Towards Semantic Interoperability of Core Registers in Croatia

Kornelije Rabuzin[1], Darko Gulija[2], Leo Mršić[3] and Nikola Modrušan[4]
[1]Faculty of Organization and Informatics, University of Zagreb, Pavlinska 2, Varaždin, Croatia
[2]Gulija Consulting and Smart Solutions, Vinogradska 74, Zagreb, Croatia
[3]Algebra University Zagreb, Gradišćanska 24, Zagreb, Croatia
[4]Central State Office for the Development of Digital Society, Ivana Lučića 8, Zagreb, Croatia

Keywords: Interoperability, Core Registers, EIF, Data Quality, Digital Government.

Abstract: Digital government assumes sharing and use of government data without restrictions. However, different reports and indicators presented in this paper show that in Croatia, core register data could and should be used and shared more extensively. In this way, better services to citizens and companies could be offered. The first step to accomplish this goal is to examine core registers in Croatia, in order to detect possible issues and problems which hinder data use, sharing and exchange. For that purpose, a project was started whose goal is to analyse basic register data in Croatia. Findings from the first phase of the project, including the first set of registers, are presented in this paper.

1 INTRODUCTION

In the past, all governments were analogue, working almost exclusively with paper, with many non-automated procedures that required a lot of manual work. Then the concept of e-government was introduced, leading to better services to citizens, as processes stopped to being performed manually. Consequently, this increased the speed and the quality of services, both for citizens and companies. Today, the concept of digital governments has its focus in including citizens into making decisions, defining priorities, proposing new ideas and services, etc. Digital Government refers to the use of digital technologies, as an integrated part of governments' modernisation strategy, in order to create public value (OECD, 2014). For that concept to be implemented, it is necessary to use digital technologies, including Internet, social media, cell phones, etc.

A public sector is considered data-driven when generates public value through the reuse of data in planning, delivering and monitoring public policies, while adopting ethical principle for trustworthy and safe reuse of data (OECD, 2019a). Also, it governs and manages data as a strategic asset for the creation of public value and the agile and responsive provision of public services (OECD, 2019b). The OECD proposed 12 key recommendations/ principles which should support the digital transformation of the public sector, grouped in three pillars: Openness and Engagement, Governance and Coordination, and Capacities to Support Implementation. Openness and transparency as well as data driven culture play an important role in the digital transformation.

Many principles and key ideas are crucial in digital transformation, but one of the most important facts is that data-driven governments ensure that public sector data are shared inside and outside the public sector in a trustworthy fashion, and under clear protection, privacy, security rules and ethical principles for national and public interest (OECD, 2019a). Open government data should be considered as a public good, and should be proactively delivered with a purpose, and with a focus on reuse, in line with user needs and its potential contribution to creating value (OECD, 2019a).

Estonia can be considered as an excellent example of the large pool of digital services, both simple and complex, that can be offered to citizens and companies (Estonia X-Road. Open Digital Ecosystem (ODE) Case study, 2020). With these services the transparency is increased, there are solutions easily accessible by using different devices, and different services are available online, among others.

In order to get better services and to include citizens, data sharing is crucial, which means that government data cannot be stored as independent silos between public bodies, but instead have to be

Rabuzin, K., Gulija, D., Mršić, L. and Modrušan, N.
Towards Semantic Interoperability of Core Registers in Croatia.
DOI: 10.5220/0011271100003269
In *Proceedings of the 11th International Conference on Data Science, Technology and Applications (DATA 2022)*, pages 337-344
ISBN: 978-989-758-583-8; ISSN: 2184-285X

used and shared. This will lead to processes to be more streamlined and with a faster execution.

Core registers are "reliable sources of basic information on items such as persons, companies, vehicles, licenses, buildings, locations and roads", and "are authentic and authoritative and form, separately or in combination, the cornerstone of public services" (European Commission, 2015). Also, they should be highly specialized, so each register should not contain data about different business entities. The interfaces between these registries need to be defined, published and harmonized, at both semantic and technical levels (European Commission, 2015). Public Administrations could (and should) get information from different core registries without having to require it to the business or citizen. Accessibility and interoperability of core registries are enablers of the Once-Only Principle (European Commission, 2015). This principle states that each citizen and company should only give each information once, to ensure efficiency in the processes.

