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List of acronyms

eGov	Electronic government
EU	European Union
MSs	Member States
EC	European Commission
Greek eGIF	Greek e-Government Interoperability Framework
DSG	Digital Single Gateway
CEN	European Committee for Standardization
W3C	World Wide Web Consortium
CPSV	Core Public Service Vocabulary
CPSV-AP	Core Public Service Vocabulary-Application Profile
PSCs	Points of Single Contacts
IS	Information System
EA	Enterprise Architecture
ISA	Interoperability solutions for public administrations, businesses and citizens
BPMN	Business Process Modeling Notation

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Executive Summary

The purpose of this study is to draft and propose a public service model compatible with existing European standards, namely the Core Public Service Vocabulary (CPSV), catering the specificities of the Greek administration.

The public services provided by eGovernment portals and websites are usually documented in an impromptu and ad hoc way, even within one country. This results in the lack of a common understanding or even definition of the “public service” concept. Each system uses its own representation and as a result they produce fragmented pieces of information with limited added value outside its own “world”. As a result, it becomes difficult to link together, reuse and combine services/information provided by different systems. Due to this situation, it is very hard to aggregate information from various portals or combine existing services to provide new services. Moreover, it is not possible to create machine-readable public service descriptions that could enable functionalities like automated service discovery and composition. Thousands of web pages exist with information about public services but there is a need for a human reader to find, understand, process and use all this information.

To solve this problem, a common public service model should be agreed as a technology independent generic representation of the public administration service. This model should be adopted at the national level, and comply with European open standards. Furthermore, this model should become an internal and core component of national eGovernment interoperability strategies and frameworks. Such a model:

- Creates a common language for describing public services resulting in the homogenisation of public services’ descriptions and facilitating the share and reuse of these descriptions.
- Facilitates the management of public services’ portfolios and the publication of business events’ and related public services’ descriptions via a point of single contact and one-stop government portals.
- Makes the service provision process identifiable, understandable and comparable to both constituents and service owners. The model is expected to help identify problems and bottlenecks.
- Facilitates public service information discovery by enabling cross–portal querying.
- Makes the description of services and information machine–readable, enabling the reuse of service descriptions at the European level, e.g. by the Digital Single Gateway or other portals using the same standard.
- Promotes transparency.
- Becomes the basis for planning, assessment, measurement and improvement of public services.
- Provides a starting point for Public Service re-engineer and improvement.
- Contributes to savings by allowing crow-sourcing to be employed for the actual description of services.

The proposed model is based on CPSV–AP, and in this way the proposed model for Greek public services remains compatible with the European standard. It is referred here as CPSV-AP-GR.

Based on a detailed analysis of international models and best practices, we propose a 4-layered model to serve as the CPSV-AP-GR spec. We considered two important design principles:

a) The model should be able to cater different implementation requirements. We propose a general standard applicable to all possible implementation scenarios.

b) All the proposed layers should remain compatible with the CPSV-AP, to ensure that descriptions of Greek public service, regardless of the used CPSV-AP-GR layer, can be easily aggregated at European level.

Each layer includes a set of metadata descriptions. The set of metadata of an upper layer is always a subset of the metadata of a lower layer.

As with all standards, there is a clear need to put in place a coherent and stable governance framework. This includes defining the owner of the specification, its management and change procedures. The link and dependence of the specification with the CPSV-AP asks also for monitoring compliance and versions in the “parent” specification.

Concluding, our proposal builds on open standards and remains fully compatible with the European standard for public service descriptions i.e. CPSV-AP. Using the proposed model, the next steps towards the implementation of a public service catalogue should be based on the following elements:

- Open source software: use of OSS for the platform to implement the public service catalogue.
- Combination of crowd-sourcing with official validation: public employees to document the services they provide, and then official validation to come from their organisations.
- Clear catalogue ownership with robust governance, transparent to everyone: one owner of the overall catalogue of services at national level.

Executive Summary (in Greek)

Ο σκοπός της παρούσας μελέτης είναι να προετοιμαστεί και να προταθεί ένα μοντέλο ηλεκτρονικής παροχής δημόσιων υπηρεσιών το οποίο να είναι συμβατό με τα υφιστάμενα Ευρωπαϊκά πρότυπα, και πιο συγκεκριμένα το Core Public Service Vocabulary (CPSV), λαμβάνοντας παράλληλα υπόψη τα ιδιαίτερα χαρακτηριστικά της Ελληνικής Δημόσιας Διοίκησης.

Οι δημόσιες υπηρεσίες οι οποίες παρέχονται από κυβερνητικές διαδικτυακές πύλες, συνήθως είναι τεκμηριωμένες με κάποιον αυτοσχέδιο ή κατά περίπτωση τρόπο, ακόμη και εντός του ίδιου κράτους. Αυτό έχει ως συνέπεια την έλλειψη συναντίληψης ή ακόμη και του ορισμού της έννοιας της «δημόσιας υπηρεσίας». Κάθε σύστημα χρησιμοποιεί τη δική του περιγραφή των δημοσίων υπηρεσιών, με αποτέλεσμα την παραγωγή κατακερματισμένης πληροφορίας, η οποία έχει περιορισμένη προστιθέμενη αξία έξω από τον «κόσμο» του συστήματος στο οποίο ανήκει. Αυτό έχει ως αποτέλεσμα τη δημιουργία προβλημάτων στη διασύνδεση, την επαναχρησιμοποίηση και τον συνδυασμό υπηρεσιών/πληροφοριών μεταξύ συτημάτων. Λόγω αυτής της κατάστασης, είναι πολύ δύσκολο να συγκεραστούν πληροφορίες από διάφορες διαδικτυακές πύλες ή να συνδυαστούν υφιστάμενες ηλεκτρονικές υπηρεσίες για τη δημιουργία νέων ηλεκτρονικών υπηρεσιών. Επιπλέον, δεν είναι δυνατή η δημιουργία μηχαναγνώσιμων περιγραφών δημοσίων υπηρεσιών, το οποίο θα μπορούσε να διευκολύνει την αναζήτηση ή τη σύνθεση μιας δημόσιας υπηρεσίας. Υπάρχουν χιλιάδες ιστοσελίδες με πληροφορίες σχετικά με δημόσιες υπηρεσίες και δημόσιες διαδικασίες, ωστόσο υπάρχει η ανάγκη κάποιος άνθρωπος να τις ανακαλύψει, να τις διαβάσει, να τις καταλάβει, να τις επεξεργαστεί, να εξάγει τις χρήσιμες γι'αυτόν πληροφορίες και τελικά να τις χρησιμοποιήσει.

Για να λυθεί αυτό το πρόβλημα, θα πρέπει να επέλθει συμφωνία για ένα κοινό μοντέλο ηλεκτρονικής παροχής δημοσίων υπηρεσιών, με το οποίο θα περιγράφονται και θα τεκμηριώνονται οι δημόσιες διοικητικές διαδικασίες και μάλιστα με τρόπο ανεξάρτητο των τεχνολογιών που χρησιμοποιούνται. Το μοντέλο θα πρέπει να υιοθετηθεί τουλάχιστο σε εθνικό επίπεδο και να είναι σύμφωνο με ευρωπαϊκά πρότυπα. Ακόμη, αυτό το μοντέλο θα πρέπει να ενσωματωθεί και να γίνει βασικό συστατικό των εθνικών στρατηγικών για την διαλειτουργικότητα στην Ηλεκτρονική Διακυβέρνηση. Αυτό το μοντέλο θα έχει τους παρακάτω στόχους:

- Τη δημιουργία μιας κοινής γλώσσας για της περιγραφή δημοσίων υπηρεσιών, η οποία θα καταστήσει εφικτή την ομογενοποίηση των περιγραφών των δημοσίων υπηρεσιών και θα διευκολύνει τον διαμοιρασμό και την επαναχρησιμοποίησή τους.
- Τη διεκόλυνση της διαχείρισης ενός «πορτοφολίου δημοσίων υπηρεσιών» και της δημοσιοποίησης με δομημένο τρόπο από ένα μοναδικό σημείο πρόσβασης για τους πολίτες και τις επιχειρήσεις.
- Τη μετατροπή της διαδικασίας παροχής δημοσίων υπηρεσιών σε μία διαδικασία αναγνωρίσιμη, κατανοητή και εύκολα συγκρίσιμη και για τους πολίτες και για τους παρόχους των δημοσίων υπηρεσιών. Αναμένεται ότι το μοντέλο θα βοηθήσει ώστε να εντοπιστούν προβλήματα και άλλες δυσχέρειες στη διαδικασία παροχής δημοσίων υπηρεσιών.
- Τη διευκόλυνση της εξεύρεσης δημοσίων υπηρεσιών πιο εύκολα, αξιοποιώντας τη δυνατότητα που θα δημιουργηθεί για αναζήτηση μιας δημόσιας υπηρεσίας μεταξύ διαφόρων διαδικτυακών πυλών.
- Τη δημιουργία μηχαναγνώσιμων δημοσίων υπηρεσιών και πληροφοριών, διευκολύνοντας έτσι την επαναχρησιμοποίησή τους σε Πανευρωπαϊκό επίπεδο, π.χ. από την υπό ανάπτυξη Digital Single Gateway ή άλλες διαδικτυακές πύλες, οι οποίες χρησιμοποιούν τα ίδια πρότυπα περιγραφής δημοσίων υπηρεσιών.
- Την προώθηση της διαφάνειας.
- Τη δημιουργία βάση για σχεδιασμό, αξιολόγηση, μέτρηση και βελτίωση με ανασχεδιασμό και απλοποίηση των δημοσίων υπηρεσιών.

- Η εξοικονόμηση πόρων συνδυάζοντας καταγραφή υπηρεσιών μέσω πληθοπορισμού και παράλληλη εποπτεία από τον δημόσιο φορέα.

Το προτεινόμενο μοντέλο βασίζεται στο CPSV–AP και έτσι παραμένει συμβατό με το Ευρωπαϊκό πρότυπο. Αναφέρεται εδώ ως CPSV-AP-GR.

