

# Architectural Representation of the Portuguese Government Interoperability Platform

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**Keywords:** Enterprise Architecture, Public Administration, Interoperability Framework, Architecture Description.

**Abstract:** The Public Administration aims to provide services through a single digital point, improving the citizen's digital journey. To achieve this goal, the public administration developed the public administration interoperability platform. This platform makes it possible to provide shared services between various entities, the provision of services. The purpose of this work is to the Portuguese Public Administration Interoperability Platform and to assist in decision-making for stakeholders about its usage and evolution by its internal and external. Views are modeled in ArchiMate and using natural language through the architectural description to understand what the public administration interoperability platform is. To reach the desired goal, the universe of discourse is analyzed and a rigorous classification of the concepts ArchiMate.

## 1. INTRODUCTION

The development of e-Government (e-Government) and the creation of the electronic public administration (e-PA) are concerns and action priorities of governments in different countries. The objective is to make the Public Administration (PA) more effective, more efficient, more transparent, citizen-oriented, and capable of offering higher quality services. Achieving this transformation requires policymakers to begin to focus on developing interoperability strategies. Interoperability is, by definition, “an ability to exchange information and use the information exchanged with each other” [1].

Information technology (IT) makes it possible to obtain an interoperable electronic government. The PA has been developing autonomous and independent systems and processes [2]. These systems and processes are created by each public agency focused on internal needs. Each organisms used different technologies. There is no concern with communication between the different systems or consistent with the exchange of information making electronic government very hard to accomplish. In recent years, governments started to give more importance to IT, which allowed the beginning of the development of e-governments. Thus, a new operating paradigm was created for the PA, allowing it to be more oriented to the needs of the citizen. With this new e-Government paradigm, it became possible to offer transversal public services, allowing the involvement of several organizations. This new paradigm aims to have public services always available in different channels. In Portugal, from the 1990s onwards, the PA reformed [3], giving rise to interoperability systems. In 2003, the work began on the development of an interoperability model, the e-Government Interoperability

Framework (e-GIF) [4]. And in 2007, the Public Administration Interoperability Platform was created [5]. The interoperability platform (iAP) is a platform that facilitates the management and improves communication between services [5]. This platform guarantees the secure exchange of information between different entities.

The Citizen's Card Life Cycle (CVCC) is an example of the exchange of information between different bodies. It is the iAP that handles CVCC communications safely and efficiently. that supports processes involving organizations and systems developed in different technologies, from different sectors, such as Justice, Health, Social Security, Finance, and Internal affairs.

### 1.1 Objectives

Due to the growing complexity of the exchange of information between different entities and the little information available about the interoperability platform, this dissertation aims to compare views and verify if there are misalignments between the information that AMA generates internally and that it exposes to the public. Another objective is to model the iAP AD. To help stakeholders understand the value of the iAP to the business, to be able to make management decisions around the iAP. To obtain the objectives, it is necessary to answer a set of questions:

- ❖ Who are the main classes of stakeholders relevant to the iAP?
- ❖ What main concerns do these classes have concerning the iAP?
- ❖ What are the main views to consider for supporting these stakeholders:
  - Promote an informed understanding of the iAP?
  - Make informed decisions about the future of the iAP?

For these last two questions, it is necessary to keep in mind another set of questions:

- ❖ Who are the iAP platform actors? What roles do they have?
- ❖ What services and processes does iAP have?

## 1.2 Research methodology

The paper is based on the *preliminary* phase of TOGAF ADM [9]. It is at this stage that it is possible to determine the organizational context that allows conducting AD. This methodology consists of three parts, the “preliminary”, the practical research, and the conclusion. The practical research is comprised of a set of sprints, which are iterated until a clearer understanding of the iAP is gained. Paper organization:

- ❖ *Preliminary Step* – This step corresponds to the description of the work context, motivation, objectives, and theoretical research developed.
- ❖ *Practical Research Step*:
  - *Source Data Collection Step* – In this step, information is collected to analyze the universe of discourse.
  - *Analysis of the Source Data Step* – In this step, it intend to objectively analyze the universe of discourse and model this analysis in ArchiMate and in natural language.
  - *Results Step* – In this step, possible misalignment between Agency for Administrative Modernization (AMA) public discourse and the rigorous classification of the concepts in question in the ArchiMate language is identified. This section aims to detect concepts that can improve AMA discourse.
  - *Validation (AMA) Step* – This step corresponds to the feedback obtained by the AMA about misalignment.
- ❖ *Conclusion Step* - This step mentions limitations, contributions, and future work.

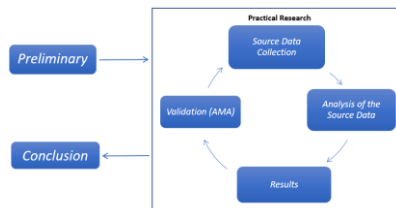


Figure 1: Paper Research Methodology

## 1.3 Document structure

The paper is divided into eight sub-sections. Section 1 presents the work context, objectives, and structure of the article. Section 2 explores theoretical concepts such as ISO 42010, Zachman Framework, TOGAF, ArchiMate, which will be used to develop iAP AD. Section 3 presents existing interoperability initiatives at the European and national levels. Section 4 discusses the information collected to create the universe of speech. The research is carried out based on documentation provided by AMA, publicly available documentation, and found documentation. Section 5 corresponds to modeling the universe of discourse. Modeling is realized in ArchiMate. Section 6 responds to the identification of the misalignment and the feedback obtained by WADA. Section 7 indicates the conclusion of the article. Section 8 is the bibliographic references of the article.

