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The visualization of program and project portfolios and smart services of municipalities by the concept of Enterprise Architecture in the public administration

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Abstract

The article refers to the trend of implementation Enterprise Architecture into Public administration domain in order to get better managerial results, understanding of complexity and huge portfolio of public services as well as the design of specific services fitting into Smart City concept.

Keywords: Public administration, digital age, Enterprise Architecture, Information and Communication Technology, visualization of modelling, TOGAF, ArchiMate, municipality, Smart City concept, smart carpooling, smart parking, smart rent a bike.

1. Intoduction into Digital transformation in Czech Republic

Digital transformation of global society and markets brought new social, economic and technological opportunities. It implies many changes of lives had long time ago crossed the borders of continents and states. These changes based on digitalization have been going naturally one of priorities of the European Union and Czech Republic. The Czech government primarily focuses at removing barriers and obstacles to business, trade, government itself and public administration services in order ensuring free movement of information, knowledge, goods and services in the digital as well as the physical world.

The part of digitalization within the current governmental initiatives formalized in "Digital Czech Republic 2019" is the improvement of government services as well as services of public administration for the citizens and entrepreneurs.

Czech Republic undergone through many legislative, organizational and digital initiatives since 90s till this time being. It resulted sometimes into positives and sometimes into negatives that have had strong impact into daily life of citizens. In comparison with other Eastern European countries, Czech Republic progressing slowly. Many digitalization projects and programs were successfully implemented and have influenced the lives of citizens. However, eGovernment (which also contains ePublic Administration) also deals with the projects and programs, which were not successfully done. Therefore, in this article we propose Enterprise architecture as an

approach, that can bring improvements and positive effects into ICT management as well as in organizational management of projects, programs and initiatives.

2. Introduction into the visualization using Enterprise Architecture

The visualization of the program and project portfolio is a multilateral activity of program and project managers in the preparatory phase. As it is a relationship between projects in program not only for them, but also for all interested or non-involved. In a public administration environment, due to its complexity and territorial scope, the situation may be much worse. Projects, whether it is an area or hierarchy within the National Architectural Plan[1] (eg ICT, etc.), are not often used. The relationships of project are hard to find. Strategic goals are not structured well and their relationships and dependencies are not also know[2]. These abuses and imperfections can be eliminated by a systematic approach called Enterprise Architecture (EA). This access to information is presented in the following section, which relates to the goal, projects and illustrations of their relationships and dependancies (not only internal but also external). The EA concept is a native general concept that can be transferred from the private sector to the public sector. The use of this concept is in favor of its high values in the form of a formalized approach (graphical signs and symbols), which increases the clarity of structured content.

The aim of using Enterprise Architecture in combination with Project/Program management methods is to improve the principles and terminology of project and programme management based on method of PRINCE2 and MSP in public administration bodies in order to be more effective in ICT initiatives co-financed from EU funds. The side effect of EA and Project/Pogram mananagement combination is to overbridge the semantic gap of different understanding of essential terminology of project management in initiation and realization phase of projects being financed from EU funds. The target group of this approach is not only ICT manager, senior managers of public administration bodies and clerks (team members) involved in project initiation and realization, but also the students of informatic, information management, public administration and economy, which are considering to get the apportunity of working for either the public administration bodies or ICT companies., see (Lukáš, 2016),

2.1 What the Enterprise Architecture is

Enterprise Architecture (EA) is often translated as an organization's architecture (enterprise architecture). In the public administration environment, it is preferable to adhere to the notion of the **architecture of the organization** or **the architecture of the public authority or the architecture of the public administration**. *"EA is the process of description and the result of describing how the future business processes, technologies, and information will best support strategy, including the definition of the necessary steps, standards, and guidelines in order to get from the current state to the expected target."*, see (1). Another view of the applicability of the EA concept is the determination of its conception. *"Architecture in Enterprise Informatics (EA) is an approach, concept, means and tool by which we express*

[1] See page #15, *National Architecture Plan* (4), European, central, regional, city and municipal layer (client layer)

[2] For example Strategy framwork of public administration development of Czech Republic 2014 – 2020 (7) or *ICT Strategy of resort for 2016–2020* (11)

fundamental arrangement of the relationship between business and information systém. This might lead to fulfillment the mission of the organization, while respecting the environment and consistently following the system design and development principles. ", see (2). The purpose of EA in a public administration environment is to describe all key dimensions: **business** layer, **application and data** layer, **technology (infrastructure)** layer. ArchiMate visualization language (notation) is a widespread language for drawing relationships between elements of an organization architecture. It enables these key dimensions to be described by means of elements and relationships between them.