From an IT point of view, interoperability is a property of computerized systems that represents the ability to exchange information with other similar systems. For the purpose of the European Interoperability Framework (EIF), interoperability is the ability of organisations (public administration units) to interact with each other to achieve mutually beneficial goals, involving the sharing of information and knowledge between these organisations. This is done through the business processes they support, by exchanging data between their ICT systems ("The New European Interoperability Framework," 2017).

EIF distinguishes 4 different levels of interoperability: legal, organizational, semantic and technical. Semantic interoperability, which is important for this paper, ensures that both the format and meaning of exchanged data (and at the same time, information) is preserved and understood throughout exchanges between parties, i.e. 'what is sent is what is understood' ("The New European Interoperability Framework," 2017).

Today, interoperability is an important topic, as systems that do contain large amounts of data should share it as well. Several reports conducted in the past few years show that Croatia is generally not badly ranking in the digital transformation topic. Nevertheless, there is an issue with core registers in Croatia, since they do not share data among them. This complicates simple procedures for data owners and citizens, since services that could be available online still require a lot of written documents and bureaucracy.

A project whose goal was to investigate and improve the interoperability of public registers in Croatia was approved. This project had in its team the authors of this paper. In the first phase of the project, 18 registers were included, along one extra register that already contains data aggregated from other registers (so 19 registers in total). This paper brings some findings which, in our opinion, will affect further developments of interoperability and data sharing between core registers in Croatia.

The rest of the paper is organized as follows; first we present some general information about interoperability and data sharing, and then we move to the core register analysis. After that, future research is presented, and in the end some conclusions are given.

2 BACKGROUND

In the past few years different analysis and reports were conducted in Croatia, revealing several problems around these topics. One of them is that core registers do not exchange data in a satisfactory manner (for example, (World Bank Group, 2017)). Digital Economy and Society Index (DESI), EU eGovernment Benchmark, and EUROSTAT showed there is an insignificant digitalization of Government to Business (G2B) services and several challenges in the reuse of business data in online forms (World Bank Group, 2021). Furthermore, Both Croatian National Development Strategy 2030 and National Recovery and Resilience Plan (NRRP) recognized that a slow pace of digitalization of G2B services prevents faster improvements of the business environment forms (World Bank Group, 2021). The report also concludes that (World Bank Group, 2021):

- The slow pace of digitalization of Government to Business (G2B) services impedes faster improvement of the business environment;
- The provision of government services to entrepreneurs (G2B) remains in an analogue format, and the level of information exchange between stakeholders is limited;
- Both interoperability and integration of business data are weak, and although the ICT solutions currently in place are a step in the right direction, they need to be further strengthened to correctly provide G2B services.

For people and institutions this usually means that they often have to submit the same data multiple time, in paper forms, and to different public bodies. Although some of this data is already stored in the

