

The Portuguese iAP Services Platform as a Building Block for User's Centric Information Systems

The Case of the Higher Education Institutions

Arsénio Reis¹, Jorge Borges², Paulo Martins¹ and João Barroso¹
¹INESC TEC and University of Trás-os-Montes e Alto Douro, Vila Real, Portugal
²University of Trás-os-Montes e Alto Douro, Vila Real, Portugal

Keywords: Information Management, Information Systems, Performance Evaluation, Software Engineering, Higher Education Institutions, iAP.

Abstract: Higher education is a complex business including very different process. At its core are the teaching and research processes and along the edge of the business model are the administrative processes, targeted to the students and alumni. Some of these processes translate into services that must be available during the whole life of the users and the institutions. For example, a higher education institution is expected to issue diplomas during the whole lifetime of its former students. In this context, we've been working in order to use the current e-government infrastructure of electronic services as building blocks for some of the features of the higher education institution electronic services. This work proposes the adoption of a set of those services. We've concluded a successful testing stage and expect to deploy a full production system very soon.

1 INTRODUCTION

In this works we explore the usage of the Portuguese national public administration interoperability framework and services (iAP) as a building block to support the development of the information system (IS) of a higher education institution(HEI).

1.1 Higher Education

Higher education has a very specific business model, as it provides a public service of education and research, while keeping an extensive autonomy from the public administration rules and hierarchy. In fact, HEI are fully autonomous in regard to their IS implementation, software solutions and providers. Another distinctive issue is the market size for HEI, which is small, when compared with other economic sectors, e.g., logistics, health (Ramos et al, 2017; Santos et al, 2014), commutations, etc, creating a sustainability barrier for the software suppliers to develops specific solutions to such market. For these reasons, some HEI use software systems adapted from other markets, e.g., financial management, procurement, human resources management, etc, and develop other solutions specific to the HEI processes,

e.g., student management, scientific documents management, etc. (Reis et al, 2013; Reis et al, 2017; Borges et al, 2017).

The HEI have the responsibility to provide some services for an unlimited time, mostly related to the certification of the former students' academic achievements. On a typical scenario, previously to the electronic services, a former student would access the HEI academic bureau to request a certificate, and the bureau staff would access the HEI archives and produce the certificate according to the information retrieved from those archives. With the introduction of electronic services and electronic documents, the student management progressed in a similar manner to the customer relationship management (CRM) on other sectors, and the students' related processes are now fully supported by digital systems. Considering the "forever" time frame and the ongoing technological evolution and uncertainty, there are some issues to be address, e.g., how to authenticate the former students, or how to send them documents. These problems are common to all the public administration services, which deals with citizens older then the digital era, and might be solved by using public joint solutions.

Other sectors, namely the national health care has successfully created user services, composed by several cooperating systems (Rocha et al, 2017; Reis et al, 2016).

1.2 e-Government

The Portuguese government has developed an e-government program since the early nineties, encompassing several initiatives, including: development of broadband infrastructures; electronic access to the public services; and services digitalization. This has been a global trend for states and governments to develop a new form of relation with their citizens (Montargil et al, 2017; Esperança, 2016). For this purpose, a specific governmental agency was created – the Agency for the Administrative modernization (AMA), which coordinates the major modernization initiatives. Two major products of these initiatives are the Portuguese national citizen card (CD) (Cartão de Cidadão, 2017) and the citizens web portal (PC) (AMA, 2017; Portal do Cidadão, 2017). The CD is an id card that every citizen must hold, which includes the citizen identification numbers for civil identification, social security identification, financial identification, and health identification. The CD, illustrated in figure 1, also has a chip, containing electronic certificates that provide electronic signature and authentication features. Recently it was also included a mobile device association, granting mobile based authentication (Almarabeh, T., & AbuAli, A., 2010; Cartão de Cidadão, 2017; Gupta, M. P., & Jana, D., 2003).



Figure 1: The Portuguese Citizen Card (source: <https://www.autenticacao.gov.pt/o-cartao-de-cidadao>).

The PC is a web portal on which the public administration services are provided and includes several other features useful for the citizens relationship with the national administration (Mateus, 2008).

1.3 Interoperability in the Public Administration

The success of the implementation of the e-government paradigm is greatly dependent of the ability of the public administration services to interoperate between themselves, in order to seemingly provide meaningful services to the citizen, according to a well perceived model, e.g., life events. This paradigm is being exhaustively revisited and updated on other works related to artificial agents that act on the user behalf (Reis et al, 2017a; Reis et al, 2017b; Reis et al, 2017c; Paulino et al, 2017).

To further address the interoperability issue, the AMA has created the iAP – the interoperability in the public administration, which is a central services platform devoted to provide the public administration with a tool for systems interoperability (iAP, 2017). The iAP's main objective is to make available the necessary shared tools for systems interconnection, identity federation, authentication providing, messaging, payments, etc. With these tools, it should be possible to compose and deploy multichannel electronic services, clearly aligned with the citizens and companies needs, in an agile and economic way.