2.2 Enterprise Architecture in the domain of Public Administration

The issue of using EA in a public administration environment is addressed in the National Architectural Plan (see Felix, Hrabě, Kuchař). It implies that each public authority will use the EA concept to develop the strategies of ICT implementation. In practical terms, it is therefore important that cities and municipalities do not have to deal with the architecture of public authorities (regional authorities, departmental ministries, etc.). It is sufficient to create and indicate a relationship and links to them. The same approach is necessary for strategic documents created, for example, by departmental organizations. There are a number of different systematic approach methodologies, none of which can be taken over mechanically. On the other hand, although there is no generally applicable methodology, it is possible to derive generally applicable principles from existing methodologies that can be applied to program and project management in public administration based on strategic documents. ArchiMate notation in each logical layer is used to record the current (AS-IS) and future (TO-BE) state of the architecture of architecture. Figure # 1 shows the architecture of public administration in four horizontal layers as defined by the National Architectural Plan. Cross-sectional architectures are shown vertically, which cannot be ignored (eg, power, security)

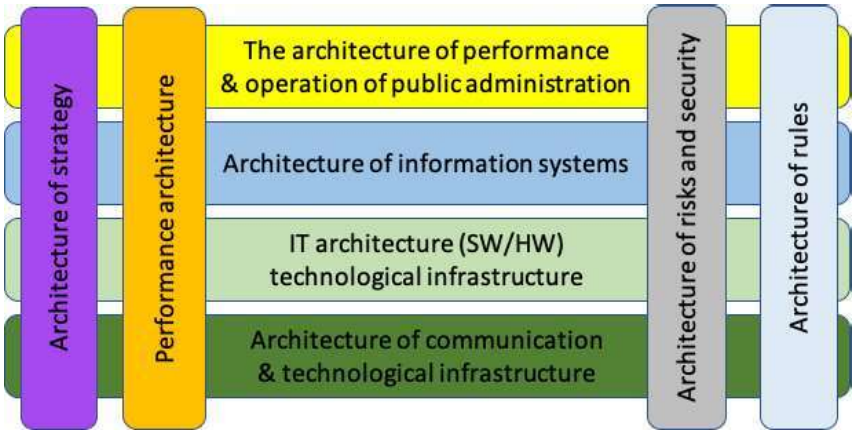

Figure #1: National ICT architecture of public administration of Czech republic (source: Felix, Hrabě, Kuchař)

2.3 Example of elements of Business layer

Selected elements of active and passive structure, behavior, sources of motivation and motivation themselves will be used to illustrate the links between **strategic documents of public administration, sectoral policies, sectoral strategies, objectives/goals, programs (areas) and implementation projects**. The element of **Business Actor** is an organizational entity capable of performing assigned business within one or more business roles. For example, the Department of Informatics provides for the acquisition and renewal of hardware infrastructure. The element of **Location** refers to the location (physical or virtual) in which the element is located. The division of the resort into individual departmental organizations performing state administration located in the Czech Republic and covered by the ministry is a good example for the location. The element of **Business function** is considered to be a group of activities according to a given criteria, which may be source, competence, goal or strategy. An example of a business function is the fulfillment of the functions of a departmental organizational unit resulting from its incorporation into the organizational order (eg implementation of EU fund projects). From opposite site, if the activities are organized according to their logical sequence (the order in which they are executed), then the element of **Business Process** is discussed. A typical example is the administrative procedure, which takes place in logical steps in accordance with Act No. 500/2004 Coll., The Code of Administrative Procedure.