Sections 1, 2, and 3 correspond to the first part of the methodology, the preliminary. Section 4, 5, and 6 correspond to

the practical research. Finally, section 7 corresponds to the third and last part, the conclusion of the paper.

## 2. ENTERPRISE ARCHITECTURE

This section is divided into four fundamental parts for understanding the work. ISO/IEC/IEEE42010 (sub-section 2.1) allows creating an AD. The Zachman Framework (sub-section 2.2) allows the understanding of the business, in this case, the iAP business. TOGAF ADM (sub-section 2.3) has a set of support tools that allow assisting in the development of an AD. The ArchiMate modeling language (sub-section 2.4) allows to model AD.

### 2.1 Conceptual Modeling Core Concepts (ISO/IEC/IEEE 42010)

ISO/IEC/IEEE 42010 is a standard that defines, analyzes, and describes the architectures of a system. This standard defines a set of concepts, relationships, and properties that should be used to create an AD for a system. Allows a process to be carried out to satisfy a stakeholder's concerns. The execution of this process allows obtaining a set of information, which later allows extracting templates that inform the respective stakeholders.

### 2.2 Zachman Framework

John Zachman defined the Zachman Framework. This structure organizes and categorizes the descriptions of an organization. The Zachman Framework allows the understanding of who the stakeholders are and their concerns. Development, change, and maintenance allow different types of architectural representations to be used by various participants and purposes through viewpoints. These representations have different perspectives (horizontal axis), and each of these perspectives is classified according to six approaches “What?; Like?; When?; Who?; At where? it's because?” (vertical axis) [7]. The answers to these questions allow decomposing complex ideas into easier, to obtain a set of relevant representations [8]. In this way, Zachman Framework helps to understand the iAP business.

### 2.3 TOGAF

Frameworks are references that include methods and representation techniques that allow expressing an organization's views. The Open Group developed the Open Group Architecture Framework (TOGAF). TOGAF is one of these frameworks and is based on IEEE [7]. TOGAF is a method that has a set of support tools. Which allows assisting in the development of an AD. This framework can be used freely by any organization wishing to develop an enterprise architecture (EA) [9]. These concepts are carried out in an iterative process that realizes their content. This process is known as the Architecture Development Method (ADM). ADM is the core of TOGAF for describing a method for developing an EA [9]. TOGAF ADM is used to assist in iAP modeling.

### 2.4 ArchiMate

The modeling language allows the 'Architect' to model a representation of the viewpoints of an organization or system. This section covers ArchiMate, the modeling language, as it is through which the views models will be developed. This language allows analysis and communication between stakeholders, thus allowing a simpler representation of business architectures. ArchiMate is divided into different layers [6] [10], Business layer; Application layer; Technology layer; Motivation Elements; Physical elements; Strategy elements. For the development of the paper, the business and application layers will be used.

### 3. ENTERPRISE ARCHITECTURE IN PUBLIC ADMINISTRATION

This section presents some adoptions of e-government initiatives. These initiatives are divided into two: the National Initiatives and the European Commission's Initiatives. Sub-section 3.1 introduces the national initiatives (EAs and IFs) that some countries have created or adapted for their UCs. Sub-section 3.2 presents the European initiatives. The European initiatives comprise the programs and initiatives that the European Commission has been developing for PA interoperability. Through these programs and initiatives, the exchange of information and the transparency of public services are facilitated.

#### 3.1 National Initiatives

EA covers all the main elements and relationships that make up a "Company". It allows the alignment of business processes, the objectives of a company, and the applications and systems that make up its technical infrastructure [1] [11].

The IF allows various public entities to provide transversal services in a simple way to citizens and other entities. Through IF, it is possible to improve government decision-making, which improves the levels of transparency between government, citizens, and organizations [1]. The IF is generally composed of three levels of interoperability, organizational, semantic, and technical. Each interoperability level is based on the previous level. The semantic level is based on the technical level, and the organizational level is based on the semantic level. By adopting a IF, services behave in a more integrated way, managing to obtain better public services for their clients and make governance decisions simpler. Currently, there are already several countries with the IF implemented or with the creation of the IF for PAs. The European Commission itself created its version of the IF, the European Interoperability Framework.

The definitions of EA and IF are not far apart. The main difference is that EA allows its use in any type of system and organization, as mentioned above. In turn, the IF focuses only on its use in information and data exchange systems [1] [11].

#### 3.2 European Initiatives

European initiatives in recent years have seen a shift in the paradigm of e-government (for example, Open Government). Open Government facilitates the transformation of public administrations into a digital governance system, optimizing the flow of open processes and data.

##### 3.2.1 The ISA<sup>2</sup> Programme

The European Commission has developed structures and initiatives to promote interoperability in PAs, such as the ISA<sup>2</sup> Program and the Single Digital Portal (Interoperability solutions for European public administrations). ISA<sup>2</sup> provides a framework that allows the Member States to work together and create efficient and effective cross-border and cross-sectoral electronic public services. This program develops solutions that support interoperable digital services [12] [13].

ISA<sup>2</sup> promotes and maintains the European Interoperability Framework (EIF<sup>1</sup>) in close cooperation between the Member States and the Commission. This framework requires the

establishment of interoperable trans-European networks that will enable citizens to take advantage of a European internal market. The EIF has three pillars, the Principles, the Layers, and the Conceptual Model.

ISA<sup>2</sup> developed the European Interoperability Reference Architecture (EIRA). This architecture facilitates the exchange of information between public services and between companies and citizens. The EIRA is a metamodel that defines more prominent architectural building blocks (ABBs). ABBs are needed to build an interoperable e-government system. The EIRA is aligned with the EIF.