Με βάση την ανάλυσή μας προτείνουμε ένα μοντέλο τεσσάρων επιπέδων ως προδιαγραφή για το CPSV-AP-GR. Για τη δημιουργία του μοντέλου λάβαμε υπόψη μας κατά το σχεδιασμό του δύο σημαντικές σχεδιαστικές αρχές:

a) Το μοντέλο θα έπρεπε να έχει τη δυνατότητα να προσαρμόζεται σε απαιτήσεις διαφορετικών υλοποιήσεων. Προτείνουμε λοιπόν ένα γενικό πρότυπο, το οποίο να μπορεί να εφαρμόζεται σε όλα τα πιθανά σενάρια υλοποιήσεων.
b) Όλα τα προτεινόμενα επίπεδα του μοντέλου θα πρέπει να παραμένουν συμβατά με το CPSV-AP, έτσι ώστε να διασφαλίζεται ότι οι περιγραφές των ελληνικών δημοσίων υπηρεσιών, ανεξάρτητα από το επίπεδο του μοντέλου που χρησιμοποιείται, μπορούν εύκολα να συναθροιστούν με άλλες δημόσιες υπηρεσίες σε Ευρωπαϊκό επίπεδο.

Κάθε επίπεδο του προτεινόμενου μοντέλου περιλαμβάνει ένα σύνολο μεταδεδομένων. Το σύνολο μεταδεδομένων του ανώτερου επιπέδου είναι πάντα υπερσύνολο του συνόλου μεταδεδομένων του κατώτερου επιπέδου.

Όπως με όλα τα πρότυπα, υπάρχει η ξεκάθαρη ανάγκη για τον καθορισμό ενός συνεκτικού και σταθερού πλαισίου διακυβέρνησης. Αυτό περιλαμβάνει τον ορισμό του ιδιοκτήτη του προτύπου, τη διαχείρισή του καθώς και τη διαχείριση των αλλαγών. Η διασύνδεση και η αλληλεξάρτηση του προτεινόμενου μοντέλου με το CPSV-AP απαιτεί επίσης την παρακολούθηση της συμβατότητας του μοντέλου με τις νέες εκδόσεις του «γονικού» μοντέλου.

Συμπερασματικά η πρότασή μας βασίζεται σε ανοικτά πρότυπα και είναι συμβατή με το μοντέλο CPSV-AP. Η χρήση του μοντέλου στα επόμενα στάδια προς τη δημιουργία ενός εθνικού καταλόγου δημοσίου υπηρεσιών θα πρέπει να βασιστεί στα παρακάτω:

- Χρήση ελεύθερου/ανοικτού κώδικα λογισμικού για την υλοποίηση του καταλόγου των δημοσίων υπηρεσιών.
- Συνδυασμό πληθοπορισμού με επίσημο έλεγχο: δημόσιοι υπάλληλοι περιγράφουν τις υπηρεσίες που εκτελούν και μετά ακολουθεί επίσημη επιβεβαίωση από τον αρμόδιο φορέα.
- Ξεκάθαρη ιδιοκτησία για τον κατάλογο υπηρεσιών, με έναν ιδιοκτήτη σε εθνικό επίπεδο.

1. Introduction

1.1. Background

During the last decade, electronic government (eGov) is high in the political agenda of most countries worldwide, e.g. Strategy 2020 in the European Union [1] and the Recovery Act in the USA [2]. The overall financial investment in eGov is immense; e.g. a recent study estimated that annual ICT expenditure in the public sector worldwide will exceed $490 billion by 2020 [3]. A core component of eGov is the online provision of public services. In European Union (EU), twenty public services have been considered as particularly important. As a result, all Member States are rushing to provide them online while European Commission regularly measures the relevant progress [4]. As an example of the anticipated benefits, just replacing paper invoices with e-invoices across the EU could lead to roughly €240 billion in savings over a 6-year period [5].

Almost all EU countries have developed eGov portals where available public services are described. Such portals also exist at lower administrative level, e.g. municipalities. The Greek eGov Portal “ERMIS” [139] is an example of a portal with service descriptions at national level. Some of the public service models (templates used to describe services) are based on national standards. This is the case of “ERMIS” which is based on the Greek eGIF [140]. However, there are several cases, especially at lower administrative levels where ad hoc service descriptions are used, as for example in the regional initiative to describe public services in the Region of Epirus, Greece (the Citizen’s Guide).

Many reports have suggested the move towards more user friendly and comprehensive eGov portals as single one-stop shops [141]. In this line, the Competitiveness Council conclusions on Single Market Policy of 29 February 2016 welcomed "*the concept of a Single Digital Gateway, which would in particular address the needs of start-ups by making it comprehensive, accessible and user-friendly, and recalls the importance of strengthening and streamlining existing Single Market tools for SMEs, in order to simplify and facilitate their cross-border activities and expansion*" [137]. The Single Digital Gateway (SDG) was originally announced in the Commission Communications on “A Digital Single Market Strategy for Europe” and the “EU eGovernment Action Plan 2016-2020”. The main objective of the SDG is to reduce the transaction costs incurred by businesses and citizens resulting from searches for information and fulfilling administrative procedures when engaging in cross-border activities. The use of common metadata from the DSG to describe relevant services has attracted attention [142].

Despite the significance of electronic public service provision, administrations still face important challenges. The development of a standard conceptual model for describing public services is identified as a major challenge by both academics and practitioners, see for example discussion in [6-11]. The introduction and sharing of unified conceptual public service models in the public service provision can improve the analysis and development of eGov systems, especially large-scale Information Systems, by providing better, faster, and reusable software components. As a result, development costs could be reduced. Additionally, software quality, users’ experience, management of government information and interoperability across different eGov systems could also be improved. Furthermore, the use of a common service model could increase the effectiveness of electronic public services and improve the citizens’ experience and perception of quality.

Standardization bodies such as CEN and W3C have become active in this area. CEN has a keen interest in the role of standards in eGov and recommends the development of commonly agreed standards for developing eGov services as a means of achieving interoperability [12]. W3C established the W3C EGOV Interest Group for advancing eGov through W3C technologies [13]. Interestingly, the development and use of a common public service model is among the cases of great interest for this group [14].

To address the lack of commonly agreed standards for public service description, the European Commission (EC) through the ISA programme launched the Core Public Service Vocabulary (CPSV) initiative, aiming at developing a simplified, reusable and extensible model that captures the fundamental characteristics of a service offered by public administrations [15].

Additionally, the ISA Programme has published the study "Definition and development of a data model for description of the services related to key business events" [129], where practices from MSs to describe services and business events are documented.

1.2. Motivation and scope of this study

In this part, the motivation and scope of the study are presented.

1.2.1. Motivation

As already discussed, the public services provided by eGovernment portals and websites are generally documented in an impromptu and ad hoc way, even within one country. This is the case also in Greece. This results in the lack of a common understanding or even definition of the "public service" concept. Each system uses its own representation and as a result they produce fragmented pieces of information with limited added value outside its own "world" as it becomes difficult to link together, reuse and combine services/information provided by one system with those provided by others. Due to this situation, it is very hard to aggregate information from various portals or combine existing services to provide new services. Moreover, it is not possible to create machine-readable public service descriptions that could enable functionalities like automated service discovery and composition. Thousands of web pages exist with information about public services and administrative procedures but there is a need for a human reader to find, understand, process, abstract and use all this information.

To solve this problem, **a common public service model should be agreed as a technology independent generic representation of the public administration service**. It is important to stress that this model should be adopted as a minimum at the national level, and comply with existing European standards. This model should become an internal and core component of national eGovernment interoperability strategies. Such a model aims at:

- Creating a common language for describing public services which enables the homogenization of public services' descriptions and facilitating the share and reuse of these descriptions.
- Facilitating the management of public services' portfolios and the publication of business events' and related public services' descriptions on the point of single access.
- Making the service provision process identifiable, understandable and comparable to both constituents and service owners. The model is expected to help identify problems and bottlenecks in the process.
- Finding information about public services more easily by enabling cross – portal querying.
- Making services and information machine – readable and thus, enabling the reuse of public service descriptions at the European level, e.g. by the EU DSG and/or other portals that use the same standard service descriptions.

1.2.2. Scope

Taking into consideration all the above, the scope of this study is **to draft and propose a public service model compatible with existing European standards, namely the**

Core Public Service Vocabulary (CPSV), catering the specificities of the Greek administration.

Potential beneficiaries include the stakeholders involved in the service provision process, i.e., citizens and businesses who consume public services, and governmental officials and industrial partners who define, develop and provide such services [134].

The actual documentation of Greek public services using the proposed model remains out of scope for this study.

1.2.3. Structure and Content

This study continues in chapter 2 with a brief description of the methodology followed for drafting the proposed model. Moreover, the existing relevant standards and international good practices are presented. Findings from a detailed comparative analysis of the identified standards are also summarised.

In chapter 3, the design principles and an overview of the proposed model appear. In chapter 4, usage scenarios and some important governance requirements are discussed.

The study is accompanied by **five appendixes** and a **spreadsheet file**. In Appendix A, the list of bibliographical references appears. In Appendix B, there is a complete list of service models found in the literature. Appendix C describes the content of the supporting spreadsheet file. The proposed list of additional concepts (classes or properties) for the CPSV extension appear in Appendix D. In Appendix E, the overall proposed model (CPSV-AP-GR) can be found.

2. Modeling and publishing administrative processes: the state-of-the-art

In this chapter, the sources and the methodology used in the current study are presented. More specifically in part 2.1, the methodology followed for the creation of the proposed model is described. Then in 2.2, existing relevant standards and models are presented including: i) the CPSV vocabulary, which is used as a reference model for our design, ii) various service models found in the literature review, iii) models used by the Member States of the EU and iv) models already used in Greece.

We performed a detailed comparative analysis of all the models, and in part 2.3, the findings are summarised. This analysis aims at identifying the concepts to be used for creating an extended version of the CPSV-AP to be used in cases where rich service descriptions are needed.

1.3. Methodology for the creation of the model

As discussed, our goal is to propose a service model for the description of administrative services to facilitate their publication, findability and reuse by both humans and machines (e.g. applications).

By studying the relevant literature some well-established general service models were found, such as the Reference Model for Service Oriented Architecture [130] and a reference service model for the Web of Services [131]. However, these are general purposes' models not specific to the area of public service provision, therefore our research scope out general service models and we focused our work to **public** service models.

The most important international initiative to model public services is based on the CPSV initiative coordinated by the ISA/ISA^2 Programme of the European Commission. Based on

CPSV, an Application Profile[1] was developed (henceforth referred to as the CPSV-AP). The CPSV–AP is a public service provision model developed by an open working group and models public services using a common vocabulary.

