as there is so far not much attention in this area of research. However, there are findings, for instance, reported by Gulledge and Sommer, that confirm positive effects of process optimization in public sector based on documenting the existing processes, managing them by means of measuring and optimizing, and improving the products or services itself [17].

In this perspective, using the vocabulary and terminology of the domain of process optimization, e-government services are usually thought of within the strategy discipline of operational excellence that is focused on efficiency, streamlined operations, supply chain management and high volume [18]. The choice of such value discipline is seemed to be evident as the product in case of the public sector is the service which is standardized, and not customized, required to be provided continuously.

The process of paperless management implementation entails a wide variety of business processes that ideally fit the purpose of continuous improvement carried out in phases. Moreover, embedding technologies and innovative solutions like EDRMS and e-government, in general, serves as a driving force for organizational changes and justifies the necessity of re-engineering business processes into more time- and cost-effective models. It is essential to ensure that while the processes will be re-engineered and updated, the internal change is also going to be thought through. Not only acceptance of technologies matters on the side of end-users, i.e. citizens, but also public-sector workers. Here, officials on the one hand are a part of the process that is being improved, and on the other, are users of technologies as well.

However, it should be taken into account that it is not always the case that each and every procedure has to be transferred to digital environment. For instance, if one application is submitted on the citizen end, in order to process this request on the government end electronically, it may require a chain of multiple queries to be executed and forwarded to multiple entities' databases [4]. That way, it should be realized that there can be easy and difficult implementations, and several options to improve those processes can be used for that purpose.

3 Overview of a Local Government EDRMS

75% of Estonian local governments use EDRMSs. The most commonly used EDRMS is Amphora by Interinx Ltd.

To date, most of the public services are electronic and linked to EDRMSs.

Submission of a service request can be performed via different channels and environments, but regardless of form of request, all processes and activities related to handling this request start in EDRMSs that facilitate efficient workflows.

Before EDRMSs have been rolled out, records management in local governments was mainly paper-based.

The development of the EDRMS Amphora started in 1998. Its main goal was to develop software that would enable public sector organizations to implement paperless document management. First steps towards it consisted of developing a software that would allow for implementation of paperless management in public sector authorities, and this proved to be a challenging task as the efficiency and realization of the system were constrained. EDRMSs have started to spread out rapidly in 2006–2007 when the primary rules and principles for implementation of paperless management were introduced. This brought EDRMSs to many other projects at the state level allowing to become also interoperable with other EDRMSs due to the opening of Estonian Document Exchange Center (DEC). Moreover, the EDRMSs, in particular Amphora, were integrated with the Estonian Citizen Portal (a one-stop-shop portal of public e-services). This was a beginning of electronic applications usage as a part of e-services in Estonia.

3.1 e-Services Used in Estonian Local Governments Based on EDRMS Functionalities

Next, we will delve into an example of e-services provision based on an EDRMS used in one of the counties of Estonia, i.e., Rapla. The case presents the application of e-services linked to the EDRMS and Citizen Portal, and the development of assessment criteria for measuring the digital performance of the local government where the mentioned functionality operates.

The entire process of implementation and integration of the EDRMS has been carried out on the basis of the e-LocGov model, a framework for the implementation of e-government solutions in local governments. The e-LocGov model consists of a technological part and a (change) management part. The technological part includes EDRMS with the required integration for implementing local government systems. The management part includes a methodology of how to carry out the transformation into a new platform. The e-LocGov model addresses: (1) state-level readiness; (2) organizational readiness; (3) transition methodology; and (4) assessment of feedback, statistics, and impact, which are an imperative part of the framework for the transition of local governments into e-governance.

As already mentioned in Sect. 2.1, when handling a request for service provision, a set of administrative legislation documentation is presupposed. In order to ensure proper implementation of an EDRMS, the first decision to make was identifying what e-services should be linked to the system. Hence, a total of 24 most important e-forms

has been developed and implemented in Rapla County. In cooperation with the workgroup from the local government, the necessary data descriptions for each selected service were prepared and created as forms. This process was coordinated with the representatives of local governments who approved the final dataset. The main shortcoming was the lack of a common repository for describing the services. Moreover, the entire process of evaluation and description was relatively time-consuming (Table 1).

Table 1. List of developed e-forms

Name of the application	Fields before	Fields after	Integration with state registries
Application for childbirth	21	19	Yes
Application for the admission to 1st grade	16	16	Partial
Application for the kindergarten	25	23	Partial
Application for freeing of property tax	21	19	Partial
Application for property excavation	18	17	Partial
Approval for positioning drill hole location	27	27	Partial
Application for guardianship	32	32	Partial
Application for placement in nursing home	24	22	Yes
Application for detail planning of property	31	29	Partial
Application for public event organisation	22	20	Partial
Withdrawal of organised waste transportation	16	16	Partial
Application for funeral benefit-support	15	12	Yes
Application for compensation of travel expenses	24	23	Partial
Application for building planning	29	24	Partial
Application for registering a pet	25	22	Partial
Application for nursing compensation	23	23	Partial
Application for school attendance	20	16	Partial
Request for information	11	11	Partial
Application for project initiation	21	21	Partial
Application for land/property division	24	21	Partial
Application for social benefits	18	17	Partial
Application for property tax exemption	19	19	Partial
Application for advertising space	17	15	Yes
Application for compensations of recreational activities	18	16	Partial

After the project, the citizens had the opportunity to obtain the necessary applications from the Citizen Portal or through the website of the local government. After filling in and submitting the application, it was received in the implemented EDRMS where further procedural processes were initiated.