##### 3.2.2 The Single Digital Gateway

Based on EIRA, it is possible to create the Single Digital Gateway (SGD) architecture. The SGD consists of five layers, each corresponding to a level of interoperability. These views allow traceability between architectural building blocks (ABBs) at different levels [14].

SDG allows national and EU services to be integrated into an interface accessible through a centralized portal. The SDG facilitates access to the information, administrative procedures, and support services that citizens and businesses need to live or operate in another EU country. The access point to the SDG is the "Your Europe" portal [15].

#### 3.3 Communications

To promote the initiatives with stakeholders, there is a communication process that includes a two-step sequence. The first starts with establishing a global communication strategy. The second is the implementation of the first stage, through workshops, print publications, conferences, audiovisual material, and presence in print and electronic media (social media) [16] [17]. To promote ISA<sup>2</sup>, internal and external communications are carried out [18]. Internal communication covers the different units of the Commission offices through Online Channels, for example, "MY INTRACOMM"; Campaigns on social networks, LinkedIn, Facebook, Twitter, Yammer; Lectures, webinars, workshops, and online training sessions. External communication is done through Campaigns on social networks, LinkedIn, Facebook, Twitter, Annual conferences.

### 4. SOURCE DATA COLLECTION

This section mentions the information that currently exists in the universe of discourse (UoD) in question. Sub-section 4.1 introduces interoperability in public administration. Sub-section 4.2. mentions the covered interoperability aspects of iAP. The source data comprises a set of documents provided by AMA and public information in websites, which resulted in the UoD for the purpose of this work.

#### 4.1 Interoperability in Public Administration

According to the iAP<sup>2</sup> website, there are currently five services, Integration Platform, Payment Platform, Messaging Platform, Document Interoperability, Opening a Dematerialized Account.

**PI** deals with the exchange of data and documents between entities, public and private. And effect the adhesion of entities and services to the iAP. **PPAP** provides and manages the integration of various digital payment methods according to the different

<sup>1</sup> EIF - <https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-european-interoperability-framework-0>

<sup>2</sup> iAP website - <https://www.iap.gov.pt/web/iap/inicio>

service channels. **GAP** enables the exchange of messages between public entities and citizens<sup>3</sup>. This platform makes it possible to expand the number of contact channels available for managing the relationship with interested parties. **Document interoperability** allows the dematerialized exchange of documents between Public Administration systems. **Opening a dematerialized account** makes it possible to open an account at banks and financial institutions. And it keeps the customer identification elements always up to date<sup>4</sup>.

## 4.2 Aspects of Interoperability Approached in the Interoperability Platform

The interoperability framework is divided into three parts, the technological interoperability, the semantic interoperability, and the organizational interoperability. **Technological interoperability** is inherent to iAP since the development of this platform followed the European EIF's recommendations and with open standards (iAP, 2011). **Semantic interoperability** underlies the integration platform through the Canonical Data Model. The Canonical Data Model provides the standardization of platform concepts and provides a Service Catalog. This Catalog has a set of Canonical Services that can be consumed by the Integration Systems (SI) with which it integrates. The Canonical service is the representation and provision of electronic service in the Platform's Service Catalog. Each entity that intends to use an electronic service must define the mapping between its internal format (data model of its SI) and the format contained in the Catalog (iAP, 2011). **Organizational Interoperability** is implicit in the Interoperability Platform, as it provides electronic services through a privileged contact channel, which allows for the transfer of information and documentation in the PA between entities (iAP, 2011).

## 5. ANALYSIS OF THE SOURCE DATA

This section aims to analyze and model UoD. The UoD modeling is developed according to the interpretation obtained in the documentation<sup>5</sup> [19]. As mentioned in *Section 1*, the first objective is to understand the **stakeholders** relevant to the iAP, and the second is to find out what their **concerns** are. In this analysis, the term audience is used to designate a set of stakeholders.

In this research, there are two types of audiences. The **first type** of audience is those who manage, develop, and maintain the iAP, have governance responsibilities, and know the business and technology. In this case, **AMA employees** occupy management positions and make decisions about the iAP. For this audience, modeling is performed in ArchiMate in a more detailed and comprehensive way. The **second type** of audience is those who use the iAP platform and make decisions as potential future users but are not knowledgeable about the business and technology. In this case, they are **entities outside the AMA**, such as the

Government, public administration entities, private entities, and citizens who use the iAP or future users. For this audience, the goal is to have a high-level view of iAP, with a focus on global value propositions. For AMA employees, a detailed view is modeled in ArchiMate. For entities outside the AMA, a detailed view is created in ArchiMate and natural language. In this research, only the diagrams in ArchiMate will be presented.

The third objective is to determine which views to consider. For this, it is necessary to first understand which actors in the iAP and their roles. iAP has four actors, AMA employees, Public Entity, Private Entity, Citizens.

AMA assumes the role of the infrastructure manager. And it can also take on the role of a service supplier. The public entity can play the role of supplier or consumer. The private entity and the citizen always have the role of consumer.

Once the actors and their roles are defined, the aim is to analyze the services and processes that the interoperability platform has. The concept of service allows representing a behavior that is defined by a stakeholder. The concept of the process allows the representation of a sequence of behaviors, which allows obtaining a set of services. In iAP, there are two types of services, the business service, and the application service.