The proposed model is based on CPSV–AP therefore remains compatible with the European standard.

More specifically:

a) The CPSV–AP model is considered the starting point for the new model.

b) The way public services have been modeled in theory (literature) and practice (portals) in various relevant initiatives is examined. Our analysis includes i) public service provision models found in literature, ii) models used for the Single Point of Contact websites in the 28 Member States of the EU, and iii) four representative models used in Greek public service portals.

c) All the concepts found in the above models are listed and documented.

d) These concepts are compared to the CPSV–AP concepts in order to be mapped wherever possible or be considered as additional candidate concepts not covered in CPSV–AP.

e) We determine which of the additional concepts should be included in the proposed model based on criteria like country- and platform-independence, technology-neutrality, common usage across different coutries, support of relevant usage scenarios (use cases) etc.

f) Last, we construct a 4-layers model, called CPSV-AP-GR. The first 3 layers are acutally views on the CPSV-AP, while the 4th layer is the proposed extension. All layers, including the 4th, are CPSV-compliant and at the same time provide different levels of service descriptions for catering different requirements and needs.

Specifically for executing step b) as presented above:

- The scientific libraries that were used for our research to find public service models include: IEEE [63], ACM [64], Elsevier [65], Springerlink [66], Citeseer [67], dblp [68], EBSCO [69], ISI - Web of Knowledge [70] and Scholar Google [71]. The portal of European Commission for the R&D projects was also employed [72] in order to identify projects related to the scope of this work. For performing the go-backward and go-forward techniques web search engines that permit search of scientific papers according to their references were used. Citeseer [67], ISI - Web of Knowledge [70] and Scholar Google [71] have been used for these purposes. The search identified in total 198 relevant articles.
- The models used by the MSs for the Points of Single Contacts were analysed as found in a study published by the EC ISA Programme [129].
- For the four Greek models, relevant documentation was used or the webportals were analyzed to extract the underlying models. The models were selected based on the importance of the underlying initiatives and as representatives of different types of initiatives, namely: eGIF as the formal and legal framework set for interoperability in Greece, ERMIS as the official national public service portal, the Citizens' Guide of Epirus as an award-winning initiative at the regional level, diadikasies.gr as a non-governmental initiative with large corpus of documented services already (>700).

1 An Application Profile is a specification that re-uses terms from one or more base standards, adding more specificity by identifying mandatory, recommended and optional elements to be used for a particular application, as well as recommendations for controlled vocabularies to be used.

1.4. State of the art: Existing relevant standards/models

In this part, existing public service provision models are presented as found in our research in four subsections.

More specifically:

- The first subsection briefly presents the CPSV–AP model.
- In the second subsection, there is a short description of the existing models found from the literature review.
- In the third subsection, the findings from the models used in the Points of Single Contacts [129] in EU MSs are presented.
- Finally, in the last subsection, four Greek models used by portals are presented and shortly described.

In total, our analysis includes 52 models for public services: 16 identified in the literature, 31 from EU MSs, the 4 Greek models and the CPSV-AP. From these 52 models, 18 are theoretical while 34 are applied models in operating systems. For the applied ones, 31 have been implemented and used in EU Member States (3 MSs have implemented 2 models each) and the other three are the Greek ones: ERMIS[2], diadikasies.gr and Citizen's Guide of the Region of Epirus.

All these models, analysed and mapped to CPSV-AP appear in the spreadsheet file that supports this study. The content of the spreadsheet file is described in Appendix C.

1.4.1. CPSV-AP

The CPSV-AP is one of the core vocabularies developed and published by the ISA/ISA[2] Programme [136]. As defined by the ISA Programme, a Core Vocabulary is a "*simplified, reusable and extensible data model that captures the fundamental characteristics of an entity in a context-neutral fashion*". Core Vocabularies are the starting point for agreeing on semantic interoperability and defining mappings between existing schemata to guarantee a minimum level of cross-domain and cross-border interoperability that can be attained by public administrations.

The Core Public Service Vocabulary Application Profile (CPSV-AP) has been developed in the context of an EC ISA Programme Working Group for describing public services and grouping them in business events [135]. The Working Group consisted of the EUGO Network[3] representatives from 10 Member States (Austria, Estonia, Finland, Greece, The Netherlands, Latvia, Lithuania, Poland, Spain and Sweden). The main focus of the CPSV-AP has thus been the description of public services and business events for the Points of Single Contact which each Member State had to implement in the context of the Services Directive (2006/123/EC).

The use of the CPSV-AP enables European public administrations to:

- Provide information on public services in a user-centric way, grouped logically into business events.
- Map different data models used in the Member States to describe business events and public services to a common model requiring only a single description. This enables the portals on which these events and services are published to federate and share information.

2 The service model of ERMIS is the one included in eGIF, therefore the two models are identical

- Improve the Points of Single Contact and government portals publishing descriptions of business events and public services in an easy, efficient and interoperable manner through a standard data model.

Although the vocabulary is new, it has already been adopted and used by MSs. For example, the Italian Digital Agency (AgID) has created a country-specific Application Profile, called CPSV-AP_IT [133], while Estonia has used the vocabulary for its national public service portal [138].

The Italian approach in which a CPSV-AP extension is created to meet the country-specific needs is considered to be very relevant to the approach adopted by us. Therefore, **the proposed vocabulary for Greece is referred as CPSV-AP-GR**.

1.4.2. Models found in the literature review

We identified 25 conceptual models for the public service and 2 relevant review papers [16, 17]. The references to the conceptual models appear in Table 1. These models are briefly presented in Appendix B.

Conceptual Model	References
UK eService Development Framework (eSDF) model	[74]
Governmental Markup Language (GovML)	[75, 76]
SmartGov model	[77, 78, 79, 80]
E-GOV Public Services Ontology (E-GOV PSO)	[73]
Switzerland Data Model for Public Administration (DMPA)	[81, 82]
OntoGov model	[83, 84, 85]
FIT Ontology	[86]
Governance Enterprise Architecture (GEA)	[87, 88, 89, 90, 91, 92, 93, 94, 95, 96]
DIP model	[97, 98, 99, 100, 101, 102]
OneStopGov model	[103, 104, 105]
Access-eGov model	[106, 107, 108, 109, 110, 111]
Government to Businesses Model (G2BM)	[112]
CEN eGovernment Focus Group (CEN eGov) model	[134]
eGovernment Knowledge Interoperability Ontology (eGKI)	[113, 114]
Life Event Ontology (LEO)	[115, 116]
Core public services vocabulary (CPSV)	[15]

Table 1: References to existing public service models

1.4.3. Service Models in the “Points of Single Contacts” portals in EU MSs

We found in [129] and included in our analysis the data models used on the member states’ PSCs for the description of business events and associated public services. The list of the models appears below in Table 2.

Member State	PSC
Austria	The Austrian Portal for the Services Directive
Belgium	business.belgium.be
Bulgaria	Point of Single Contact – Republic of Bulgaria
Croatia	Point of Single Contact Croatia
Cyprus	PSC Cyprus
Czech Republic	BusinessInfo.cz
Denmark	Business in Denmark
Estonia	Eesti.ee Gateway to eEstonia
Finland	Enterprise Finland
France	Centre for Business Formalities (CFE)
Germany	Dienstleisten leicht gemacht
Greece	Ermis – Guide for service provisioning in Greece
Hungary	Hungary Point of Single Contact
Ireland	Irish Point of Single Contact for Services Directive
Italy	impresainungiorno.gov.it
Latvia	The single state and local government portal www.latvija.lv
Lithuania	Business Gateway Lithuania
Luxembourg	Guichet.lu Le guide administratif de l’Etat luxembourgeois
Malta	BusinessFirst.com.mt
Netherlands	Answers for Business
Poland	Point of Single Contact businessinpoland.gov.pl
Portugal	Company Portal
Romania	edirect.e-guvernare.ro
Slovakia	Public Administration, Point of Single Contact
Slovenia	Slovenia business point
Spain	Spain One stop Centre
Sweden	verksamt.se
The United Kingdom	GOV.UK

Table 2: Public service models from the PSC’s of the 28 EU MSs

1.4.4. Greek service models

We present below the four Greek public service models which we included in our analysis.

A. ERMIS

ERMIS[4] aspired to operate as the National eGov portal for Greece [139]. It was procured in 2006 with an estimated development cost of about 9 ME [143]. ERMIS functionality covers a

4 URL: _

wide spectrum of eGov domain. For example, it has implemented an authentication mechanism for users to sign in, it incorporates a process management module, it has implemented the citizen's electronic space, etc. Recently, it provides users with the option to sign in using the TAXISnet (the national tax portal) credentials (Single Sign On). Furthermore, ERMIS in collaboration with other Greek eGov Information Systems, mainly Base Registries, provides 4th level electronic services. For example, ERMIS in collaboration with the National Population Register provides citizens electronic birth certificates. Documents that have been published by ERMIS can be authenticated for validity.

ERMIS combines a rich front-end environment that is supported by a strong back-end module. Focusing on the front-end, many administrative procedures, from all the administrative levels are described based on the service model of the Greek e-Government Interoperability Framework (Greek e-GIF) [140]. Furthermore, public services are organised by thematic categories as well as by life events to facilitate discovery of public services by citizens.

B. eGIF

The Greek e-Government Interoperability Framework (Greek eGIF)[5] is comprised of a set of documents aiming to facilitate interoperability between eGov portals as well as between eGov systems. It was developed in the same year with ERMIS, namely 2006, to support ERMIS with a set of conceptual models. One of these models has been the model for the description of public services.

The model proposed by eGIF is based on the Dublin Core metadata standard. The model is strucntured in subsets e.g "General metadata of the Public Service", "Metadata for the Electronic Availability of the Public Service", etc. Indicatively, the relevant here "General metadata of the Public Service" subset includes the following metadata: Identifier, Title, Abstract, Responsible Public Body, Related Public Body, etc.

C. Citizen's Guide of the Region of Epirus

The Citizen's Guide of the Region of Epirus is a structured documentation of administrative procedures, linked to the provision of services to citizens. The relevant website[6] is based on Free/Open Source software.

The Citizen's Guide is dealing with administrative procedures, including their input and their output and focuses on extrovert procedures, which include interaction with the region's citizens. Nevertheless, its methodology could easily be extended to include and facilitate internal processes as well.