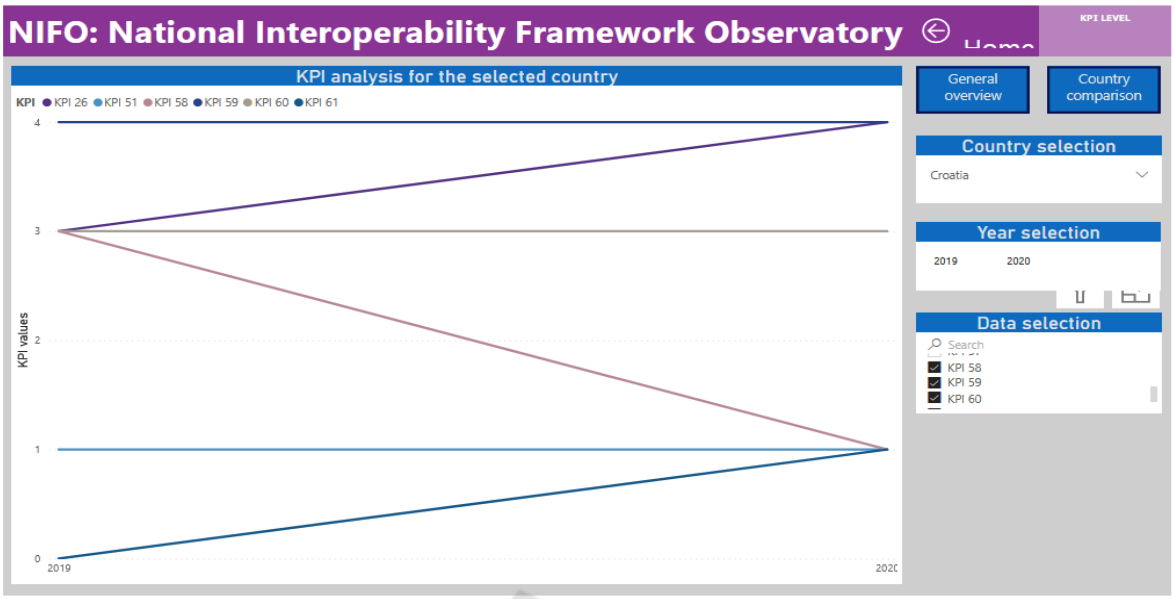

Figure 1: EU National Interoperability Framework Observatory KPI's related to Base Registries for Croatia for 2019 and 2020, accessed on October 24, 2021 (https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/eif-monitoring).

computerized systems, it is not easily available to be used. This is frustrating, both for people and companies as they have to submit the same paper forms multiple times to get some services which could be made available online. Registers containing data are treated as independent silos, and the level of data exchange is rather low.

The key performance indicators (KPI) from the European Interoperability Framework Monitoring Mechanism (EIFMM) that are related to the interoperability of base registers for Croatia show space for improvements, as shown in Figure 1.

In particular, the master data management and reusable data structures for semantic interoperability of core registers can be upgraded.

As seen in Figure 1, some KPIs are rated 1 out of 4:

- KPI 26 - Extent to which the five major Base Registries (Population, Vehicle, Tax, Land, Business) are available for reuse in digital public services;
- KPI 51 - Existence of metadata, master data and reference data management policies;
- KPI 58 - Existence of agreements on reference data in the form of taxonomies, controlled vocabularies, thesauri, code lists and reusable data structure/models to achieve semantic interoperability of the Base registries;
- KPI 59 - Existence of registry of Base Registries;
- KPI 60 - Extent to which base registries draw up and implement a data quality assurance plan to ensure the quality of their data;
- KPI 61 - Existence of a master data management and Quality Assurance (QA) plans for one or more of the five major Base Registries: Population, Vehicle, Tax, Land, Business.

As discussed earlier, registers should represent trusted sources of information containing data about basic entities, which include people, vehicles, businesses, etc. As it has been stated above, the interoperability and data exchange are still not satisfactory, and a good starting point for improving semantic interoperability is to perceive data and information as a valuable public asset ("The New European Interoperability Framework," 2017). Within the first phase of the project the main registers about persons and business entities were analysed. In the next section the most important findings for selected registers in Croatia will be presented.

3 CORE REGISTER ANALYSIS

This section is composed of several subsections that cover different aspects of the analysis that has been conducted during the project. One register contains

data aggregated from other registers, while one register that is called "Metaregistar" contains metadata about other registers. All other registers, 17 of them, contain data about people (birth register, death register, register of life partnership …), business entities (craft register, register of business entities, court register…) and territorial units, all of them included in this analysis. In the next phase of the project, other core registers will be covered.

3.1 Database Management Systems (DBMS) in Use

When looking at the selected core registers in Croatia, it is clear that there are three main database management systems in use, which are: MS SQL Server, Oracle and DB2. Only one register is implemented in PosthreSQL DBMS. Table 1 shows the number of registers that are implemented in each system:

Table 1: Number of registers per DBMS.