The business service describes the behavior defined by a supplier. The application service represents a behavior defined by the AMA. Application services support business services as well as existing business processes in iAP. iAP currently has three application services:

- ❖ **Integration Service (IS)** - Allows handling the exchange of data and documents between entities.
- ❖ **Messaging Service (MS)** - Allows the exchange of messages between entities and citizens.
- ❖ **Payment Service (PS)** - Allows making payments between entities and the citizen.

*Note<sup>6</sup>: All models in ArchiMate can be found in the link reference.*

### 5.1 Integration Platform

In IS, the role of the registered supplier is associated with a public entity. The role of the registered consumer is associated with a private or public entity. **Figure 2** represents the application services that IS has to offer to protocol suppliers. These application services allow entities to communicate with each other and share data and documents.

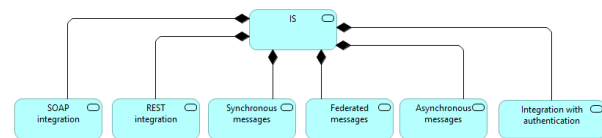


Figure 2: IS Application Services

The Integration Service has three processes, the **process of registering the service**, the **process of registering the entity**, and the **process of using the service**. IS provides through each process an easy and integrated method of providing services. In this way, it can provide accessible shared services to all registered entities.

<sup>3</sup>More information - [http://historico.simplificar.gov.pt/sites/default/files/uma\\_so\\_vez\\_manual\\_de\\_procedimentos\\_1.0.pdf](http://historico.simplificar.gov.pt/sites/default/files/uma_so_vez_manual_de_procedimentos_1.0.pdf) and <https://www.iap.gov.pt/web/iap/inicio>

<sup>4</sup>More information - [http://historico.simplificar.gov.pt/sites/default/files/uma\\_so\\_vez\\_manual\\_de\\_procedimentos\\_1.0.pdf](http://historico.simplificar.gov.pt/sites/default/files/uma_so_vez_manual_de_procedimentos_1.0.pdf) and <https://www.iap.gov.pt/web/iap/inicio>

<sup>5</sup>More information - [http://historico.simplificar.gov.pt/sites/default/files/uma\\_so\\_vez\\_manual\\_de\\_procedimentos\\_1.0.pdf](http://historico.simplificar.gov.pt/sites/default/files/uma_so_vez_manual_de_procedimentos_1.0.pdf), <https://www.iap.gov.pt/web/iap/inicio> and <https://zenodo.org/record/5544542#.YVd3ZrMKUI>

<sup>6</sup>More about modeling - <https://zenodo.org/record/5544587#.YVd8MprMKUk> and <https://zenodo.org/record/5544542#.YVd3ZrMKUI>



The **process of registering a service** involves registering the supplier (if not yet registered with the SI) and registering that service. The **process of registering an entity** involves registering a consumer entity in a previously existing service. The **service utilization process** is the orchestration process. This process allows a consumer entity registered in the IS to use the services provided by the supplier entities registered in the IS.

The **process of registering a service** begins with a supplier entity (protocolled or not in the IS) to make a formal request to AMA. In case the supplier entity is not registered in the IS, the registration process involves first registering the supplier entity and only then the service. In case the supplier is already registered with IS, the registration process involves registering only the service. Once the service and the supplier entity are registered, the necessary operations are carried out for the development of the service at the supplier, as well as with the quality tests and the transition to production. This process takes place between the supplier entity and the IS Manager.

The **registration process an entity** registers the consumer entity in the service. After registration, the technical operations necessary for the development of the customer service are carried out. And finally, the transition to production takes place. This process is handled between the consumer, supplier, and IS Manager.

The supplier and the consumer entity must be registered in the business service and the IS to perform the **orchestration process**. The orchestration process starts with the consumer entity requesting to use a service. IS processes the data and communicates it to the supplier of this service. Finally, the supplier receives the information from the IS and makes the service request to the consumer.

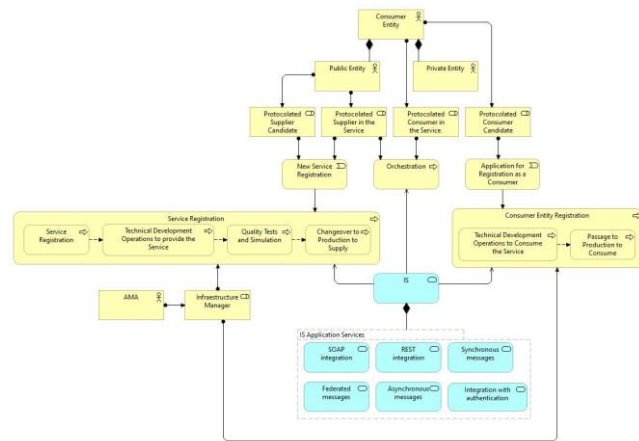


Figure 3: PI Detailed View

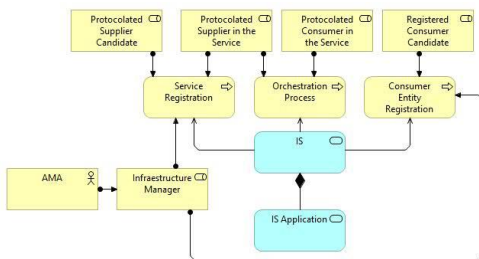


Figure 4: Simplified View of PI in ArchiMate

## 5.2 Payment Platform

In PS, the registered suppliers are the public entities, and the registered consumers are the citizens. **Figure 5** represents the application services that PS has to offer to protocol suppliers. These application services allow payments to be made.