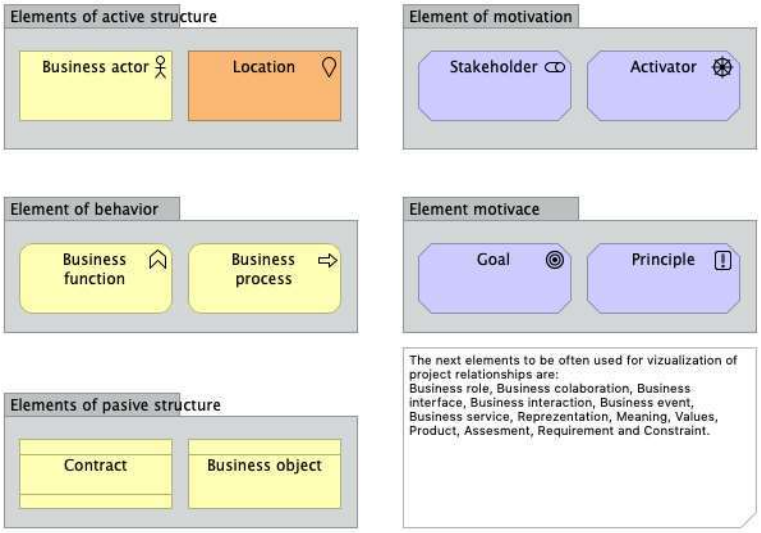

Figure #2: Example of elements for vizualization of the relationships between strategic goals, program and project (source: author)

An element that is significant to an organizational unit (organization) in terms of securing a service is called **Business Object**. An administrative decision issued in the administrative procedure for a given area (service) is an example of good practice of perceiving Business Object. **Contract** is an element that determines the relationship between product associated rights to it. Typically, it is an agreement or contract to own, use, rent a product, movable or immovable property. Individuals, teams, organizational units or entire organizations involved in the architecture of an organization or the entire organization system are considered **Stakeholders**. A frequent example is the project management committee, the output and benefit

beneficiaries and the users. The factor that creates, directs, and motivates changes to the organization is called the **Iniciator**. Often, the initiation of the decision by the management, or decisions of a political nature or decisions of the program and project managers. The state we want to achieve (ie TO-BE status) is **Goal**, such as the introduction of high-speed Internet or a qualified electronic seal for a departmental organization. If a general property applies to all elements in a system or systems in a given context, then it is referred to as **Principle**. An important example from the European point of view in relation to central and central IS is the possibility to identify and authenticate foreign entities in accordance with the eIDAS Regulation. Figure #2 shows the elements described above.

3. Visualization of ICT Strategy of the resort and its surroundings

Project Portfolio Managers and Program Managers will need these elements not only to create simple models that visualize strategic document goals, change requirements, but also to create a transformation program architecture and implementation projects. They can also be used to quickly draw a business area for improvement (see Figure #3). The strategy document is represented as a document consisting of one main body and two annexes (Appendix 1: Overview of sub-objectives, measures and assumptions and Appendix 2: Baseline overview). The ICT Strategic Program is listed on the right as a set of strategic projects for the target group Citizen, Entrepreneur (in the upper left corner. Places in the resort, the so-called Departmental Organizations are listed on the left).

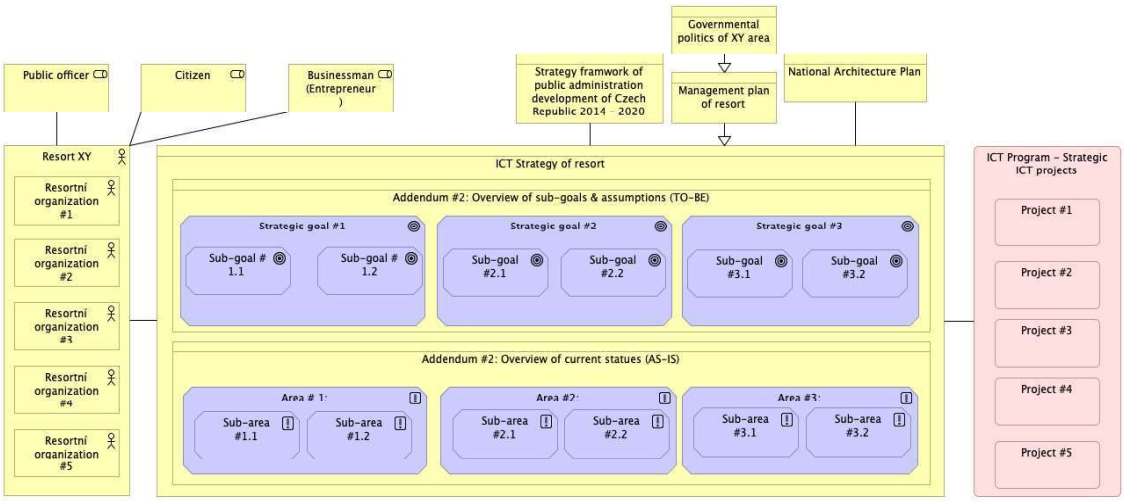

Figure #3: Example of vizualization of common ICT Strategy (source: author)