Database management systems	Number of registers
DB2	5
MS SQL Server	3
Oracle	8
PostgreSQL	1

3.2 Naming Conventions – Recommendations

Naming conventions could be defined as rules that, although not written, if applied have the ability of increasing the readability and understanding of the model that is being generated. Usually, a database contains a large number of tables, and by using these naming conventions it is easier to find objects that are needed at each moment. There are advantages of using them in the implementation phase, for updating data, for development application, among others.

The first question is whether to use singular or plural when naming objects. In the conceptual design phase, an entity type is usually specified as a singular noun, while in the implementation phase table names are usually plural nouns, since it is expected that each table contains a large number of entity instances. To connect two or three words usually the symbol "_" is used; leading to the use of *customer_purchase* in contrary to *customerpurchase*, for example. Also, it is preferable to use lowercase writing, for example *customer_purchase*, over *CUSTOMER_PURCHASE*.

Regarding the primary key, "_id" can be added to the end of the column, like *customer_id*, or simply use the id as a primary key column. A foreign key should also be created in a similar way, for example, in the orders table we could have a *customer_id* as a foreign key, to denote that an order belongs to a customer.

When creating a constraint, it should also have a name as well, and for example a primary key constraint could be named as *table_pk*.

For columns that contain data we could use *country_code*, *country_name*, etc. Also, when using dates, it is better to specify what the date means, for example *start_date*, *end_date*, etc. For columns that can have binary values, like flags which denote that something is added, updated, or deleted, it can be used, for example, *is_deleted*, *is_updated*, etc.

There are also some rules for stored procedures, functions, and views, but these were not explained in this paper, since there was no access to registers' databases and all the database objects. Also, for some registers, only the documentation was available.

3.3 Naming Conventions - Analysis

Here we have to repeat that there was no access for some registers of the database, and so, analysis was done based on the available documentation. For that reason, it is not possible to give answers to some of the recommendations mentioned previously. However, based on the analysis of selected registers the following can be stated:

- Column and table names are mostly in Croatian, except for one database whose table and column names are specified in English;
- Regarding singular and plural naming convention, some registers contain just one table, so we did get only the column names, and not the table name. For other registers, no rules were taken into account in this matter. Table names are always specified as nouns, sometimes as singular and sometimes as plural;
- Underscore is mostly used when naming objects in databases, but many situations were found that did not use this rule. For example, DATUMRODJ is a column that represents the birth date, where two words are merged together without using "_" or any other special character. Other example is PREZIMEBRACDRUGA, which is a column name that consists of three words that are merged together without any separation (the spouse last name). Also, words are written in uppercase, which goes against previously stated naming conventions. As it is

possible to see, this slightly affects and diminishes the readability of the information;

- Regarding upper and lower case, one register uses combinations such as DateCreated, where words are merged together, and each letter of a new word is written in uppercase. The same happens in the following example: ContractDeliveryDate;
- Regarding the primary key:
  - some registers use only the ID as a primary key column name,
  - some registers use other identifiers, like OIB or MBS, as they are usually good natural keys,
  - in some registers we have the combination of ID and table name (for example, ID_MATICE),
  - some registers use arbitrary names for primary keys.
- Regarding the dates, we list some of the examples found:
  - DATUMUPISA - represents the date of registration. As one can see, both words are merged together and the underscore symbol is not used,
  - DATUM - is a date column, but it is not known which value should be stored. Luckily, there was a comment specified for the column, so it was possible to determine what should be stored and what is the true meaning of the values,
  - DATUM_VERIFIKACIJE - represents the date when the entry was verified. Most date columns in registers do contain the word which denotes the precise meaning of a date column (start date, end date, date of change, etc.).
- Comments are mostly not used, except for one database which is well commented. Here we were able to query the structure and to extract the comments, as everything was specified in English.

Based on the findings above, it is clear why semantic interoperability may be hard to achieve. Heterogeneous data sources, different naming conventions, different column meanings, in some cases even for the same column names, etc., represent the challenges which will certainly affect the level of interoperability of these systems.