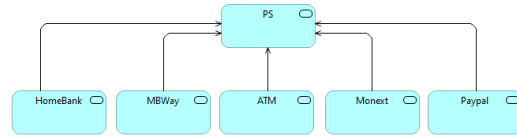


Figure 5: PS Application Services

The Payment Service has three processes, the **supplier registration process**, the **payment order issuance process**, and the **payment order settlement process**. The **process of registering an entity** involves registering a supplier entity in the PS. For **payment order issuance and settlement processes**, this service provides references for the payment order issuance and provides consumers with several methods to settle the payment order. Entities such as PayPal, IGCP<sup>7</sup> (Treasury and Public Debt Management Agency), SIBS<sup>8</sup> (Interbank Services Society), and Redeunice issue various payment order references (As mentioned in **Table 1**).

Table 1: Each entity generates a certain reference

Entity	Reference
PayPal	PayPal
IGCP	DUC
SIBS	MBWay and Bank
Redeunice	Bank

PS obtains the references through the payment network and issues these same references to each supplier entity. To facilitate PS, it previously requests for a range of DUCs and bank references to be used later in its services. PayPal and MBWay referrals are generated in real-time. When the consumer receives a payment reference, they can use one of the PS services (PayPal, Monext, ATM, MBWay, HomeBank). PS informs the supplier when payment is made.

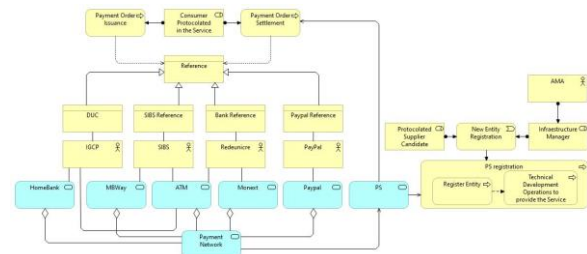


Figure 6: PPAP Detailed View

<sup>7</sup> More About IGCP - <https://www.igcp.pt/pt/>

<sup>8</sup> More About SIBS - <https://www.sibs.com/>

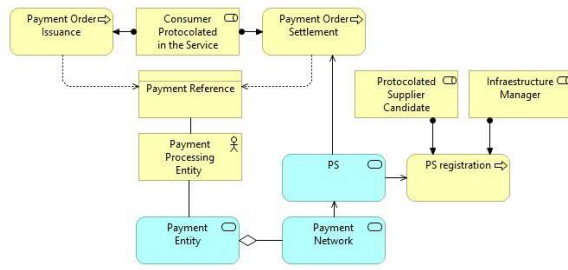


Figure 7: Simplified View of PI in ArchiMate

### 5.3 Messaging Platform

At Messaging Service, the registered suppliers are the public entities, and the registered consumers are the citizens. **Figure 8** represents some of the application services that MS has. The information service allows sending messages or notifications to recipients. The transactional service sends and replies SMS.

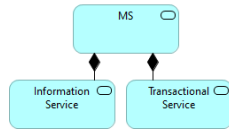


Figure 8: MS Application Services

The Messaging Service has three processes, the **entity registration process**, the **SMS issuing process**, and the **SMS reception process**. The process of registering an entity involves registering a supplier entity in the MS. When a public entity intends to send an SMS, the issue process emits a UUID and a GUID and forwards the SMS through the "public SMS network". If an MS receives an SMS, it is forwarded via the "public SMS network" to the intended public entity. The citizen is an actor outside MS who sends and receives SMS through the "public SMS network".

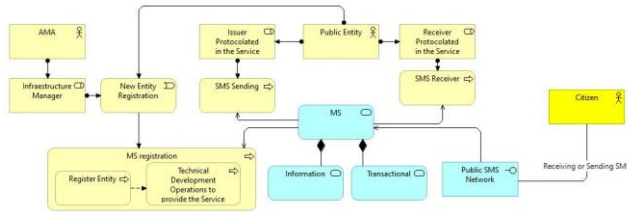


Figure 9: GAP Detailed View

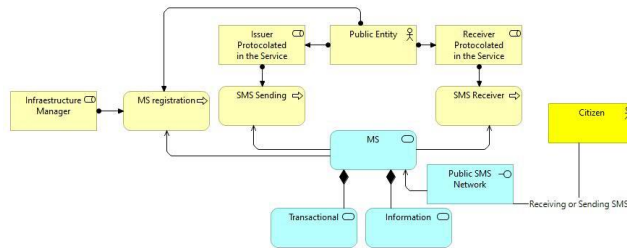


Figure 10: Simplified View of GAP in ArchiMate

## 6. RESULTS

Section 6.1 presents misalignments between AMA public discourse on iAP and the rigorous classification of relevant concepts in the ArchiMate language. Misalignments are based on the interpretation made of the information obtained. These misalignments present concepts that can improve AMA discourse,

not meaning that they are necessarily wrong. Sub-section 6.2. presents the conclusion of the feedback obtained by the AMA.

### 6.1 Misalignment

Chapter 6.1 presents misalignments between AMA public discourse on iAP and the rigorous classification of relevant concepts in the ArchiMate language. Misalignments are based on the interpretation made of the information obtained. These misalignments present concepts that can improve AMA discourse, not meaning that they are necessarily wrong. Each misalignment is divided into five points:

- ❖ **Currently** – What currently exists in iAP.
- ❖ **Analysis** – Summary of the analysis that is carried out and the explanation of the misalignment is made.
- ❖ **Conclusions for the future** – Modifications that can be made so that the iAP has a clearer understanding.
- ❖ **Employees AMA feedback**: The misalignment is presented to a small group from AMA, who then provided feedback.

