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Blockchain and the Governance of Pandemics

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Abstract

Significant difficulties in managing the supply chain, lack of coordination, and sharing of information between healthcare structures, suspension of the fundamental rights of citizens, enormous damage to global economies: these are some of the side effects of COVID-19. It is a health crisis first, however, it is producing collateral, multi-systemic consequences on healthcare, economic, social, and information systems. After the pandemic, the world is undoubtedly going to be a very different place and we will need new approaches and tools to face this reality [1].

New blockchain projects fighting COVID-19 are emerging at a fast pace, showing the potential of this disruptive technology to mitigate the multi-systemic threats that the pandemic is posing in all phases of the emergency management and generating value for the economy and society as a whole.

The analysis conducted intends to offer a contribution in answering the following research questions:

1. For what kind of problems may blockchain be leveraged to offset the impact of COVID19-like pandemics?
2. Which is the level of maturity of existing solutions on the market?
3. What kind of value can this technology offer?
4. Is there a phase in the management of emergency that may specifically benefit from the use of blockchain?

Preliminary evidence shows how blockchain technology has been applied to address a wide range of problems, mostly requiring a coordination effort. Distributed ledger technologies represent, in fact, a trust enabler for sharing and collaboration activities. Such technologies have been fruitfully employed along most of the emergency management process, from tracking to the reduction of information asymmetries, certification, privacy preservation, trust.

To access the full study please visit: http://overtheblock.io

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Shaping Digital Europe 2040: Artificial Intelligence & the Digital Transformation of Governance

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Abstract

Going back to the future envisioned for Digital Europe 2030 [1] ten years ago, and presented at the first Samos Summit in 2010, the presentation will discuss the current scenarios for Shaping Digital government transformation in the EU at the horizon 2040, being developed by the Joint Research Centre of the European Commission as part of the DIGIGOV Research Project on Exploring Digital Government transformation, conducted under the framework of the ELISE Action of the ISA^2 Programme.

To set the ground for the excursion into the future, the results of the analysis of the state of the art of the research on public sector innovation in a data-driven society and the findings from experimental case studies and empirical analysis of the use of digital technologies and geolocation data to improve public service delivery, governance processes and policy making mechanisms, will pave the way to the debate on the use and impact of Artificial Intelligence in the public sector.

In this respect, the presentation will provide an overview of the first mapping of AI use in public services in Europe carried out as part of the AI Watch – the European Commission Knowledge Service to monitor the development, uptake and impact of AI for Europe, managed by the JRC in collaboration with DG CONNECT to support Member States in the implementation of the Coordinated Plan of Action on AI Made in Europe.

Feeding new, large data sets into advanced machine learning algorithms are definitely improving the efficiency of many processes in the public sector. A sector who has been called to have a bigger role in the post-Covid crisis leading the recovery and channelling strategically huge sums into the real economy. For this an more effective, transparent and participatory public sector is needed to promote and consolidate societal resilience.

AI can definitely help in this task whereas responsiveness and accountability will be high in the public agenda todays and more so in the years to come. But decisions on the future we want, for us and for the next generations must be taken today. Policy implications from the journey to 2040 will be therefore outlined in light of the current debate on the role of the Public Sector within the Digital Europe Programme and to make sure to achieve the new von der Leyen Commission's priority to make Europe fit for the Digital age.

Governments across the EU are in fact exploring the potential of AI to facilitate engagement with citizens, support policymaking and redesign governance processes. It is a game-changer in reorganising the public administrations at all levels. But this is as much a technological issue as an organisational and governance one.

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Innovative public services in Europe – taking stock and looking ahead

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Abstract

From giving out birth certificates, administering unemployment benefits, to planning cities and neighbourhoods – our European way of life, characterised by advanced market economies, welfare state, democracy, and rule of law, could not be imagined without essential services provided by the public sector. These services often administer public goods (non-rivalrous and non-excludable), natural monopolies, or address market failures. They are therefore services, that for the most part, cannot or should not be provided by the market, which puts great responsibility on the public sector.

Because of this great responsibility, public are services are under great public scrutiny. And they do not always live up to the expectations of citizens, businesses, and civil society. Public services have the potential to significantly improve the daily lives of citizens, unlock dormant economic potential, while strengthening accountability, transparency, and democratic governance. Many public services do fulfil this promise, while others fall short. Especially in the field of digital technologies, there is often still a disconnect between the expectations of citizens and the reality of public services. And the Covid-19 global health crisis has painfully emphasised these shortcomings.

The ISA² Programme[1] of the European Commission addresses these issues in its Innovative Public Services Action[2]. Within this action, a number of horizontal studies set out to identify the innovation potential and framing conditions of emerging and disruptive technologies such as blockchain and distributed ledgers, Artificial Intelligence, Internet of Things, or technological solutions and platforms already mature in the private sector such as APIs, so to better assess their impact in terms of more efficient and improved public services, as well as improved interaction between governments, citizens, and business.

This presentation will present the state of work of these studies and discuss its implications for public service innovation in Europe.

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Innovative Public Service Catalogues

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Abstract

The Catalogue of Services project is part of the ISA² Programme (Interoperability solutions for public administrations, businesses and citizens) that promotes interoperability across the European Union for better digital services [1].