A form was created for the documentation of information (metadata), concerning each administrative procedure, in a structured manner. The information that was collected, using that form, constitutes the profile of every procedure. That profile includes fields (metadata), such as the title and the description of the procedure, the cost for citizens, the completion time, the relevant legal framework, the steps for the completion of the procedures, the supporting documents, the validity time of the output, etc. All the procedures are grouped by Direction General of the Region of Epirus and in a second level by thematic category, to facilitate discovering by the citizens without having to know the administrative structure of the Region of Epirus. Currently, the Citizens Guide of the Region of Epirus includes description of about 250 administrative procedures.

The Citizen's Guide has the potential to be utilized as a platform for promoting the cooperation between Regions as many of the administrative processes are common to all regions.

It is worth noting that the implementation team of Citizen's Guide is composed exclusively of civil servants while it is based on Free/Open Source software. As a result, there has been

5 URL:
6 URL:

minimal implementation, maintenance and support cost. The implementation period of the project was about 30 months and is in operation since February 2014.

D. diadikasies.gr

Diadikasies.gr[7] provides an open and collaborative wiki space as a knowledge base that is continuously enriched with new services and processes of the public sector. It was created by the Greek Open Technologies Alliance (GFOSS)[8], started as an initiative under the Open Government Action of the Region of Western Macedonia with the collaboration of the GFOSS/Open Government Group. Executives from public agencies document the services they provide, and the underlying procedures using a crowd-sourcing approach and utilizing exclusively Open Source Software.

Each service is a wiki-based entry that contains in diadikasies.gr the following information in the form of service metadata:

- official title of the service
- brief description
- relevant legislation on which it is based,
- a table of the necessary forms and / or electronic forms, with templates,
- a table with its step-by-step procedures,
- any co-competent administrative units
- the forms with which it is provided to the end user with templates
- the records kept for its provision.

1.5. Comparative analysis: concepts for public service descriptions and mappings to CPSV

The goal of the conducted comparative analysis was to identify the super-set of all concepts used in the various models to create an overview of how researchers, practical initiatives and projects describe the concept of the public service[9]. As explained in the methodological part, our intention is to use this set of concepts to the proposed CPSV-AP-GR specification.

To create this super-set of concepts, all concepts introduced per model were listed, documented and mapped to the CPSV-AP concepts i.e. classes and properties. The total list exceeds 600 different concepts. Then we mapped all these concepts to the CPSV-AP spec. The mapping of a concept resulted in the following cases:

a) Mapped concept: The concept under examination has a clear match to a CPSV-AP concept. These mappings are captured and documented in our analysis.

b) New and relevant concept: The concept under examination i) do not match to any of the CPSV-AP concepts, ii) are considered relevant for general use. This set of concepts are candidates to be used for the CPSV extension. We normalised the set by mapping the new concepts from the various models to each other. We ended up with 77 concepts, which appear in Appendix D.

c) New but too specific concept or unclear/vague concept. These concepts either:

   i. do not match to any of the CPSV-AP concepts but rather meet a specific need, as being country or application or technology-specific and are not relevant in a general model

   ii. lack clear documentation to decide on their exact scope and definition

7 URL:
8 https://gfoss.eu/
9 All the documentation can be found in the spreadsheet file which is described in more details in the Appendixes C, D and E

Close to 400 concepts belong to this category and although identified in the analysis are not considered candidates for inclusion in the proposed model.

Based on the results of this comparative analysis, we proceeded and proposed the CPSV-AP-GR specification as described in the next chapter.

3. CPSV-AP-GR: A service model for modeling and publishing administrative processes in Greece

Based on the above analysis, we propose here a 4-layered model to serve as the CPSV-AP-GR spec. For readability purposes, we do not include here the detailed model, but only its overview. The model together with the Greek translation of its concepts can be found in the Appendix E.

1.6. Design Principles

We had two important design principles/requirements to cater with the proposed model:

a) The model **should be able to cater different implementation requirements** as there are no specific, pre-defined use cases to support. Thus, we propose here a **general standard** applicable to different possible implementation scenarios: a public authority may need a minimum implementation of the CPSV-AP-GR or a wider set of metadata. The layered approach caters these different needs.
b) **All the proposed layers should remain compatible with the CPSV-AP**, to ensure that descriptions of Greek public service, regardless of the specific CPSV-AP-GR layer used, can be easily aggregated at European level by CPSV-AP compatible tools and platforms e.g. by the Digital Single Gateway in the future.

Each layer includes a set of metadata descriptions. The set of metadata of an upper layer is always a subset of the metadata of a lower layer, i.e. Layer-4 includes all concepts of all other layers plus additional concepts only availble in Layer-4.

1.7. Model Overview

According to the documentation of the CPSV-AP and the Core Vocabularies Handbook[10], "*a minimal implementation of the CPSV-AP at least provides information on the mandatory properties of the mandatory classes*". Therefore, we started with a "minimal" Layer-1 which remains compatible with CPSV-AP by providing the minimal description for a public service. All the other layers are built on top of this. More specifically, the CPSV-AP-GR is structured as follows:

a) **Layer-1 contains only the mandatory properties of the mandatory CPSV-AP classes**.
b) **Layer-2 contains the properties of the above layer, plus the mandatory properties of the optional classes of the CPSV-AP**. So, Layer-2 contains all classes with only their mandatory properties.
c) **Layer-3 corresponds to the full CPSV-AP spec**, including all properties, mandatory and optional, of all classes, mandatory and optional.
d) **Layer-4 contains the full CPSV-AP model plus the additional concepts** (classes and properties) identified and proposed in our study.

The three first layers provide different views to the CPSV-AP, while the Layer-4 extends it. The proposed model can be represented as four concentric circles (see next figure). Each circle corresponds to a layer. Every layer includes a superset of metadata of its inner layer.

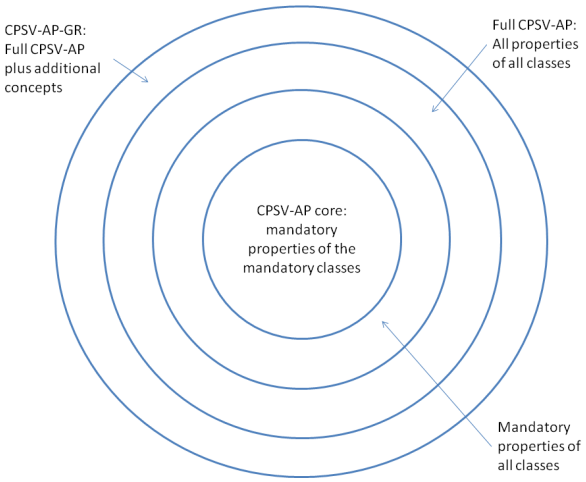

Figure 1: The 4 layers of the CPSV-AP-GR

4. Using the model in practice

In this chapter, we present some ideas for possible usage scenarios for the model. We also discuss some important governance and change management issues.

1.8. Creating a service portfolio

The proposed model can be further used in a variety of scenarios:

- Service reengineering and the provision of more sophisticated services.
- To create a service graph, representing and capturing all the interrelationships that exist amongst public services. This graph is the first step for “service portfolio management”, an approach that manages services not as independent entities but as parts of connected and inter-dependent elements, e.g. the output of one service may be the input to several other services.
- To develop new systems for electronic public service provision at all administrative levels.
- To populate a library of reusable software components based on the common model, see for example tools for the CPSV-AP in the Join.up platform of the European Commission and the repositories discussed in [32].
- For domain engineering purposes. Domain engineering is the process of developing a set of reusable assets (analysis and design models, software architectures and software components) for a family of IS operating in a specific domain [31], e.g. eHealth, eJustice.
- To develope Enterprise Architectures (EA). EA is a framework for supporting the strategic shaping of information systems within an organization by aligning its strategic objectives with IS, business process and organizational systems [126], [127].
- To the revision of the Greek Interoperability Framework, which should take into consideration and include CPSV-AP-GR as a standard to be promoted nation-wide.

1.9. Visualising administrative processes using BPMN

The Business Process Modeling Notation (BPMN) is a graphical notation language that defines the steps in a business process [144]. It is designed to visualise rich set of process flow semantics within a business process and the communication/relationships between independent processes.

BPMN has been used as a tool for public service description and visualization, e.g. in [145]. Government agencies realise the benefits from documenting, modeling, visualising and analysing their processes. Process orientation becomes a common practice to an increasing number of agencies sometimes also coupled by standardisation and use of BPMN as a language to model processes. The goal is to increase efficiency by standardising procedures to ensure consistent outcomes.

Furthermore, it is identified in relevant studies (e.g. [146]) that organizational complexity is a big challenge to solve in order to strive innovation. Business Process Management (BPM) can be considered as a suitable tool to resolve such complexity and continuously improve quality in public services. At the same time, it is a tool to close the gap between business and IT perspectives.

As examples in [147] initiatives since 2014 towards standardization are discussed. In Greece, the proposed Documentation Model for Public Administration Processes and Data (DMPAPD) aims at defining the notation, the rules and the specifications that must guide the process and data models’ design which must be based on either BPMN and UML activity

diagrams in the case of processes, and XML Schema and UN/CEFACT/CCTS in the case of documents and data. In the same direction, the Lithuanian SIRIP (State Information Resource Interoperability Platform) operating rules and legislation describe that "*During the design of e-services with SIRIP tools an agreement on how e-service would work is signed and BPMN diagrams are developed, which are a part of the SIRIP tools. Each institution is obliged to further document their business processes before developing services or e-services and to agree on how these processes will interact to deliver a public service*". Another case where BPMN is used in the EU public sector is a map of business processes and models of business processes describing the as-is state and to-be state of the service were created. Models of business processes are created using commonly known standards e.g. [148]. Furthermore, a leading public corporation which manages information and services for the Portuguese government is using a BPM solution for implementing financial and human resources management shared services [149]. They have focused on the optimisation and benefits achieved through implementing shared services through a BPM solution.