#### 6.1.1 iAP Services

**Currently:** On the iAP website its mention the word *services* at various points.<sup>9</sup>

**Analysis:** According to the analysis, there are two types of services in iAP, business services (**Figure 14, Figure 16, and Figure 18**) and application services (**Figure 11**). Business services allow representing the behavior defined by the supplier. Application service represents a behavior defined by the AMA. The application services allow support of existing iAP services and business processes.

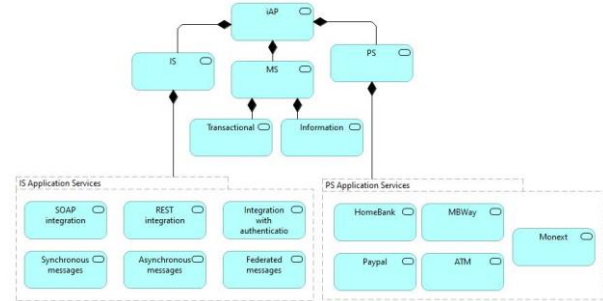


Figure 11: iAP application services

The business services do not belong to iAP, belong to the supplier entities registered in IS, MS, or PS. However, for business services to work, they need the intervention of application services.

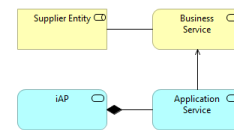


Figure 12: Application and Business Services

**Conclusions for the future:** Distinguish the existence of two types of services, application, and business.

**Employees AMA feedback:** The iAP website is a commercial communication tool, and therefore it is designed to demonstrate all the services present in iAP. AMA agrees that distinguishing between the two types makes understanding clearer.

<sup>9</sup> More information - <https://www.iap.gov.pt/web/iap/inicio>

### 6.1.2 Integration Services

**Currently:** On the IS page, they mention the same concept of "service" twice, **Figure 13** and **Figure 14**.<sup>10</sup>

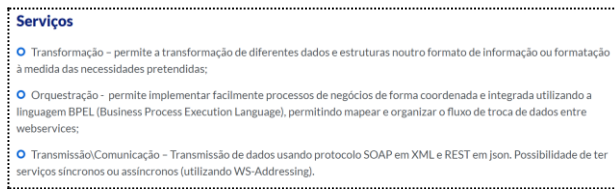


Figure 13: iAP website screenshot (IS) - "In Portuguese"



Figure 14: Image of IS's "Main Services" - "In Portuguese"

**Analysis:** **Figure 13** represents the **transmission** \ **communication**, **transformation**, and **Orchestration**. The **Transmission/communication** allows data communication, which represents an access point. **Transformation** permits the transformation of different data and structures into another format or information formatting so, **transmission/communication** and **transformation** are application services. These services are present in the iAP services catalog. Business service suppliers consume these application services. (iAP, 2011) **Orchestration** is triggered by an event, for example, when a consumer makes a service request. **Orchestration** represents a business process, which is intended to produce a defined set of business services. (iAP, 2011)

In **Figure 14**, when the "orchestrating" business process is triggered, the business service is executed, and supplier entities (currently registered with IS) provide business services (iAP, 2011).

**Conclusions for the future:** AMA must distinguish between application and business services.

**Employees AMA feedback:** The IS page is a commercial communication tool, and thus it is designed to demonstrate all the services present in IS. However, AMA agrees that distinguishing between the two types of service makes the understanding of IS clearer.

### 6.1.3 Payment Services

**Currently:** On the PS page, they mention the same concept of "service" twice, **Figure 15** and **Figure 16**.<sup>11</sup>



Figure 15: iAP website screenshot (PS) - "In Portuguese"



Figure 16: Image of PS "Main Services" - "In Portuguese"

**Analysis:** **Figure 15** represents the PS application services. These services are consumed by business service suppliers (iAP, 2011).

**Figure 16** represents business services that belong to the supplier entities currently registered with MS. Consumers, in turn, can consume these services (iAP, 2011).

**Conclusions for the future:** AMA must distinguish between application and business services.

**Employees AMA feedback:** The PS page is a commercial communication tool, and thus it is designed to demonstrate all the services present in PS. However, AMA agrees that distinguishing between the two types of service makes the understanding of PS clearer.

### 6.1.4 Messaging Services

**Currently:** On the MS page, they mention the same concept of "service" twice, **Figure 17** and **Figure 18**.<sup>12</sup>

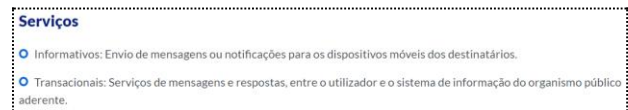


Figure 17: iAP website screenshot (MS) - "In Portuguese"

<sup>10</sup> More information - <https://www.iap.gov.pt/web/iap/plataforma-de-integracao>

<sup>11</sup> More information - <https://www.iap.gov.pt/web/iap/plataforma-de-pagamentos>

<sup>12</sup> More about GAP - <https://www.iap.gov.pt/web/iap/plataforma-gateway-de-mensagens>

Serviço	Entidade
1. Informação sobre o estado de uma entidade de crédito	Serviço de Informação de Administração Central
2. Apresentação e validação de informações sobre a situação financeira de crédito e de risco	Serviço de Informação de Administração Central
3. Apresentação de informações (descrição por IS)	Ministério da Saúde
4. Acesso ao Registo Nacional de Empresas (RNE)	Agência para a Modernização Administrativa (A3)
5. Acesso à Informação Digital (Acesso à Informação)	Agência para a Modernização Administrativa (A3)
6. Informação de acesso ao atendimento ao cidadão	Agência para a Modernização Administrativa (A3)

Figure 18: Image of MS "Main Services" - "In Portuguese"

**Analysis:** Figure 17 represents the MS application services. These services are consumed by business service suppliers (iAP, 2011).