Regarding the data access, it is clear that data is protected, with several levels of security being usually operational, like usernames and passwords, certificates, Intranet, etc. Furthermore, in order to get access to some of the registers, institutions require an agreement to be signed first, and only afterwards data access can be granted.

3.4 Data Types

When designing a database, it is important to select appropriate data types. The recommendation is to use standardized data types, since specific data types can cause problems in migrations and/or integrations. Also, usually new versions of the same database management system do not support the exact same data types. Some specific types can be declared as obsolete, and in some point of time the support for them will simply end.

One of the main identifiers in Croatia is the OIB number (Personal Identification Number). It was introduced in 2009, and is used for different purposes. One of them is related to tax purposes, in order to help to determine the amount of tax each citizen has to pay. One of the reasons this number was introduced was to comply with the EU legislation.

OIB should contain 11 digits (0 – 9), it should not contain any private data and the number should be randomly generated. Based on the previously presented facts, the OIB data type should be specified as CHAR(11). Since the last digit is a control digit, when entering the OIB also it is possible to check and calculate whether the entered value is correct or not.

In the analysis phase, it was found that different data types were being used in the OIB columns, and some of them possibly incorrect ones. While in the OIB columns for some of the registers the data type was set to CHAR(11), others used VARCHAR and INT data types instead. This is not a good practice for at least two reasons: different data types could cause problems during the data integration phase, and by selecting an inappropriate data type some data could be lost, which is a big security concern. Since the length of OIB is fixed, there is no need to use VARCHAR, and using an INT data type could result in data loss.

For other columns the data type selection was somewhat appropriate. In some cases, the specified length was a longer then actually needed; for example, in one register the first name was specified as VARHCAR(240), which is definitely too long to store that kind of data.

Identifier (internal)	Term / Label	Type	Class	Data Type	Definition
Address	Address	Class	Address		An address representing a location.
AddressFullAddress	Full Address	Property	Address	Text	The complete address with or witho
AddressPOBox	PO Box	Property	Address	Text	The Post Office Box number.
AddressThoroughfare	Thoroughfare	Property	Address	Text	The name of a passage or way thro
AddressLocatorDesignator	Locator Designator	Property	Address	Text	A number or a sequence of charact relevant scope.
AddressLocatorName	Locator Name	Property	Address	Text	A proper noun applied to the real w
AddressAddressArea	Address Area	Property	Address	Text	The name of a geographic area or l objects for addressing purposes, wi
AddressPostName	Post Name	Property	Address	Text	The key postal division of the addre
AddressAdminUnitL2	Admin Unit L2	Property	Address	Text	The region of the address, usually a encompasses several localities.
AddressAdminUnitL1	Admin Unit L1	Property	Address	Text	The uppermost administrative unit
AddressPostCode	Post Code	Property	Address	String	The post code, a.k.a. postal code, Z
AddressAddressID	Address ID	Property	Address	String	A globally unique identifier for this

Figure 2: EUCore Vocabularies.

3.5 Authentic Data

Each register should contain authentic data and it should be clear for each register which data is authentic and which is not. The analysis revealed that:

- the same data is declared as authentic in at least two registers;
- the data that should be authentic within the register was not declared as authentic;
- several registers hold the same redundant data, which leads to unnecessary storage.

3.6 The Use of Standard Codes, Vocabularies and Classifications

As proposed in (European Commission, 2015), the use of controlled vocabularies should be obligatory. EUCore Vocabularies are simplified, reusable and extensible data models that capture the fundamental characteristics of an entity in a context-neutral fashion. These consist on the list below, and can be also seen in Figure 2 (European Commission, n.d.-a).

- The Core Business Vocabulary - simplified, reusable and extensible data model that captures the fundamental characteristics of a legal entity, e.g. legal name, activity, address, legal identifier, company type, and its activities;
- The Core Location Vocabulary - a simplified, reusable and extensible data model that captures the fundamental characteristics of a location, for example an address, a geographic name, or geometry. The Location Vocabulary is aligned with the INSPIRE data specifications;
- The Core Person Vocabulary - a simplified, reusable and extensible data model that captures the fundamental characteristics of a person, e.g. name, gender, date of birth, etc.;
- The Core Public Service Vocabulary - a simplified, reusable and extensible data model that captures the fundamental characteristics of a service offered by public administration. Such characteristics include title, description, inputs, outputs, providers, locations, etc. of the public service;
- The Core Public Organisation Vocabulary - a simplified, reusable and extensible data model used for describing public organizations in the European Union.