For the purposes of the current study **we propose the Layer 2/3/4 of the 4-layered proposed model to support BPMN of Public Services**. Notably, CPSV-AP mentions that "*The Rule class represents a document that sets out the specific rules, guidelines or procedures that the Public Service follows...Instances of the Rule class are FRBR Expressions, that is, a concrete expression such as a document, of the more abstract concept of the rules themselves. The CPSV-AP does not envisage instances of the Rule class as machine-readable business rules. Detailed modelling of the rules related to Public Services is out of scope of the CPSV-AP*". Nevertheless, and based on our aforementioned survey findings, **the needs of Public sector to share knowledge on services and process and envisage work and tasks as a set of Rules and Steps implementing a formal framework is overwhelming** (see fig. 2 as an extract from CPSV). BPMN can serve as a tool for visualizing Public services for the benefit of both public servants and public service consumers. Practically speaking, the 4-layered model provides minimum support for BPMN as it includes information about Rules and Formal frameworks. This approach remains compliant to CPSV, as it extends it, catering for its limitations in making more human (and even machine) readable the tasks/steps of a service/process.

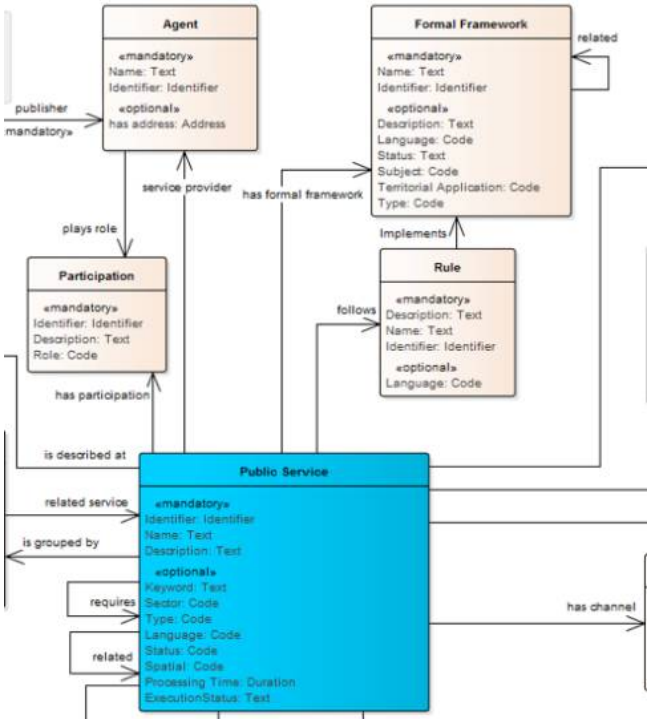

Figure 2: A part of CPSV that is related to supporting BPMN within our 4-layered CPSV-based model

1.10. Federating descriptions of public services at national and European level

The use of the CPSV-AP-GR makes possible the descriptions of the Greek public services to be federated and integrated to any European Catalogue that is based on CPSV-AP and thus promotes the idea of an EU Digital Single Market.

As all the proposed layers remain compatible with the CPSV-AP, all implementations choosing one of these layers can claim compliance with the standard. The benefit of this compliance is multifold: standardised descriptions, reuse of existing and forthcoming tools that support the spec, e.g. a mapping tool developed by the European Commission[11].

However, the reusability of the descriptions at a national and cross-national level is perhaps the most important advantage: projects using different technologies and even context can export the CPSV-AP compliant descriptions and then aggregate this information to create federation of portals.

In a different context related to open data, this approach has been also used by the European Data Portal[12], where, using a very similar approach to one proposed here, another ISA Programme standard, namely the DCAT-AP[13] provides the common metadata standard and language to describe open datasets and catalogues all over Europe. Interestingly, the common spec can also federate existing portals inside one country, something which has already happened in Germany[14].

In this sense, CPSV-AP-GR can be used as a national standard in Greece allowing, independent portals in municipalities, regions, etc to use whatever technology and internal models they want, as soon as they export some basic (or more advanced descriptions, see the proposed layers) of their services using the CPSV-AP-GR spec.

1.11. Governance and change management considerations

The prospect of using CPSV-AP-GR as a national standard has been already introduced and clear benefits discussed. However, as with all standards, there is a clear need to put in place a coherent and stable governance framework. This includes defining the owner of the specification, its management and change procedures. Its relevance at a national level requires ownership at this level by a strategic stakeholder (e.g. horizontal ministry or agency) being able to promote and even make mandatory its use via legislation or procurement.

As part of the governance framework, a clear change management procedure should be put in place, identifying the stakeholders to participate with various roles.

The link and dependence of the specification from the CPSV-AP requires monitoring compliance and versions in the “parent” specification.

Last, a clear line of communication with the relevant group at the ISA Programme should be established as the work here can also provide valuable input for future CPSV-AP versions.

11 http://cpsv-ap.semic.eu:8890/cpsv- ap_mapping/
12 https://www.europeandataportal.eu/
13
14https://www.govdata.de/

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Appendix B: List of service models found in the literature

Conceptual Model	Description
1. UK eService Development Framework (eSDF) model	The OeE's e-Service Development Framework (eSDF) provides a structure for developing interoperability specifications and standards for e-Services to be used in the public sector. The focus is on preserving the information content so that the information receiver can use it without loss or change of meaning.
2. Governmental Markup Language (GovML)	The Governmental Markup Language (GovML) is a template for describing public services and life events. It is anticipated that both public organizations and consumers of public services (citizens, businesses and other public organizations) would benefit from such a common information structure.
3. SmartGov model	The overall aim of the SmartGov project is to specify, develop, deploy and evaluate a knowledge-based platform to assist public sector employees to generate online transaction services. It achieves this by simplifying their development, maintenance and integration with already installed IT systems.
4. E-GOV Public Services Ontology (E-GOV PSO)	The ontology for e-government public services covers multiple aspects of services, including administrative responsibility, involved documents, legislation, and metadata, formulating a semantically rich network of interrelated concepts. This network can be jointly developed by public administrations, subject to administrative authorization, and directly supports essential tasks of service provision, such as service composition, change management and service cataloguing.
5. Switzerland Data Model for Public Administration (DMPA)	The ontology for e-government public services covers multiple aspects of services, including administrative responsibility, involved documents, legislation, and metadata, formulating a semantically rich network of interrelated concepts. This network can be jointly developed by public administrations, subject to administrative authorization, and directly supports essential tasks of service provision, such as service composition, change management and service cataloguing.

Conceptual Model	Description
6. OntoGov model	In the OntoGov project the possibility of applying ontologies in the E-Government domain for the creation of self managing systems is investigated. Self-managing systems are systems that can continually update themselves (at least to a certain extent automatically) according to the changes in the domain. This is the main difference of the OntoGov project in comparison to the existing projects related to ontologies in the E-Government domain.
7. FIT Ontology	On the pure ontology side, the definitive project comes from projects under the 4th IST call. The FIT project addresses the need for an adaptive front office, which ensures that the electronic delivery of public services is tailored to the preferences, needs and expectations of each user individually. The project aims to develop, test and validate a self adaptive egovernment framework based on semantic technologies that will ensure that the quality of public services is proactively and continually fitted to the changing preferences and increasing expectations of citizens and businesses.
8. Governance Enterprise Architecture (GEA)	GEA aims at introducing a consistent set of models that constitute the basis for reference eGovernment domain ontology. This ontology is generic enough to cover the overall eGovernment domain, and at the same time specific enough to sufficiently model PA specific semantics.
9. DIP model	e-Government Ontology: This Ontology was created from an already existing taxonomy (seamlessUK), created by Essex County Council. The semalessUK project began in 1998 with the aim of creating a classification of all the relevant terms citizen access to “community information” provided by governmental and other agencies, at national and local level. The seamless UK taxonomy is no longer being expanded, only refined and maintained, as it will be integrated within a broader project called the “Public Sector Merged Vocabulary (PSMV)”.

Conceptual Model	Description
10. OneStopGov model	The proposed model is based on a small number of core classes and properties. These were derived by studying previous work such as the GEA models and public services ontologies (e.g. the Meta ontology proposed by the OntoGov project). The proposed classes are: life-event, public service, citizen, user profile, input, output, rules, Public Administration (PA) document and non-Public Administration object.
11. Access-eGov model	It is about a front office approach to integration of government services on the semantic level including results of first prototype testing in real settings in three EU countries. The proposed approach, developed within the AccesseGov project, enables integration of traditional (i.e. face-to-face) and existing electronic services.
12. Government to Businesses Model (G2BM)	The project called Government for Business (in short G4B) was granted by the Italian Ministry of Industry in years 2003 - 2005. The project called Government for Business (in short G4B) aims at building a technological infrastructure to enable the businesses to make effective use of public administration services.
13. CEN eGovernment Focus Group (CEN eGov) model	The eGovernment Focus Group mapped the various activities in the field of eGovernment standardization, discussed a roadmap for the future in Europe and released its final report in February 2008.
14. eGovernment Knowledge Interoperability Ontology (eGKI)	It refers to the creation of an eGovernment ontology, and the development of a knowledge-based registry of governmental services in Greece. This Registry is an advanced web portal, devoted to the formal description, composition and publishing of traditional, electronic and web services, including the relevant electronic documents, information systems and as well the process descriptions and the workflow models in an integrated knowledge base. Through such a repository, the discovery of services by users or systems has been automated, resulting in an important tool for achieving interoperable eGovernment transformation.

Conceptual Model	Description
15. Life Event Ontology (LEO)	As eGovernment becomes a very active research area, a lot of solutions to solve citizens' needs are being deployed. These solutions, even of a high quality, suffer from some drawbacks. Most of them related to the lack of interoperability among different Public Administrations or the difficulties to locate or invoke the desired service. To deal with these issues, a semantic-based approach centered in citizens is proposed. It tackles the provision of a front-end solution to access services in Public Administrations.
16. Core public services vocabulary (CPSV)	The Core Public Service Vocabulary (CPSV) is designed to make it easy to exchange basic information about individual public sector services. By using the vocabulary, almost certainly augmented with sector-specific information, organisations publishing data about their services will enable: easier discovery of those services with and between countries; easier discovery of the legislation and policies that underpin service provision; easier recognition of how services provided by a single organisation interrelate and are used either by other services or external users; and easier comparison of similar services provided by different organisations.

Appendix C: Documentation of the supporting spreadsheet file

The mappings between all the concepts (classes or properties) of all models included in our study have been made on a spreadsheet file, namely the Mapping_PSs_metadata_to_CPSV_AP_v043.xlsx file, which is constituted of 8 tabs. Below all tabs of the spreadsheet file are described:

“1_About” tab: This tab includes the description of the study, the descriptions of the other tabs, some statistics and categorization of the models included in the study, some colour codes used or the categorization of the concepts (e.g. mandatory class, mandatory property, etc), the status of the spreadsheet (e.g. draft) and the version of the spreadsheet.

