**INTRODUCTION**

Several initiatives have been launched in many countries with the aim of modernizing public services. In this sense different reports and documents have indicated the need for investing in technologies to offer better services to citizens and organizations (Department of Public Expenditure and Reform, 2011; United Nations, 2012) and thus reduce the burden for them. This trend is named “electronic government (e-government),” and it can be defined as the “the use of information technology to enable and improve the efficiency with which government services are provided to citizens, employees, businesses, and agencies” (Carter & Belanger, 2005).

Although several countries have improved their services through the use of more sophisticated Web pages, according to the Department of Public Expenditure and Reform (2012), countries still need to introduce more technologies and automated processes with the aim of reducing the burden of processes currently needed for citizens and organizations. In several public processes the citizens and organization must present physical documents that are delivered manually from one section to another, sometimes producing delays in the delivery due to human causes such as illness, oversight, or overwork of the public worker. By means of automated processes, this documentation is immediately available to the next section or administration in the business process once the documentation has been analyzed and completed by the corresponding section or administration. In this sense public bodies must ensure that the sharing of data between different public organizations provides a reduction in the number of times citizens or businesses must ask for data.

Dealing with the objective of streamlining the public processes needed for citizens, the inclusion of business process technologies may allow some of these processes to be carried out electronically, avoiding the “passing of paper” between several public workers. In this line Strykowski and Wojciechowski (2012) indicated the need to increase the quality of public service execution by introducing a fundamental change in the way public administration works. Moreover, they stated, “In the case of public administration, such procedures are primarily associated with information processing, which is perfectly suited to be taken over by computer systems.”

Business process management (BPM) consists of the analysis, design, implementation, and monitoring of business processes that allow the design of intra-organizational and cross-organizational processes. According to Muehlen and Indulska (2010), “business processes are logically ordered sets of activities that produce a result of value to the customer.” Some BPM tools may help public administrators to model the internal processes as well as deploy them in a platform. These tools usually support a graphical notation and standards with the aim of designing the processes. Although several notations have appeared throughout the years, such as business model language (BML) (Johannesson & Perjons, 2001), recent trends focus on the use of business process model and notation (BPMN) (BPMN link).

To model the processes of an organization, communication is needed between several departments and sections. Moreover, this communication is quite crucial when processes involve different organizations. In addition, the people involved in these designs do not have to be aware of deep issues of the selected technology; instead, easy graphic tools can be used, allowing all responsible parties to design the right process prior to the implementation. Therefore, the introduction of these technologies should be associated to an organizational methodology.

Among the most important open source tools we can find for modeling and developing business processes, we highlight the following: Bonita BPM, Intalio BPMS, and jBPM. The integration of these technologies involves the use of service-oriented architecture (SOA), which also implies a change in the development of applications. As well as the processes that must be designed, analysts must design services to be reusable for the different processes. Thus, service design is also an important step in the adoption of BPM.

The University of Murcia is a public entity that started the convergence to e-government in 2005, when its master plan “Towards E-Government” was created. Among the goals of this plan is the integration and redefinition of a number of existing administrative applications toward more streamlined operations.

Some challenges were initially found due to the legacy systems and the number of vertical applications for different departments of the University. After a first analysis, procedures from different areas of the University were inconsistent, making it difficult for electronic office personnel to streamline procedures and sometimes to support the varying procedures that strained the system.

These challenges influenced the motivation for developing a new architectural infrastructure based on SOA paradigm from previous years. Several e-government services have been implemented, such as Digital Signature, Registry, Record Management, and Notification.

Currently, the University of Murcia has the software infrastructure ready to move forward, including a new stage where the business process management paradigm would be applied. However, the adoption of BPM is not just to choose a BPM suite (BPMS) and apply it; it also requires the adoption of a methodology that involves all process participants.

The aim of this chapter is to present a methodology for integrating e-government business processes over the software-oriented architecture developed at the University of Murcia. Due to the open source strategy the University of Murcia collected in its master plan, the software tools used for developing business processes must be open source. Therefore, we will also depict a comparison between the most important open source tools for BPM, as indicated by the one selected at the University of Murcia.

This chapter is structured as follows. In the first section we introduce our work. The second section describes the background in business process and e-governance carried out in public administration. In the third section we analyze prior works related to the adoption of e-governance at universities. Then we review the most important technologies for designing business processes, dealing as well with a comparison with some existing tools, such as Bonita BPM and Intalio BPMS. The fifth section describes the methodology designed at the University of Murcia for dealing with the automation of existing processes, and after that we comment on the lessons learned from this methodology. Finally, we offer our conclusion and look to the future as it relates to this work.

**BACKGROUND**

The integration of e-government in public administration involves crucial changes not only in the use of technologies, but also in the culture of people (citizens, business, public workers, etc.) influencing the collaboration between citizens and public administration, as well as the collaboration between several public administrators (Weerakkody et al., 2011). The adoption of e-government in different countries has been promoted by important organizations such as the United Nations and the European Union (EU).

Reviewing the literature, we can find several works related to the research, results, guidelines for introducing e-government, and evaluations of current e-government adoption in different countries (Chatfield, 2009; Collins, 2009; Tsai et al., 2009; Rose & Grant, 2010; Weerakkody et al., 2011). The integration of e-government has involved changes in the laws of several countries (Walser & Schaffroth, 2011; Concha et al, 2012; Estevez & Janowski, 2013. More specifically, several countries have created laws and norms for supporting and dealing with novelty issues such as the management of electronic documents, electronic signatures, or the validity of these signatures. Spain offers a good example (BOE, 2007).