4 Interoperability as a Basis for Seamless e-Service Provision

An EDRMS cannot exist as a central system that provides services to an organization as an independent unit. In order to ensure a complete paperless management, the internal and external systems of an organization have to communicate based on an interoperable solution [19]. In Estonia, the integration of EDRMS with other IT solutions has been a growing trend. The exchange of data between software helps to save money and time that is otherwise spent on preparing transcripts, copies, and reconfiguring data. Information management in a common system with the cross-usage of data allows for better monitoring of the procedural steps.

The cross-usage of data between different systems is an important future perspective that allows re-using data and optimizes the time spent on data entry. EDRMS must be able to offer the intermediation of such communication because the dataset inserted there is essentially the same as the data in the main state registries. While running various projects aimed for establishing paperless systems in local governments, the interoperability of the EDRMS system has been the main focus for offering an interface for intermediating communication (automatically generating the requested data into the document form) with different state databases. In order to integrate EDRMS Amphora with other systems, it is possible to use different protocols and technologies: http, https, get, post, WebDav, SOAP, XML-RPC, Twain, IMAP, POP3, SMTP, SSL, LDAP, etc.

4.1 Managing Business Processes via Interoperability Functionalities

This subsection is ought to give an understanding of the role of interoperability when it comes business processes where the involved parties operate based on heterogeneous technologies.

Over several years, numerous integrations have been developed on the basis of EDRMS, e.g. interfaces with national registries, financial software and personnel software, etc. Information management in a common system and cross-usage of data allows for better monitoring of the procedural steps.

Figure 1 depicts a concrete example of a workflow and cross-usage of data carried by multiple organizations.

The information moves between the systems on the basis of a set of agreed-upon rules of metadata in the XML format. In this case, the scheme shows how an interface functions and enables interaction between EDRMS and a finance management software (among the solutions that are aimed at local governments).

A unified finance management software has been used by more than half of the local governments in Estonia. For verifying the data descriptions, the e-invoice

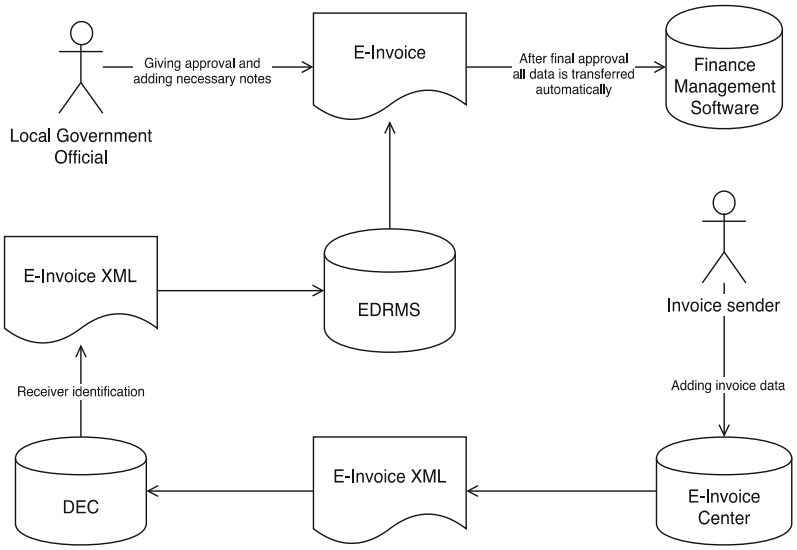

Fig. 1. The invoice handling process between finance management software and EDRMS

standard developed by the Bank of Estonia is used, and the items of the invoices are transmitted between the systems.

There is also an interface with a finance management software, wherein the interface is still based on the XML-invoice that conforms to the Estonian e-invoice standard. It was adapted to the finance management software's invoice base, in order to enable exporting the XML-output that conforms to the Estonian e-invoice standard and importing it to the finance management software's databased. The communication between the systems is carried out in both directions – EDRMS is being updated with regard to the dimensions and suppliers of an invoice, and EDRMS sends the items of an invoice to the finance management software's database. This functionality permits to digitalize all incoming invoices and process them in the digital form. Analogous practices can be found where digital invoices are used in the public sector elsewhere in the world. A data exchange channel that has been developed in EDRMS is the interface for communicating with national registries where gateway functionality facilitates creating different get and post requests when using web services and linking those to other systems. Inside an institution, there are several information systems where the organization-related information is managed. In addition, there was a need to develop an interface in EDRMS for communicating with a personnel software Persona, whereby a document that is registered in Persona is sent with its content and metadata to EDRMS. Many smaller local governments can manage the personnel-related documents directly in EDRMS and the financial software. In addition to the above-mentioned interfaces, EDRMS communicates with DEC and Service of Official Documents (SOD) that permit a fully electronic exchange of documents between local governments and citizens. The re-use of already existing data is inevitable in order to save time when processing the information and eliminating the data entry mistakes.