Core Vocabularies can be used in two ways (European Commission, n.d.-b):

- By designing a new data model and either binding it to an existing syntax or creating a new syntax for it; or
- By creating mappings from a data model to the Core Vocabularies' conceptual data model and to the respective syntaxes.

Unique UN Assig	ABIE/ BBII	Dictionary Entry Name (auto generated)	Definition
UN00000078	BCC	Person. Alias. Text	An alias, expressed as text, reflecting a sh
UN00000079	BCC	Person. Middle Name. Text	Name or names, expressed as text, usuall
UN00000080	BCC	Person. Family Name. Text	A name, expressed as text, that a person
UN00000082	BCC	Person. Title. Text	A textual expression of the title associate
UN00000083	BCC	Person. Salutation. Text	A formal sign or expression of greeting, e
UN00000084	BCC	Person. Family Name Prefix. Text	A textual expression of a prefix that prece
UN00000085	BCC	Person. Name Suffix. Text	A textual expression of a suffix that follov
UN00000088	BCC	Person. Marital Status. Code	A code specifying the married status of th
UN00000089	BCC	Person. Gender. Code	A code specifying the gender of this persc
UN00000189	BCC	Person. Birth. Date Time	A date, time, date time or other date time
UN00000186	BCC	Person. Age. Measure	A measure of the age of this person such
UN00000190	BCC	Person. Death. Date Time	A date, time, date time or other date time
UN00000093	BCC	Person. Language. Identifier	A unique identifier of a language related t
UN00000242	BCC	Person. Description. Text	A textual description of this person.

Figure 3: UN CCL.

The UN Core Component Library (CCL) is a library of business semantics in data models that is harmonized, audited and published by UN/CEFACT (United Nations, 2012). The library contains a list of business entities, for example party, organization, location, person, etc., and they can be reused in different domains and contexts. Business entities are based on core components, and each component has a vast number of attributes that are suitable and can be used in different scenarios, as seen in Figure 3.

EUCore Vocabularies also define mappings between different vocabularies, including mappings between the EU Core Vocabularies and UN CCL.

There are also other vocabularies that can be used, for example IMI Core Vocabulary or eIDAS minimum dataset, but unfortunately, this cannot be covered within the scope of this paper. However, one of the goals of this work was to map the existing data model that comes from different registers with Core Vocabularies or UN CCL. This would lead one step closer to semantic interoperability of the mentioned registers, as proposed by (European Commission, n.d.-b).

3.7 National Classifications

In Croatia there are two important national classifications: national classification of activities and national occupational classification.

National classification of activities contains areas (one-letter mark), sections (two-digit number), groups (three-digit numbers) and classes (four-digit numbers), and be analyzed in Figure 4.

Područje	Odjeljak	Skupina	Razred	Naziv	NACE Rev. 2
A				**POLJOPRIVREDA, ŠUMARSTVO I RIBARSTVO**	
	01			**Biljna i stočarska proizvodnja, lovstvo i uslužne djelatnosti povezane s njima**	
		01.1		**Uzgoj jednogodišnjih usjeva**	
			01.11	Uzgoj žitarica (osim riže), mahunarki i uljanog sjemenja	01.11
			01.12	Uzgoj riže	01.12

Figure 4: National classification of activities.

The national classification of occupations contains a list of occupations, and was established for the first time in 1998 by the Croatian Bureau of Statistics. It is comparable to the International Standard Classification of Occupations (ISCO-88). The second updated version was released in 2008, and it was changed later in 2010, after ISCO-08 appeared in 2008.

We can conclude that database designers of the analyzed registers were aware of the two classifications, and both classifications were extensively used within the registers.