“2_definitionsCPSV-AP” tab: The definitions of the concepts (classes and properties) of the CPSV-AP, which is the base model, are depicted.

“3_MappingConceptstoCPSV-AP” tab: The mappings of the concepts of all models with the concepts of CPSV-AP, which is the base model, are shown. The concepts of every model that is mapped with a concept of the CPSV-AP are stored in cells of the same row of the tab. If more than one concept of a particular model are mapped with the same concept of CPSV-AP, then one concept is stored in a cell of the same row which the concept of the CPSV-AP and the rest of the mapped concepts are in vertically consequent cells. In such a case, the concepts of the CPSV-AP are not stored in vertically consequent cells, but there are empty shells between the shells that the concepts of the CPSV-AP are stored.

“4_MappingConceptstoCPSV-Apstat” tab: In this tab the concepts of the CPSV-AP are sorted in descending numerical order, accordingly to the number of models that include a concept that has been mapped to this particular concept of the CPSV-AP.

“5_AdditionalConcepts” tab: In this tab there are the concepts of all models, except CPSV-AP, that have not been mapped to any of the concepts of the CPSV-AP. They constitute the set of concepts that are candidates to extend the CPSV-AP.

These concepts have been mapped between themselves. It has been adopted the following methodology: Setting the metadata model of diadikasies.gr as the base model, the concepts of the rest of the models have been mapped with the concepts of diadikasies.gr. The mapping process is the same as the process followed in tab 3. The rest of the concepts of the model next to diadikasies.gr model, namely the concepts of the PSP models found in literature review, that have not been mapped to any of the concepts of diadikasies.gr model, are stored in vertically consequent cells, below the concepts of diadikasies.gr. Then, the concepts of the rest of the models have been mapped to these concepts of the PSP models found in literature review. This procedure continued until the last model. After, the previously described procedure, a list of all candidates concepts is shown in the left columns of the tab.

“6_AdditionalConcepts_stats” tab: In this tab the candidates concepts, depicted in the previous tab, are sorted in descending numerical order, according to the number of models that appear, even with different names.

“7_4layerPSPmodel” tab: In this tab the proposed 4 layer Public Service Provision model, namely the CPSV-AP-GR, is shown. The proposed model is comprised of the concepts (classes and properties) of the CPSV-AP and the additional concepts (tab 5) that appear in more than one metadata model.

The first column stores the layer that a concept belongs to. If we press the number “1” button in the top left corner than the concepts of the layer 1 of the proposed model appear and so on.

Moreover the last column of this tab contains information about the relevance of every concept to the modeling of the execution of a public service.

“8_All_Concepts_stats” tab: Tab 8 is the union of the tabs 4 and 6. All the concepts, both the concepts of the CPSV-AP and the candidates concepts, are sorted in descending numerical order, according to the number of models that appear, even with different names.

“9_ProposedAdditionalConcepts”: In this tab the proposed additional concepts (classes and properties) are presented. It has been formated in order to be printed in A4 size paper in portait orientation. It has been copied to Appendix D of the study.

“10_4layerPSPmodel_without_defs”: This tab is duplication of tab 7, but with fewer columns. It has been formated in order to be printed in A4 size paper in portait orientation. It has been copied to Appendix E of the study.

Appendix D: List of additional concepts for the CPSV-AP extension

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Public Service	Steps of the execution	Δημόσια Υπηρεσία	Βήματα για την εκτέλεση της ΔΥ	This property represents the steps of the execution of the public service in order its output to be produced.
Public Service	Start trigger	Δημόσια Υπηρεσία	Γεγονός Εκκίνησης της ΔΥ	This property represents the event that triggers the initiation of the execution of the public service.
Public Service	Concequence (GEA)	Δημόσια Υπηρεσία	Συνέπεια	Information about the executed public service that needs to be forwarded to interested parties [GEA]
Public Service	Subsector	Δημόσια Υπηρεσία	Υποτομέας	This property represents the subsector of the sector a Public Service relates to, or is intended for.
Public Service	Profession	Δημόσια Υπηρεσία	Επαγγελματική ομάδα	This property represents the subsector of the professions a Public Service relates to, or is intended for.
Public Service	Societal Entity [GEA] (Consumer)	Δημόσια Υπηρεσία	Κοινωνινκή Οντότητα (Καταναλωτής ΔΥ)	Information about the service consumer [OneStopGov]
Public Service	Period of time (Availability) / Deadline	Δημόσια Υπηρεσία	Χρονική διαθεσιμότητα / Καταληκτική Ημερομηνία	This property represents the period of time that a Public Service is available or the deadline for applying.
Public Service	Additional sources of information	Δημόσια Υπηρεσία	Πρόσθετες πηγές πληροφόρησης	This property represents the URIs of any webpages, documents, data catalogues, etc that cantain information relevant to the Public Service.
Public Service	Guide	Δημόσια Υπηρεσία	Οδηγός/Εγχειρί-διο	This property represents the URIs of any Guide(s) relevant to the application for or the execution of the Public Service.
Public Service	Complaint - Appeal mechanisms between service providers and recipients	Δημόσια Υπηρεσία	Μηχανισμοί παραπόνων -προσφυγών μεταξύ των παρόχων και των αποδεκτών της ΔΥ	This property describes the means that a Citizen or Business may utilize to express a complaint or submit an appeal against the output of a Public Service.
Public Service	Link for apply (Website)	Δημόσια Υπηρεσία	Ηλεκτρονική Αίτηση	This property represents the URL for the online application for the execution of a Public Service.

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Public Service	Authentication	Δημόσια Υπηρεσία	Ταυτοποίηση	This property represents the type of Authentication for the online application for the execution of a Public Service.
Public Service	Current Online Sophistication Level	Δημόσια Υπηρεσία	Τρέχον επίπεδο ηλεκτρονικοποίησης	This property represents the Current Online Sophistication Level of a Public Service.
Public Service	Target Online Sophistication Level	Δημόσια Υπηρεσία	Επιθυμητό επίπεδο ηλεκτρονικοποίησης	This property represents the Target Online Sophistication Level of a Public Service.
Public Service	Link to machine-readable service description	Δημόσια Υπηρεσία	Σύνδεσμος σε μηχαναγνώσιμη περιγραφή της ΔΥ	This property represents the URL linking to the file containing the machine-readable (e.g. RDF, XML, etc) service description of a Public Service.
Public Service	Parent Service	Δημόσια Υπηρεσία	Γονική ΔΥ	This property represents the URI of the description of the Parent Public Service, if it exists. For example the Central Government could issue the description of a Public Service that is applied at Regional Level and each Region based on this abstact description optimized the description of its correspomding Public Service to the specific requirements of the Region.
Public Service	Date of Creation	Δημόσια Υπηρεσία	Ημερομηνία Δημιουργίας	This property represents the Date of the initiation of a Public Service.
Public Service	Date of Modification	Δημόσια Υπηρεσία	Ημερομηνία Τελευταίας Τροποποίησης	This property represents the Date of the last update of a Public Service.
Public Service	Disposal Date	Δημόσια Υπηρεσία	Ημερομηνία Κατάργησης	This property represents the Date of the termination of the provision of a Public Service.
Public Service	FAQ	Δημόσια Υπηρεσία	Συχνές Ερωτήσεις	This property represent a list of Frequently Asked Questions regarding a Public Service.
Public Service	Notes	Δημόσια Υπηρεσία	Σημειώσεις	This property represent any note, or other information regarding a Public Service that could not be stored to other property.

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Evidence	Acquisition by the Service Provider	Αποδεικτικό στοίχειο	Ανάκτηση του αρχείου	Indicates where can be automatically obtained by the Service Provider, e.g. utilizing a Web Service operating on a Base Registry.
Evidence	Base registry	Αποδεικτικό στοίχειο	Βασικό Μητρώο	This property represents the URI of the Base registry from where the specific document can be obtained.
Evidence	Base registry Key	Αποδεικτικό στοίχειο	Κλειδί στο Βασικό Μητρώο	This property represents the value of the key field of the Base registry from where the specific document can be obtained.
Evidence	Form / Document / Data	Αποδεικτικό στοίχειο	Έντυπο / Έγγραφο / Δεδομένο	This property links the Evidence Class with the classes Form, Document or Data.
Output	Related Documentation	Έξοδος	Σχετικό Έγγραφο	This property represents documentation that contains information related to the Output, for instance a particular template for an administrative document, an application or a guide on formatting the Output.
Output	Language	Έξοδος	Γλώσσα	Indicates the language(s) in which the Output must be provided.
Output	Validity period	Έξοδος	Χρόνος ισχύος	This property represents the validity period of the Output.
Output	Renewal Process	Έξοδος	Διαδικασία ανανέωσης	This property represents the URI of the Public Service for the extention of the validity period of the Output or for the reissuing of the Output.
Output	Form / Document / Data	Έξοδος	Έντυπο / Έγγραφο / Δεδομένο	This property links the Output Class with the classes Form, Document or Data.
Document		Έγγραφο		Any Document related to the Public Service that can be either Evidence or Output
Document	Identifier	Έγγραφο	Αναγνωριστικό	This property represents an Identifier for the Document.
Document	Document_type	Έγγραφο	Τύπος_κειμένου	This property represents the Document Type, e.g. Permit, Certificate, Ministerial Decision etc.