4. Visualization of relationships between strategic goals and projects (portfolio and program management)

If a strategic document is visualized as outlined in the previous paragraph, then it is advisable to follow the step of visualizing and developing the architecture of the dependency of the implementation projects on lower and strategic objectives. Figure #4 shows the logical decomposition of strategic goal 1 and 2 into sub-goals (sub-targets). The decomposition of goals into sub-goals is indicated by the **aggregation** constraint. This means that, for example, sub-

objectives 1.1, 1.2 and 1.3 are aggregated into a strategic objective 1. In practice, this means that the link represents a situation where a strategic target groups is a set number of sub-targets. Since sub-goals may also enter other strategic objectives, they may be part of other aggregate links. This is often used in practice. It is not always clear when linking objectives to each other and how many areas they enter. If it is clear that sub-targets do not enter other aggregations, ie if they do not consist of more than one target, then this is a constraint of the **composition** type. This is shown in Strategic Objective 2, which consists of sub-objectives 2.1, 2.2 and 2.3 (consisting of 3 components).

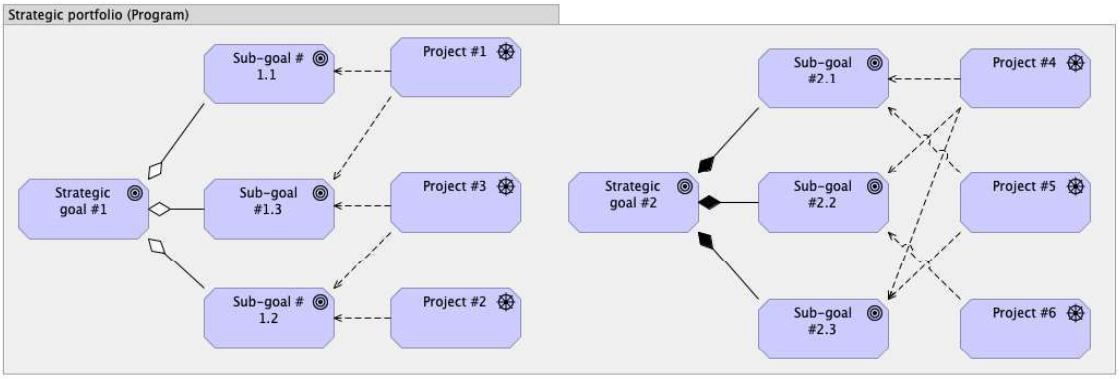

Figure #4: Example of vizualization of projects within program and strategic goals & sub-goals (source: author)

The ICT program includes strategic ICT projects 1, 2,… 5. The linkage of **realization** will be used to illustrate their link to partial objectives. Its mission is to combine a source of motivation element with a more specific element of motivation (partial goal). This connection means that the project implements and fulfills a sub-objective (eg project 2 implements sub-objective 1.2 or project 4 implements sub-objectives 2.1, 2.2 and 2.3).

Creating a visualized architecture of ICT implementation projects within the ICT program will contribute to the transparency of links between themselves and sub-goals. This visualized portfolio is managed more efficiently. If a commercial or open source project management tool is introduced (eg, redmine), project IDs are better created for project administrators and projects are easier to link with each other, especially when program objectives are not clearly defined and it is focused on monitoring the status of projects in the program, including related metrics (eg, milestones, budget, human resources, etc.).

5. Examples of EA service design for municipalities

The Enterprise Architecture is also used in the design of Smart Cities concept across the municipalities of Czech Republic. The main aim of EA on municipality level is to design specific improvement of quality of life in cities and villages in order to the maintenance of sustainable development (e.g. smart parking services, carpooling and bike sharing services, etc.). There is an opportunity for EA approach, at the municipal level. The cities and the villages do not have their own enterprise architecture model, therefore the public services should be proposed and designed to comply with a reference model which is included in the National

Architecture Plan of the Czech Republic, on the one site. However, if the city management dedicate appropriate support and sources of funding, then EA model might be created in short time period by EA professionals (EA community). EA model of city can show what kind of services are needed as well as summarizes strengths and weaknesses and identifies opportunities and threats to these services.

5.1 Service of Smart Parking

Following picture shows an example of service design (business layer) for municipality, which consider to develop Smart Parking as part of Smart City concept. This TO-BE model was developed and supervised along a diploma thesis, which I reviewed and consulted. The result is drawn in ArchiMate notification.