**Figure 18** represents business services that belong to the supplier entities currently registered with MS. Consumers, in turn, can consume these services. (iAP, 2011)

**Conclusions for the future:** AMA must distinguish between application and business services.

**Employees AMA feedback:** The MS page is a commercial communication tool, and thus it is designed to demonstrate all the services present in MS. However, AMA agrees that distinguishing between the two types of service makes the understanding of MS clearer.

### 6.1.5 Main Services

**Currently:** In the IS, PS, and MS its mention the table "Main services". In the case of IS, it has two columns, "service" and "source" (Figure 14). In the case of PS and MS, there are columns "service" and "Entity" (Figure 16 and Figure 18)<sup>13</sup>.

**Analysis:** The "Source" column of the IS represents the entities providing the services from the "Services" column. In the case of PS and MS, the "Entity" column is the entity that provides the services in the "services" column.

**Conclusions for the future:** To make it clearer in (Figure 14), change the name of the column "Source" of the IS to "Supplier" and in (Figure 16 and Figure 18) change the column "Entity" of the PS and MS to "Supplier".

**Employees AMA feedback:** However, AMA agrees that in this way it is clearer to understand who the consumer and supplier entities are.

### 6.1.6 Document Interoperability and Dematerialized Account Opening

**Currently:** At iAP, they present the Document Interoperability and Dematerialized Account Opening in two different moments. They are represented in the IS as business services, which belong to the supplier entities registered with the SI. And both have their page.

**Analysis:** As Document Interoperability is responsible for exchanging documents. And the IS concept is also responsible for exchanging information/documents. Document Interoperability should be mentioned only in IS. (For example, in the AMA "document bag" service, this service does not have its page and is a service registered with the IS.) The same happens for opening a dematerialized account.

**Conclusions for the future:** Not having a specific page for a Document Interoperability. The same happens for opening a dematerialized account. Mention only in the SI.

**Employees AMA feedback:** As a commercial communication tool, the site intends to communicate to a wide audience. AMA has created a separate page for both services to market these services.

### 6.1.7 iAP Platforms

**Currently:** According to the iAP website, there are currently five application services<sup>14</sup>, Integration Platform (PI), Payment Platform (PPAP), Messaging Platform (GAP), Document Interoperability, Dematerialized Account Opening.

**Analysis:** As already mentioned, iAP has three application services. Since Document Interoperability and the Opening of a Dematerialized Account are business services, these two services belong to entities registered in the IS.

**Conclusions for the future:** Mention that the iAP website has three application services IS, PS, and MS.

**Employees AMA feedback:** The answer is not obtained.

### 6.1.8 Adhesion Process

**Currently:** Each platform has its own membership process.<sup>15</sup> (iAP, 2011)

**Analysis:** Considering the additional consumption of the PS and MS services, the adhesion processes are carried out integrating the IS. (iAP, 2011)

**Conclusions for the future:** The adhesion processes of PS and MS are carried out through the integration of PI and not individually.

**Employees AMA feedback:** Currently, each platform has its membership process. However, according to AMA, there is an additional expense currently for the processes of joining the PS and MS services. By integrating these two processes into the IS service, it allowed minimizing these expenses. In this way, AMA agrees with the misalignment.

## 7. CONCLUSIONS

In sub-section 7.1, the work that can be developed in the future is addressed based on this paper. In sub-section 7.2, it is assessed if this research objectives are achieved or not. In subchapter 7.3, the work that can be developed in the future is addressed based on this dissertation.

In this paper two types of stakeholders are found. Each of these types has its view. The first type of audience is AMA employees, that manage, develop, and maintain the iAP, have governance responsibilities, and know the business and technology. For this audience, iAP modeling is performed in ArchiMate in a more detailed and comprehensive way. The second type of audience is entities outside the AMA, that use the iAP and make decisions, as potential future users but who do not know the business or technology. For this audience, a simplified view is modeled in ArchiMate and natural language.

The actors of iAP services and their roles are analyzed to identify the most suitable views for each stakeholder. It is possible to identify the following actors, AMA employees, Public Entity, Private Entity, and citizen. The AMA employees can have two

<sup>14</sup> More information - <https://www.iap.gov.pt/web/iap/inicio>

<sup>15</sup> More information - <https://www.iap.gov.pt/web/iap/inicio>

<sup>13</sup> More information - <https://www.iap.gov.pt/web/iap/inicio>



roles, either as infrastructure manager or service supplier. The public entity can play the role of supplier or consumer. The private entity and the citizen have the role of consumer. Suppliers and consumers are divided into two roles, candidates to register for the service and those registered for the service.

This way is possible to determine that the iAP has three application services, Integration Service, Payment Service, and Messaging Service. For each one, nine views are modeled for each application service (**Table 2**). For IS, six application services are identified, SOAP integration, REST integration, synchronous messages, federated asynchronous, integration with authentication. The IS has three processes, the **process of registering the service**, the **process of registering the entity**, and the **process of using the service**. And a list of business services.

For PS, five application services are identified, PayPal, Monext, ATM, MBWay, HomeBank. PS has three processes, the **supplier registration process**, the **payment order issuance process**, and the **payment order settlement process**, and a list of business.

For MS, two application services are identified, informational and transactional. MS has three processes, the **entity registration process**, the **SMS issuing process**, and the **SMS reception process**. And a list of business services.