So, included in the iAP are seven services:

- (i) Integration platform, providing the features for the creation of transversal electronic services;
- (ii) Authentication provider, which can be used to authenticate users with the CD;
- (iii) Payment platform, which provides electronic payments features for different access channels;
- (iv) Short messages (SMS) gateway, which allows the secure exchange of SMS messages with the citizens and the public administration departments.
- (v) Qualified Electronic Signature using the CD;
- (vi) Professional attributes alongside with the electronic signature;
- (vii) A Personal Citizen folder for document in the citizen web portal.

2 A PROPOSAL FOR HIGHER EDUCATION

In this work we developed a proposal towards the usage of the iAP services by the HEI. We identify a set of electronic services for which the iAP could

contribute as a building block and that have an administrative nature.

a. HEI Services and iAP Services

The HEI services to use iAP are:

- Student registration;
- Student and alumni authentication;
- Payments of administrative fees;
- General contacts;
- Certificates electronic signature;
- Document sharing.

The services should use iAP as follows in the next subsections and resumed in table 1.

Table 1: HEI and iAP Services.

HEI services	iAP
Student registration	Integration platform Authentication provider
Student and alumni authentication	Authentication provider
Payment of Administrative Fees	Payment platform
General Contacts	Integration platform
Electronic Signing of Academic Certificates	Citizen card (qualified electronic signature using the CD; professional attributes alongside with the electronic signature)
Document Sharing	Integration platform (personal documents folder)

i. Student Registration

Regular students’ registration occurs at the beginning of the academic year and it is a very important mandatory service for the first-year students, who don’t have credentials from the HEI nor have a previous knowledge about the electronic systems to make their online registration. A good option would be to have the registration process publicized and available on the Citizen Portal (PC), so a student can use a well-known platform – the PC – with a secure and reliable authentication method as well as a well-

known electronic address. This service would use the iAP’s integration platform to provide and integrate the registration system in the PC’s services catalogue, as well as the iAP’s authentication provider to authenticate the user and forward its id to the registration system.

ii. Student and Alumni Authentication

For the current era students, the authentication from iAP can be provided as an alternative, secure and reliable method of authentication. For the alumni, who don’t have an electronic id issued by the HEI, or just don’t remember their credentials from times when they were students at the HEI, the usage of the authentication from iAP is a very good option, as they can gain access to the HEI services platform using their citizens credentials as they do with other public administration services.

iii. Payments of Administrative Fees

The students are subjected to several types of payments, including the tuition fees and other administrative fees, e.g., diploma issuing. The usage of the iAP payment platform is advantageous for the students because it provides a well-known method, as well as for the HEI because it comes with the service assurance of the Portuguese public administration on several regards, e.g., security, legal compliance, well-known interface, etc.

iv. General Contacts

The general contacts of the HEI can be integrated on the PC catalogue, so the HEI can be searched for and found as any other public administration department. The HEI can be contacted directly from the CP. It is used the iAP integration platform feature.

v. Electronic Signing of Academic Certificates

The academic certificates issued by the HEI can issued as electronic documents and electronically signed by the proper responsible using the citizen card, which has a particular feature for an HEI’s staff member to digitally sign a document including his personal id and his professional role at the HEI. It is a very important iAP’s feature, as the HEI has immediate access to a reliable nationally deployed infrastructure of personal digital certificates. All the documents from the HEI can be digitally signed and their authenticity verified using the iAP.

vi. Document Sharing

As part of the integration platform, the iAP provides a personal documents folder for each citizen so the public administration can store the documents issued to the citizen. The HEI can use that personal folder to store the students and alumni personal documents, e.g, diploma, certificates, etc. The student can then use the folder to share the documents with other departments of the public administration as needed.

3 IMPLEMENTATION

This work's approach to the usage of iAP on the HEI is being implemented by the University of Trás-os-Montes e Alto Douro. The implementation work is part of the OO@UTAD project, financed by the Agência da Modernização Administrativa (AMA). The preliminary technological tests have been successfully executed and the full production will soon be available.

4 CONCLUSION

This approach introduces the usage of e-government infrastructures by HEI, on which the administrative processes are treated in the context of the relationship of the citizens with their country's public administration. Particularly for alumni or future students, the approach simplifies their interaction with the HEI, as they use the same tools and process that they use with other public administration services. For the HEI it provides a reliable set of services and infrastructure, with a life cycle properly assured by the government. We have successfully tested the software and the feasibility of the concept. Only with the production deployment it will be possible to evaluate other issues related to the acceptance and usage of the iAP services as well as to the management of the life cycle of the systems using iAP.

5 FUTURE WORK

At the current stage, the future work will be a production deployment. There is a particular care, on which we are currently working, which is related to the maintenance of the HEI's systems life cycle without interference from the iAP services life cycles. It will be developed a software abstraction layer,

acting as a stub for the iAP services, so the HEI systems can be independently managed.

The assessment of the users' experience will be very important to access the true success of the approach.

ACKNOWLEDGEMENTS

This work was supported by Project "SAMA OO@UTAD", number: 021970, operation code: POCI-02-0550-FEDER-021970, financed by the Program COMPETE 2020, Portugal 2020.

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