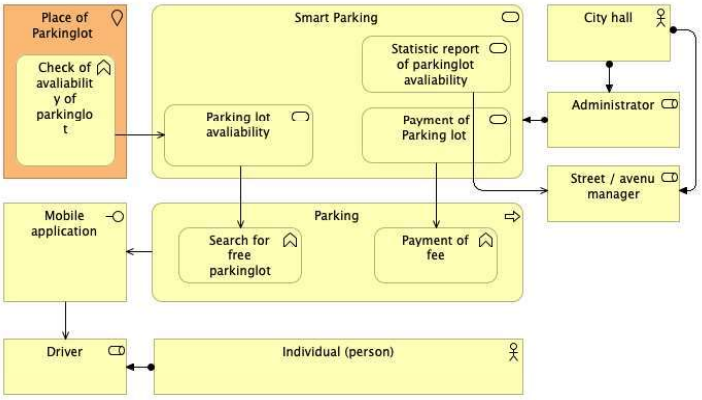

Figure #4: Example of Smart Parking service - business layer (source: author)

The actor of Smart Parking service is the City hall. The role City hall as an actor is an administrator and street / avenue manager. The business actor is an individual in the role of drive. The drive asks via mobile application for free parking lot. If a parking lot is available in the surrounding, then the drive pays via mobile application also (without get out of the car). Smart Parking service provide to an individual following sub-services in electronic form: Finding the Parking Occupancy and Paying the Parking Fee. The needs of the City hall in order to have information overview are met by the statistical report.

5.2 Service of Carpooling

The design of service Carpooling design might differ from city to city and village to village. The reason is simple, the common model of Carpooling service does not exist in National Architecture Plan either in regional Smart City strategies.

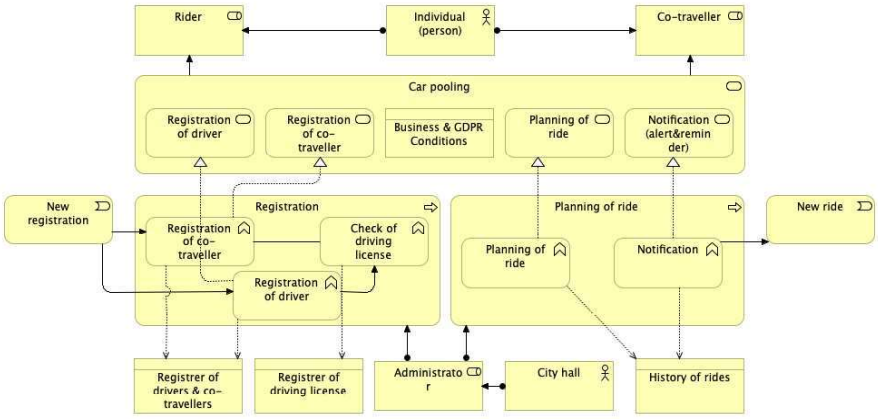

Figure #5: Example of Smart Carpooling service - business layer (source: author)

The actor is an individual who propose free seat in the car. Other role of an individual is the body who seeks for empty seat in car in given direction. It is required to register via mobile application. The driver assigns also soft copy of driving license to the registration via smart phone into mobile application and also confirm the consent to the processing of personal data (GDPR). The driver is a provider of the carpooling service to the citizens of the city, the appropriate ride is then service for an individual and the payments is relevant only between car driver and and co-traveller. The registration is "in just in time" and "non-repeatable" service (enter data just once). The City hall is in the role of administrator, planer and provider of rides. Also manages the database of drivers and co-travellers and alerts free car seats and/or request for carpooling by SMS and/or by emails.

5.3 Service of Rent a bike

Many municipalities are managed environmentally. Therefor is visible the support for the providers of rent a bike service. Following example shows how Enterprise architecture approach can help designing the service of rent a bike in more effective way than it is at this time being. This TO-BE model was developed and supervised as a part of along a diploma thesis, which I reviewed and consulted.