Table 2: Modelled views for each type of audience

Application Services	Audience	Views
Integration Service	AMA employees	<ul style="list-style-type: none"> <li>❖ IS detailed view</li> <li>❖ View with registration processes</li> <li>❖ View with service orchestration process.</li> </ul>
Integration Service	Entities outside the AMA	<ul style="list-style-type: none"> <li>❖ Simplified IS View</li> <li>❖ View with registration processes</li> <li>❖ View with service orchestration process</li> </ul>
Payment Service	AMA employees	<ul style="list-style-type: none"> <li>❖ PS Detailed View</li> <li>❖ View with the registration process</li> <li>❖ View with payment processes</li> </ul>
Payment Service	Entities outside the AMA	<ul style="list-style-type: none"> <li>❖ Simplified view of PS</li> <li>❖ View with the registration process</li> <li>❖ View with payment processes</li> </ul>
Messaging Service	AMA employees	<ul style="list-style-type: none"> <li>❖ MS Detailed View</li> <li>❖ View with the registration process</li> <li>❖ View with SMS processes</li> </ul>
Messaging Service	Entities outside the AMA	<ul style="list-style-type: none"> <li>❖ Simplified view of MS</li> <li>❖ View with the registration process</li> <li>❖ View with SMS processes</li> </ul>

After the evaluation, eight misalignments are presented. In conclusion, this paper supports the audience's decision-making. Highlighting the existence of three application services, Integration Service, Payment Service and Messaging Service. Each of them is composed of a set of application services that belong to the platform.

## 7.1 Contributions

The main goal is to model the iAP AD. To achieve this paper provides answer to the following questions.

**The first question “Who are the main classes of stakeholders relevant to the iAP?”.**

As already mentioned in section 5.1, there are two classes of audiences (two classes of stakeholders). The first class of the audience is AMA employees who contain knowledge of the technology. The second class of audience is external entities that are not knowledgeable about the technology.

**The second question is, “What main concerns do these classes have concerning the iAP?”.**

The first audience is concerned with obtaining information to manage and make decisions around the iAP. The second class is concerned with being able to obtain information to make decisions.

**To answer the third question, it is first necessary to answer another set of questions:**

❖ **Who are the iAP platform actors? What roles do they have?**

❖ **What services and processes does iAP have?**

**In response to the first question, “Who are the iAP platform actors? What roles do they have?”** there are four actors, AMA employees, the Public Entity, the Private Entity, and the citizen. AMA has the role of iAP manager and can assume the role of supplier. The public entity can perform the role of supplier or consumer. The private entity and the citizen have the role of consumer. The supplier and consumer entity can be divided into two roles:

❖ Entity registered in the service

❖ Candidate for entity registered in the service

**In response to the question, “What services and processes does iAP have?”.**

iAP has three application services, IS, PS, and MS. IS has six application services, SOAP integration, REST integration, synchronous message, asynchronous messaging, federated messaging, and integration with authentication. The integration service has three business processes, the process of registering the service, the process of registering the entity, and the process of using the service.

PS has five application services, PayPal, Monext, ATM, MBWay, and HomeBank. The payment service comprises three business processes, the supplier registration process, the payment order underwriting process, and the payment order settlement process.

MS has two application services, transactional and informational services. The messaging service also has three processes the entity registration process, the SMS issuing process, and the SMS reception process.

For each of the three application services (Integration Service, Payment Service, and Messaging Service), there is a table of business services (that provided by the protocol providers).

**In this way, it is possible to answer the last question, “What are the main views to consider for supporting these stakeholders?”.** However, to answer this question, it needs to pay attention to the following:

❖ **Promote an informed understanding of the iAP?**

❖ **Make informed decisions about the future of the iAP?**

For this paper, the main views are those that have complete information about each service, in this case, **Figure 3**, **Figure 6**, and **Figure 9**. These main views have the business layer and the application layer.

Considering the ArchiMate viewpoints<sup>16</sup> list, this paper follows “Business Process Cooperation Viewpoint”. This viewpoint represents the dependencies that exist in the business. It models the business processes between itself and its environment and the relationships of the actor and its role. From this point of view, the iAP business context is modeled.

For the modeling of views, care is always taken to promote an informed understanding of the iAP. Thus, being able to assist in decision-making about the future of the iAP for each audience. Through the modeled views, it is possible to develop the iAP AD, obtaining the main objective of the paper. Thus, it is possible to conclude that this paper managed to achieve the objectives defined initially.

## 7.2 Limitations

This subchapter presents the limitations that occurred during the dissertation. The first limitation is due to lack of information. It is not possible to obtain a complete list of all application services. Also, due to the limited information available, more views could have been modeled for the audiences. The second limitation is due to the subchapter on the evaluation of a dissertation. In this dissertation, this subchapter is replaced by the analysis of misalignment. The misalignment chapter presents the misalignment and AMA officials' assessment of each misalignment.

## 7.3 Future Work

In the next iteration of the work, the iAP AD could be represented in a proper tool (e.g., ATLAS). Based on this, relevant viewpoints could be defined, according to each audience, for example: “Viewpoints for technical management” (for those with technical and technological training); “Viewpoints for political sponsors” (for members of the Government, who make high-level decisions, with knowledge of public services and business, but with limited technological training); “Viewpoints for public communication” (anonymous citizens). Taking these viewpoints into account, the iAP AS-IS modeling could be tested and validated. And finally, you could produce a new value modeling on the iAP TO-BE and use these models to support future decision-making processes.

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<sup>16</sup> More information - <https://pubs.opengroup.org/architecture/archimate3-doc/apdxc.html>