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Document	Step number	Έγγραφο	Βήμα Διεκπεραίωσης της ΔΥ	This property represents the number of the step for the execution of a Public Service that the document is related.
Form		Έντυπο		Any Form related to the Public Service that can be either Evidence or Output.
Form	Identifier	Έντυπο	Αναγνωριστικό	This property represents an Identifier for the Output.
Form	Form_type	Έντυπο	Τύπος_εντύπου	This property represents the Form Type.
Form	Responsible organisation	Έντυπο	Αρμόδιος Φορέας	This property represents the Organization that is responsible for the creation of the Form.
Data		Δεδομένο		Any Data related to the Public Service that can be either Evidence or Output.
Data	Identifier	Δεδομένο	Αναγνωριστικό	This property represents an Identifier for the Output.
Data	Data_type	Δεδομένο	Τύπος_δεδομένου	This property represents the Data Type, e.g. Integer, Binary, Alpharithmetic String, etc.
Agent	Spatial	Συμμετέχων	Γεωγραφικός Προσδιορισμός Αρμοδιότητας	This property represents the geographic area that the Agent has some authority to act.
Agent	Administrative Level	Συμμετέχων	Διοικητικό Επίπεδο	This property represents the Administrative Level (e.g. National, Regional, etc) of the Agent.
Agent	Description	Συμμετέχων	Περιγραφή	This property represents the decription of the Agent in free text.
Agent	Homepage	Συμμετέχων	Ιστοσελίδα	This property represents the URL of the Website of the Agent.
Agent	Parent Organization	Συμμετέχων	Φορέας στον οποίο ανήκει	This property links the Agent to the Organisation that is part of.
Agent	Has Contact Point	Συμμετέχων	Έχει Σημείο Επικοινωνίας	This property links the Agent Class to the Contact Point class. The value of this property, the contact information itself, should be provided using schema:ContactPoint.
Public Organisation	Administrative Level	Δημόσιος Οργανισμός	Διοικητικό Επίπεδο	This property represents the Administrative Level (e.g. National, Regional, etc) of the Public Organisation.

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Public Organisation	Description	Δημόσιος Οργανισμός	Περιγραφή	This property represents the decription of the Public Organisation in free text.
Public Organisation	Homepage	Δημόσιος Οργανισμός	Ιστοσελίδα	This property represents the URL of the Website of the Public Organisation.
Public Organisation	Address	Δημόσιος Οργανισμός	Διεύθυνση	This property represents an Address related to an Public Organisation.
Public Organisation	Responsible Unit	Δημόσιος Οργανισμός	Αρμόδια Οργανική Μονάδα	This property links the Agent class to the Responsible Unit class.
Responsible Unit		Αρμόδια Οργανική Μονάδα		This class represents the Responsible Unit (e.g. direction, department, etc) of the Competent Authority of the Service Provider that is in charge for the provision of a Public Service.
Responsible Unit	URI	Αρμόδια Οργανική Μονάδα	Αναγνωριστικό	This property represents an Identifier for the Responsible Unit.
Responsible Unit	Name	Αρμόδια Οργανική Μονάδα	Όνομα	This property represents the Name of the Responsible Unit.
Responsible Unit	Location on the map	Αρμόδια Οργανική Μονάδα	Γεωγραφική θέση στον χάρτη	This property represents the geographical position of the Responsible Unit.
Responsible Unit	Contact Point	Αρμόδια Οργανική Μονάδα	Σημείο Επικοινωνίας	This property links the Responsible Unit class to the Contact Point class. The value of this property, the contact information itself, should be provided using schema:ContactPoint.
Contact Point	URI	Σημείο Επικοινωνίας	Αναγνωριστικό	This property represents an Identifier for the Contact Point.
Contact Point	Name	Σημείο Επικοινωνίας	Όνομα	This property represents the Name of the Contact Point (usually it is expected to be the name and surname of the responsible employee).
Contact Point	Address	Σημείο Επικοινωνίας	Διεύθυνση	This property represents the Address of the Contact Point.
Contact Point	E-mail	Σημείο Επικοινωνίας	Διεύθυνση Ηλεκτρονικού Ταχυδρομείου	This property represents the e-mail address(es) of the Contact Point.
Contact Point	Phone	Σημείο Επικοινωνίας	Αριθμός Τηλεφώνου	This property represents the phone number(s) of the Contact Point.

Class	Property	Greek traslation of the class	Greek traslation of the property	Definition
Contact Point	Fax	Σημείο Επικοινωνίας	Αριθμός Τηλεομοιοτυπίας	This property represents the fax number(s) of the Contact Point.
Step		Βήμα ΔΥ		This class describes a particular step of the sequence of steps needed for the execution of the public service.
Step	Name	Βήμα ΔΥ	Όνομα	This property represents the Name of a Step.
Step	Type	Βήμα ΔΥ	Τύπος	This property represents the Type of a Step.
Step	Service	Βήμα ΔΥ	Υπηρεσία	This property links the Step class to the Public Service class.
Step	Number	Βήμα ΔΥ	Όνομα	This property represents the Number of a Step.
Step	Description	Βήμα ΔΥ	Περιγραφή	This property represents the Description of a Step in free text.
Step	Contact details	Βήμα ΔΥ	Πληροφορίες Επικοινωνίας	This property links the Step class to the Contact Point class. The value of this property, the contact information itself, should be provided using schema:ContactPoint.
Step	Documents	Βήμα ΔΥ	Έγγραφα	This property links the Step class to any relevant documents.
Step	Fees	Βήμα ΔΥ	Κόστος	This property links the Step class to the Cost class.
Step	Deadline	Βήμα ΔΥ	Καταληκτική ημερομηνία	This property represents the Deadline for the completion of a Step.
Step	Participants	Βήμα ΔΥ	Συμμετέχοντες	This property links the Step class to the Agent class.
Step	Has Input (Evidence)	Βήμα ΔΥ	Έχει είσοδο	This property links the Step class to the Evidence class.
Step	Produces	Βήμα ΔΥ	Παράγει	This property links the Step class to the Output class.
Step	Related Rule(s)	Βήμα ΔΥ	Σχετιζόμενοι Κανόνες	This property links the Step class to the Rule class.

Appendix E: CPSV-AP-GR

Layer	Class	Property	Greek traslation of the class	Greek traslation of the property
1	Public Service		Δημόσια Υπηρεσία	
1	Public Service	Identifier	Δημόσια Υπηρεσία	Αναγνωριστικό
1	Public Service	Name	Δημόσια Υπηρεσία	Όνομα
1	Public Service	Description	Δημόσια Υπηρεσία	Περιγραφή
4	Public Service	Steps of the execution	Δημόσια Υπηρεσία	Βήματα για την εκτέλεση της ΔΥ
4	Public Service	Start trigger	Δημόσια Υπηρεσία	Γεγονός Εκκίνησης της ΔΥ
4	Public Service	Concequence (GEA)	Δημόσια Υπηρεσία	Συνέπεια
3	Public Service	Keyword	Δημόσια Υπηρεσία	Λέξη κλειδί
3	Public Service	Sector	Δημόσια Υπηρεσία	Τομέας
4	Public Service	Subsector	Δημόσια Υπηρεσία	Υποτομέας
4	Public Service	Profession	Δημόσια Υπηρεσία	Επαγγελματική ομάδα
3	Public Service	Type	Δημόσια Υπηρεσία	Τύπος
3	Public Service	Language	Δημόσια Υπηρεσία	Γλώσσα
3	Public Service	Status	Δημόσια Υπηρεσία	Κατάσταση
3	Public Service	Is Grouped By	Δημόσια Υπηρεσία	Ομαδοποιούνται από
3	Public Service	Requires	Δημόσια Υπηρεσία	Απαιτεί
3	Public Service	Related	Δημόσια Υπηρεσία	Σχετίζεται με
3	Public Service	Has Criterion	Δημόσια Υπηρεσία	Έχει Κριτήριο
1	Public Service	Has Competent Authority	Δημόσια Υπηρεσία	Έχει Αρμόδια Αρχή
3	Public Service	Service Provider	Δημόσια Υπηρεσία	Πάροχος Υπηρεσίας
3	Public Service	Has Participation	Δημόσια Υπηρεσία	Έχει Συμμετοχή
4	Public Service	Societal Entity [GEA] (Consumer)	Δημόσια Υπηρεσία	Κοινωνινική Οντότητα (Καταναλωτής ΔΥ)
3	Public Service	Has Input (Evidence)	Δημόσια Υπηρεσία	Έχει είσοδο
3	Public Service	Has Formal Framework	Δημόσια Υπηρεσία	Έχει Νομικό Πλαίσιο
3	Public Service	Produces	Δημόσια Υπηρεσία	Παράγει
3	Public Service	Follows	Δημόσια Υπηρεσία	Ακολουθεί
3	Public Service	Spatial	Δημόσια Υπηρεσία	Γεωγραφικός Προσδιορισμός Εφαρμογής
4	Public Service	Period of time (Availability) / Deadline	Δημόσια Υπηρεσία	Χρονική διαθεσιμότητα / Καταληκτική Ημερομηνία
3	Public Service	Has Contact Point	Δημόσια Υπηρεσία	Έχει Σημείο Επικοινωνίας
3	Public Service	Has Channel	Δημόσια Υπηρεσία	Έχει Κανάλι
3	Public Service	Processing Time	Δημόσια Υπηρεσία	Χρόνος διεκπεραίωσης
3	Public Service	Has Cost	Δημόσια Υπηρεσία	Έχει Κόστος
4	Public Service	Additional sources of information	Δημόσια Υπηρεσία	Πρόσθετες πηγές πληροφόρησης
4	Public Service	Guide	Δημόσια Υπηρεσία	Οδηγός/Εγχειρίδιο
4	Public Service	Complaint - Appeal mechanisms between service providers and recipients	Δημόσια Υπηρεσία	Μηχανισμοί παραπόνων -προσφυγών μεταξύ των παρόχων και των αποδεκτών της ΔΥ