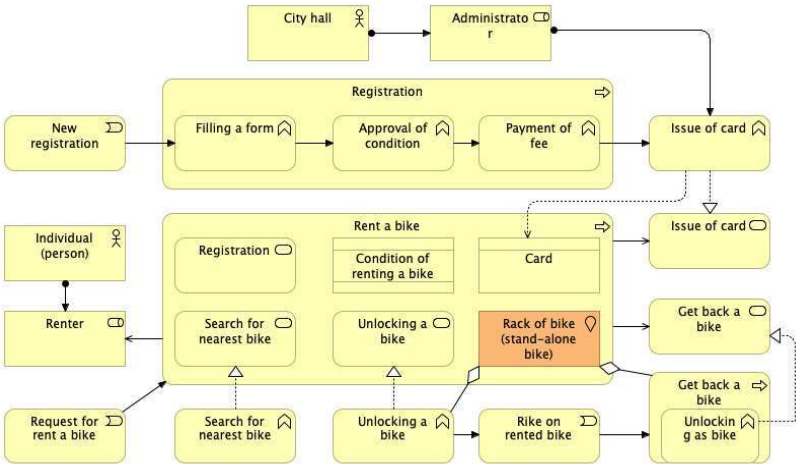

Figure #6: Example of Smart rent a bike service - business layer (source: author)

The picture above shows the rental of a bike service according to the Smart Cities concept. The role of the administrator is assigned to the City hall as an actor, who provides the Card Issue function. The card is issued based on the Registration process and is used to identify a person in case of damage or non-return. The fee for card and for system usage are paid once. Registration includes the Fill Out Form, Terms of Approval, that is, consent to the processing of personal data and general terms and conditions relating to rental, and the Payment of the Registration Fee. A person in the role of a borrower, after registering through a mobile application, searches for the nearest bike, unlocks the bike in the rack and/or stand-alone bike by using the card, returns the bike by locking it after driving.

6. Storage of Models of Enterprise Architecture

Creating a public administration architecture in all its complexity is a huge task (on the national level as well and on the municipal level). Therefore, it is recommended to approach it by stepwise and coordinated action in accordance with the National Architectural Plan and/or other strategies covering Smart City concept, Regional & Municipality development. If the architects succeed in creating the architecture of strategic documents, strategic objectives, partial objectives and related implementation projects as well as services, then it is a good prerequisite for creating applications for calls for operational programs. If the projects within the program or the program itself exceed the criteria set by the Department of Chief Architects of the Ministry of the Interior of the Czech Republic (CZK 6 million in each year for 5 years), it is possible to use the parts of the business architecture thus created for requests for OHA MV opinions. On the other hand, there is a good basis for departmental elements that can be stored in the architectural repository and reused for the creation of other architectural layers. Requirements for architectural repositories that store models and reusable elements by different users and interest groups should be based on the need to work with them and describe them in the Czech language in a way that allows remote access via the Internet / Intranet independently of the licensed or open source modelling used on the machine. At the same time, architectural repositories need to be able to remove element duplications and guarantee their unique storage in the repository.

7. Conclusion

One of the important prerequisite of progressive development of Czech Republic, at this time being, is the digitization of governmental and public administration services. Only this way can help Czech Republic become an innovation leader, to be competitive in European Union as well as in global economic.

As Mr.Dzurila (Guarantor for the area of eGovernment, Chief Digital Officer of the Government of the Czech Republic) said "*We are aware of the fact that the digital trans- formation will bring about a number of changes, affecting each of us, as well as the authorities them- selves. Citizens and entrepreneurs, as well as their unions, are at the same time calling for the digitiza- tion of state administration and finally it has started to move forward.*" , see (Dzurila, 2019).

This article shows that EA can support the progress of digital transformation of Czech Republic in order to be more structured, well managed and efficient if ICT implementation and penetration into many parts of citizen lives. The effective usage of EA must be perceived in the light of wider theme of eGovernment, digital transformation and modern services of public administration because the architecture of new ICT services should be described and management in transparent and structured way.

The Enterprise architecture approach successfully helped to developed – basic registers, data mailboxes, CzechPOINTs and the data sharing infrastructure. Next ICT projects supported by EA on national level are - the citizen portal, electronic identification (NIA), changes in the distribution of documents, electronic stamps, electronic signature, eIdentity cards.

List of abbreviations

EA	Enterprise Architecture
ICT	Information and Communication Technology
AS-IS	Current status
TO-BE	Future status
eIDAS	Electronical Identification Services
ID	Identificator
CZK	Czech crown
OHA MV Republic	Department of Chief Architects of the Ministry of the Interior of the Czech
GDPR	General Data Protection Regulation
SMS	Short Message Service

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