It is necessary to mention once again the eIDAS regulation that in this context is also relevant and urges to introduce necessary changes to enable as well the cross-border interoperability of e-services.

5 Obstacles to EDRMS Implementation

Although various technological solutions have been developed, several shortcomings still hinder their wider use. One of the main shortcomings is implementing the new solutions as their application requires a significant amount of financial and human resources. It has become evident that all technological solutions (not only EDRMSs) targeted for local governments should be described on the basis of a harmonized format and methodology. The solutions applied in local governments need to be described by employing consistent principles. It is important to consider communication and interoperability with other systems. This would ensure cooperation between the various local government and state systems. The integration of government information resources and processes, and ultimately, the interoperation of an independent government information system appear essential [20].

Another issue related to interoperability of involved entities is the excessive complexity of administrative business processes (Sect. 2.2). In addition, developing new duplicating systems should be avoided. A more efficient integration of existing solutions would entail resource savings for all parties. This creates an increased necessity for integrating the various IT solutions employed in the work of the institutions upon the transformation from one governance model to another. That in turn changes the existing work processes from the perspective of handling surrounding information and knowledge, amongst others. Given that e-government services extend across different organizational boundaries and heterogeneous infrastructures, there is a dire need to manage the knowledge and information resources stored in these disparate systems [21]. A customized and thorough knowledge management strategy is required. In this sense, knowledge management also serves as an important component when it comes to optimization of business processes (Sect. 2.2) that ensures effective use of information and resources within organization creating added value. Distinguishing and understanding business processes allows for description of information architecture, business process models and working procedures. Consequently, it becomes then possible to describe also roles and responsibilities of employees, apply efficiently their skills, knowledge and experience.

6 Discussion and Related Work

The developments of the information society over the past decade have resulted in inevitable changes. The decision-making processes that have often been static and unwavering have had to evolve and adapt in the light of new principles. Expanded social networks have reformed the interaction between local governments and citizens which are now infinitely more interactive. Digital channels are open for interaction, which could not have been foreseen years ago. The administration of a local

government or the use of services by citizens from any corner of the world is becoming a reality. Along with ICT, the tendency in the last few years has been to develop and apply a competence-based governance model. The most widespread approach is the creation of the ICT capacity and competence base, employing people and their knowledge as software.

As mentioned above, in the past there were no appropriate IT solutions for launching paperless management. Today, however, major parts of IT systems for supporting transition into e-governance have been developed.

Citizens can use different e-services and participate in the decision-making processes of local governments. They are more aware of the possibilities of how to monitor the work procedures of local governments. Conditions have been and are being created for citizens to use services and obtain information from local governments by using different channels. Extensive use of EDRMS gives the opportunity to move communication to a faster level of consuming services and information. Nevertheless, the extent of that use is left to be decided by the local governments: whether to follow the legislation with its minimum requirements, or to create opportunities for implementing the participatory democracy on a larger scale.

The growth of citizen satisfaction is tied to the growth of the digital performance of local governments. The higher the digital performance of a local government, the more possibilities the citizen has to take advantage of the services. According to Accenture eGovernment Report, the goal for e-government now is to tailor service delivery to meet the needs of the citizens, as opposed to approaching it from the government side [22]. During the application of e-governance possibilities, there are contradictions between requirements arising from rules and standardized work routines, and from using progressive ICT tools. The implementation of paperless management and digital document work proceedings has to be facilitated by the rules and instructions described on the state level wherein several problems still require solutions in order to reach a wider assessment of the synergies and cooperation between local governments and the state.

The application itself does not only entail learning the software components. It is also necessary to change one's thinking by implementing renewed work routines. User acceptance of intergovernmental services is an important factor [2]. People are afraid of changes and becoming replaceable. They are not confident about the accessibility of the technology. On the one hand, according to Bannister and Connoly [23], the expectation that technology-enabled change has the ability to increase the trust of the citizens, thereby transforming government, may be too high. However, having a solid foundation provides a good start for bridging that trust gap [24].

Coming back to the case of Estonia where public sector is successfully functioning online and has gained citizens' trust, it is planned to bring public service provision to next level. A proactive and automated service provision is expected to be beneficial to government in terms of improvements in workflows of organizations, cost- and time efficiency.

7 Conclusion

As a part of the transition to e-government, paperless management can enable the creation of e-services that allow for fully digitalized digital interaction between citizens and local governments. The case of Rapla County in Estonia and its results proves the potential of EDRMSs for improving the technological and organizational performance of local governments, which in turn facilitates better service provision to the citizens. Upon its implementation and further development, the developed framework leads to a more effective local government and increases the efficiency of cooperating with citizens and enterprises. However, in order to ensure the success in establishing such systems, a huge implementation effort is needed. In case of Estonian local governments, a systematic implementation methodology was used. We consider that the most important lessons that can derived from Estonian experience are: development and utilization of interoperability solutions that enable communication and data exchange between entities, continuous improvement of processes as well as continuous feedback.

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