Layer	Class	Property	Greek traslation of the class	Greek traslation of the property
4	Public Service	Link for apply (Website)	Δημόσια Υπηρεσία	Ηλεκτρονική Αίτηση
4	Public Service	Authentication	Δημόσια Υπηρεσία	Ταυτοποίηση
4	Public Service	Current Online Sophistication Level	Δημόσια Υπηρεσία	Τρέχον επίπεδο ηλεκτρονικοποίησης
4	Public Service	Target Online Sophistication Level	Δημόσια Υπηρεσία	Επιθυμητό επίπεδο ηλεκτρονικοποίησης
4	Public Service	Link to machine-readable service description	Δημόσια Υπηρεσία	Σύνδεσμος σε μηχαναγνώσιμη περιγραφή της ΔΥ
4	Public Service	Parent Service	Δημόσια Υπηρεσία	Γονική ΔΥ
4	Public Service	Date of Creation	Δημόσια Υπηρεσία	Ημερομηνία Δημιουργίας
4	Public Service	Date of Modification	Δημόσια Υπηρεσία	Ημερομηνία Τελευταίας Τροποποίησης
4	Public Service	Disposal Date	Δημόσια Υπηρεσία	Ημερομηνία Κατάργησης
4	Public Service	FAQ	Δημόσια Υπηρεσία	Συχνές Ερωτήσεις
4	Public Service	Notes	Δημόσια Υπηρεσία	Σημειώσεις
2	Event		Γεγονός	
2	Event	Identifier	Γεγονός	Αναγνωριστικό
2	Event	Name	Γεγονός	Όνομα
3	Event	Description	Γεγονός	Περιγραφή
3	Event	Type	Γεγονός	Τύπος
3	Event	Related Service	Γεγονός	Συσχετισμένες ΔΥ
3	Business Event		Επιχειρηματικό Γεγονός	
3	Life Event		Γεγονός του κύκλου ζωής	
2	Participation		Συμμετοχή	
2	Participation	Identifier	Συμμετοχή	Αναγνωριστικό
2	Participation	Description	Συμμετοχή	Περιγραφή
2	Participation	Role	Συμμετοχή	Έχει Ρόλο
2	Criterion Requirement		Έχει κριτήριο	
2	Criterion Requirement	Identifier	Έχει κριτήριο	Αναγνωριστικό
2	Criterion Requirement	Name	Έχει κριτήριο	Όνομα
2	Criterion Requirement	Type	Έχει κριτήριο	Τύπος
2	Evidence		Αποδεικτικό στοίχειο	
2	Evidence	Identifier	Αποδεικτικό στοίχειο	Αναγνωριστικό
2	Evidence	Name	Αποδεικτικό στοίχειο	Όνομα
3	Evidence	Description	Αποδεικτικό στοίχειο	Περιγραφή
3	Evidence	Type (Value list: Form / Document / Data)	Αποδεικτικό στοίχειο	Τύπος (Λίστα τιμών: Φόρμα / Έγγραφο / Δεδομένο)
3	Evidence	Related Documentation	Αποδεικτικό στοίχειο	Σχετικό Έγγραφο

Layer	Class	Property	Greek traslation of the class	Greek traslation of the property
3	Evidence	Language	Αποδεικτικό στοίχειο	Γλώσσα
4	Evidence	Acquisition by the Service Provider	Αποδεικτικό στοίχειο	Ανάκτηση του αρχείου
4	Evidence	Base registry	Αποδεικτικό στοίχειο	Βασικό Μητρώο
4	Evidence	Base registry Key	Αποδεικτικό στοίχειο	Κλειδί στο Βασικό Μητρώο
4	Evidence	Form / Document / Data	Αποδεικτικό στοίχειο	Έντυπο / Έγγραφο / Δεδομένο
2	Output		Έξοδος	
2	Output	Identifier	Έξοδος	Αναγνωριστικό
2	Output	Name	Έξοδος	Όνομα
3	Output	Description	Έξοδος	Περιγραφή
3	Output	Type (Value list: Document / Data)	Έξοδος	Τύπος
4	Output	Related Documentation	Έξοδος	Σχετικό Έγγραφο
4	Output	Language	Έξοδος	Γλώσσα
4	Output	Validity period	Έξοδος	Χρόνος ισχύος
4	Output	Renewal Process	Έξοδος	Διαδικασία ανανέωσης
4	Output	Form / Document / Data	Έξοδος	Έντυπο / Έγγραφο / Δεδομένο
4	Document		Έγγραφο	
4	Document	Identifier	Έγγραφο	Αναγνωριστικό
4	Document	Document_type	Έγγραφο	Τύπος_κειμένου
4	Document	Step number	Έγγραφο	Βήμα Διεκπεραίωσης της ΔΥ
4	Form		Έντυπο	
4	Form	Identifier	Έντυπο	Αναγνωριστικό
4	Form	Form_type	Έντυπο	Τύπος_εντύπου
4	Form	Responsible organisation	Έντυπο	Αρμόδιος Φορέας
4	Data		Δεδομένο	
4	Data	Identifier	Δεδομένο	Αναγνωριστικό
4	Data	Data_type	Δεδομένο	Τύπος_δεδομένου
2	Cost		Κόστος	
2	Cost	Identifier	Κόστος	Αναγνωριστικό
3	Cost	Value	Κόστος	Τιμή
3	Cost	Currency	Κόστος	Κόστος
3	Cost	Description	Κόστος	Περιγραφή
3	Cost	Is Defined By	Κόστος	Καθορίζεται από
3	Cost	If Accessed Through	Κόστος	Κανάλι που χρησιμοποιείται
2	Channel		Κανάλι	
2	Channel	Identifier	Κανάλι	Αναγνωριστικό
3	Channel	Owned By	Κανάλι	Ανήκει σε
3	Channel	Type	Κανάλι	Τύπος
3	Channel	Has Input	Κανάλι	Έχει είσοδο
3	Channel	Opening Hours	Κανάλι	Ωράριο λειτουργίας

Layer	Class	Property	Greek traslation of the class	Greek traslation of the property
3	Channel	Availability Restriction	Κανάλι	Περιορισμός διαθεσιμότητας
2	Opening Hours Specification		Ωράριο λειτουργίας	
2	Rule		Κανόνας	
2	Rule	Identifier	Κανόνας	Αναγνωριστικό
2	Rule	Description	Κανόνας	Περιγραφή
3	Rule	Language	Κανόνας	Γλώσσα
2	Rule	Name	Κανόνας	Όνομα
3	Rule	Implements	Κανόνας	Εφαρμόζει
2	Formal Framework		Νομικό Πλαίσιο	
2	Formal Framework	Identifier	Νομικό Πλαίσιο	Αναγνωριστικό
2	Formal Framework	Name	Νομικό Πλαίσιο	Όνομα
2	Formal Framework	Description	Νομικό Πλαίσιο	Περιγραφή
3	Formal Framework	Language	Νομικό Πλαίσιο	Γλώσσα
3	Formal Framework	Status	Νομικό Πλαίσιο	Κατάσταση
3	Formal Framework	Subject	Νομικό Πλαίσιο	Θέμα
3	Formal Framework	Territorial Application	Νομικό Πλαίσιο	Γεωγραφική εφαρμογή
3	Formal Framework	Type	Νομικό Πλαίσιο	Τύπος
3	Formal Framework	Related	Νομικό Πλαίσιο	Σχετική ΔΥ
2	Agent		Συμμετέχων	
2	Agent	Identifier	Συμμετέχων	Αναγνωριστικό
2	Agent	Name	Συμμετέχων	Όνομα
3	Agent	Type	Συμμετέχων	Τύπος
3	Agent	Plays Role	Συμμετέχων	Έχει Ρόλο
3	Agent	Has Address	Συμμετέχων	Έχει Διεύθυνση
4	Agent	Spatial	Συμμετέχων	Γεωγραφικός Προσδιορισμός Αρμοδιότητας
4	Agent	Administrative Level	Συμμετέχων	Διοικητικό Επίπεδο
4	Agent	Description	Συμμετέχων	Περιγραφή
4	Agent	Homepage	Συμμετέχων	Ιστοσελίδα
4	Agent	Parent Organization	Συμμετέχων	Φορέας στον οποίο ανήκει
4	Agent	Has Contact Point	Συμμετέχων	Έχει Σημείο Επικοινωνίας
1	Public Organisation		Δημόσιος Οργανισμός	
1	Public Organisation	Identifier	Δημόσιος Οργανισμός	Αναγνωριστικό
1	Public Organisation	Preferred Label	Δημόσιος Οργανισμός	Επίσημος Τίτλος
1	Public Organisation	Spatial	Δημόσιος Οργανισμός	Γεωγραφικός Προσδιορισμός Αρμοδιότητας

Layer	Class	Property	Greek traslation of the class	Greek traslation of the property
4	Public Organisation	Administrative Level	Δημόσιος Οργανισμός	Διοικητικό Επίπεδο
4	Public Organisation	Description	Δημόσιος Οργανισμός	Περιγραφή
4	Public Organisation	Homepage	Δημόσιος Οργανισμός	Ιστοσελίδα
4	Public Organisation	Address	Δημόσιος Οργανισμός	Διεύθυνση
4	Public Organisation	Responsible Unit	Δημόσιος Οργανισμός	Αρμόδια Οργανική Μονάδα
4	Responsible Unit		Αρμόδια Οργανική Μονάδα	
4	Responsible Unit	URI	Αρμόδια Οργανική Μονάδα	Αναγνωριστικό
5	Responsible Unit	Name	Αρμόδια Οργανική Μονάδα	Όνομα
4	Responsible Unit	Location on the map	Αρμόδια Οργανική Μονάδα	Γεωγραφική θέση στον χάρτη
4	Responsible Unit	Contact Point	Αρμόδια Οργανική Μονάδα	Σημείο Επικοινωνίας
3	Contact Point		Σημείο Επικοινωνίας	
4	Contact Point	URI	Σημείο Επικοινωνίας	Αναγνωριστικό
4	Contact Point	Name	Σημείο Επικοινωνίας	Όνομα
4	Contact Point	Address	Σημείο Επικοινωνίας	Διεύθυνση
4	Contact Point	E-mail	Σημείο Επικοινωνίας	Διεύθυνση Ηλεκτρονικού Ταχυδρομείου
4	Contact Point	Phone	Σημείο Επικοινωνίας	Αριθμός Τηλεφώνου
4	Contact Point	Fax	Σημείο Επικοινωνίας	Αριθμός Τηλεομοιοτυπίας
4	Step		Βήμα ΔΥ	
4	Step	Name	Βήμα ΔΥ	Όνομα
4	Step	Type	Βήμα ΔΥ	Τύπος
4	Step	Service	Βήμα ΔΥ	Υπηρεσία
4	Step	Number	Βήμα ΔΥ	Όνομα
4	Step	Description	Βήμα ΔΥ	Περιγραφή
4	Step	Contact details	Βήμα ΔΥ	Πληροφορίες Επικοινωνίας
4	Step	Documents	Βήμα ΔΥ	Έγγραφα
4	Step	Fees	Βήμα ΔΥ	Κόστος
4	Step	Deadline	Βήμα ΔΥ	Καταληκτική ημερομηνία
4	Step	Participants	Βήμα ΔΥ	Συμμετέχοντες
4	Step	Has Input (Evidence)	Βήμα ΔΥ	Έχει είσοδο
4	Step	Produces	Βήμα ΔΥ	Παράγει
4	Step	Related Rule(s)	Βήμα ΔΥ	Σχετιζόμενοι Κανόνες

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