However, when looking at some international classifications, including ISO 3166 Country Codes, ISO 4217 currency codes, etc., only two registers use ISO 3166 country codes (register of territorial units and personal identification number register), and other classifications are not used at all. For example, ISO 11179 classifications (used for objects,

properties, representations, etc.) are only used within the Metaregistar.

There is also the register of territorial units (RPJ), which holds country data on counties, cities, etc. This is an important register as data from the register can be used for different purposes. Although the register contains important data, it is not used by the majority of registers.

4 FUTURE WORK

At this stage, the research is extended to cover a larger set of core registers, in a total of seventy core registers. This phase should be finished until autumn 2022.

For the second phase, the goal is to implement a small application which would be used to map existing data models to EU Core Vocabularies or UN CCL. In that way, it would be possible to solve some of the issues mentioned previously. For example, it would be possible to find authentic data, to find all the attributes that are relevant for the basic set of entities (persons, business entities, among others), etc. Also, it would be possible to reconstruct basic entities and their attributes based on the mappings. This would be important for the design of new web services which should integrate data from different registers.

Since interoperability also covers organizational and legal issues, the plan is to identify other issues, and to amend existing regulations, laws and procedures accordingly to the results of the study, and the plan is to publish the findings in mentioned areas.

5 CONCLUSION

Within the project, whose goal is to analyze and to improve the interoperability of public registers in Croatia, the current state of the art was analyzed and some findings regarding the core registers are presented in this paper. Generally speaking, there is a low level of data exchange between the registers, which slows down the procedures, both for citizens and companies. Namely, for the digital government concept, data sharing is crucial, and there is still a significant space for improvement in a form of core register data sharing and exchange.

The analysis also revealed that heterogeneous database management systems are in use, with different naming conventions within the registers. Also, standard vocabularies are not used, standard classifications are used partially, and column meanings are not always clear as conventions are not always used, among others. These problems will have to be tackled as they prevent the semantic interoperability with the hinder of the development towards digital government.

Also, some other issues were identified regarding other aspects of interoperability, like legal and organizational, but since they were out of the focus of this paper, they will be discussed in future published work.

REFERENCES

Estonia X-Road. Open Digital Ecosystem (ODE) Case study. (2020). Retrieved from https://opendigitalecosystems.net/pdf/01-Estonia-Case-Study_vF.pdf

European Commission. (n.d.-a). About Core Public Service Vocabulary Application Profile . Retrieved January 22, 2022, from https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/solution/core-public-service-vocabulary-application-profile/about

European Commission. (n.d.-b). Semantic Interoperability Community (SEMIC) - Core Vocabularies. Retrieved January 22, 2022, from https://joinup.ec.europa.eu/collection/semantic-interoperability-community-semic/core-vocabularies

European Commission. (2015). Base Registries.

OECD. (2014). *Recommendation of the Council on Digital Government Strategies*. Paris. Retrieved from https://legalinstruments.oecd.org/en/instruments/OECD-LEGAL-0406

OECD. (2019a). *5th OECD expert group meeting on open government data: Building an open and connected government*. Paris. Retrieved from https://www.oecd.org/governance/digital-government/5th-oecd-expert-group-meeting-on-open-government-data-summary.pdf

OECD. (2019b). *Digital Government in Chile – A Strategy to Enable Digital Transformation*. OECD. https://doi.org/https://doi.org/10.1787/f77157e4-en

OECD. (2020). *Digital Government Index: 2019 results*. https://doi.org/https://doi.org/https://doi.org/10.1787/4de9f5bb-en

The New European Interoperability Framework. (2017). Retrieved January 23, 2022, from https://ec.europa.eu/isa2/eif_en

United Nations. (2012). UN CCL. Retrieved March 14, 2022, from https://tfig.unece.org/contents/uncefact-ccl.htm

World Bank Group. (2017). *Policy Options for Reforming the Business Entry Regime, Summary note*.

World Bank Group. (2021). *Assessment of Digital Government to Business Services - Croatia Business Environment Reform II*. Zagreb, Croatia.