The goal of this project is to enhance the interoperability of digital portals and catalogues describing public services at Member State but also at European Union level to improve the user's experience when interacting digitally with governments [2]. As part of it the CPSV-AP (Core Public Service Application Profile) has been developed, which provides a common data model for describing public services as the first step to build public service catalogues [3]. It is the result of a joint effort from different public administrations to reduce interoperability barriers. CPSV-AP allows public administrations to provide public services in a user-centric way, grouped logically around businesses or life events.

Public administrations can bring innovation by fostering the creation of public services catalogues and building new interactive and user-centric services on top of that like chatbots.

As practical examples on way to bring innovation to public services:

- The use of common data models allows to publish information on Points of Single Contact [4] and eGovernment portals in a more efficient and interoperable way, by federating and representing the data on a single entry point (the so called one-stop-shop). The Regulation for the Single Digital Gateway in Europe actually strives to this concept: public administrations can on their side each have a different categorization of the public services, while representing it to the user in a harmonized way.

- Automating the collection of the public service descriptions with a certain frequency could be done by implementing a network of APIs between the different European catalogues of services as shown in Figure 1. The left schema is without a common data model and the right schema with a common data model (e.g. CPSV-AP). The data descriptions or metadata of the public services are stored in the catalogues of services databases at subnational level.

- Public service chatbots could be built making use of structured data around public service catalogues, like the CPSV-AP to optimise their responses and offer a better user's experience.

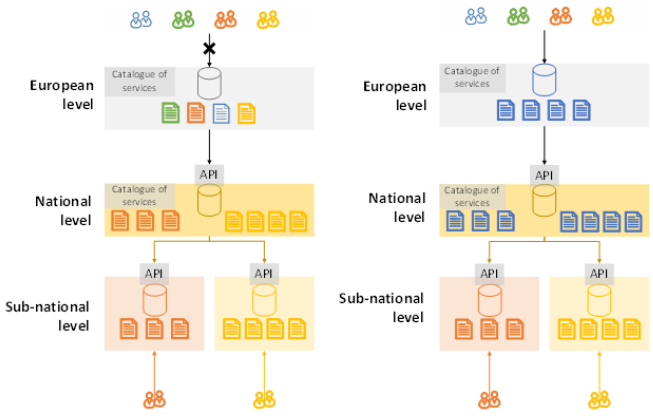

Fig. 1: Use of APIs to build cross-sector or cross-national public service catalogues

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Interoperability Academy: An enabler for the future of Digital Governance

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Abstract

The Interoperability Academy action is part of the ISA² Programme (Interoperability solutions for public administrations, businesses and citizens) that promotes interoperability across the European Union for better digital services [1]. The action started in 2019 to support civil servants and young professionals to advance their digital skills in the area of interoperability. This presentation will shed light onto the Interoperability Academy's plan to create a unique free access point to an eLearning platform, accessible 24/7 and its contribution to the eLearning community across Europe. Over the years, ISA/ISA² and Connecting Europe Facility (CEF) programmes have generated a number of solutions including a variety of learning resources (i.e. presentations, videos and webinars). These learning resources were gathered and under a rigorous approach will be transformed or repurposed to educational resources in order to create high-quality interoperability courses for the eLearning platform.The Interoperability Academy's eLearning platform will make a unique contribution to the eLearning community in various ways. Firstly, it has identified the need to bring together a community of stakeholders involved in interoperable digital services. Hence, the 'Digital Skills in the public sector' community on Joinup was established where stakeholders can share news, best practices, and challenges of their initiatives related to training programmes and educational resources for interoperable digital services. Secondly, the courses that will be created for the eLearning platform will reuse the ISA/ISA² and CEF solutions. Thirdly, the platform courses will support the implementation of the European Interoperability Framework (EIF). Another important advantage of this educational ecosystem is that the Interoperability Academy will be hosted in the European Union Academy - a free, eLearning platform that will host Massive Open Online Courses (MOOCS) from a range of European Commission, European Agencies and other Institutions. Some of the major outputs of the action so far, are: 1) a comprehensive cursus with different learning paths based on user's diverse professional and educational background; 2) a catalogue of educational resources [2]; 3) development of eLearning Interoperability courses; 4) creation of a Learning Management System platform based on Open Source and open standards, and; 5) organisation of schools, seminars, training sessions with the provision of a certificate of attendance to successful participants.

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MAZI: An innovative information system for managing the activities of the Greek Government

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Abstract

In this paper MAZI, the system that we describe, achieves the mission of Special Secretariat for Monitoring and Evaluating the Government Program (SSMEGP). MAZI may be described as a fast effective digital tool which can concentrate, organize and monitor all the governmental procedures, implemented under the supervision of the SSMEGP.

It introduces an e-government model for executive Project Management, by specifying and gathering all necessary information of all ministries and thus composing and evaluating the whole plan of the Greek government. An important aspect of the design process of MAZI was studying the governance operational methods of former Greek governments, taking, as well, into consideration the principles of Project Management.

It is an IT system that helps the government coordinate its tasks and the Ministries to work towards their goals specified by the Prime Minister. With this digital tool, the Greek government aspires to promote the efficiency of the public sector and, consequently, to benefit businesses and individuals.

Introduction

MAZI has a hierarchical structure of maximum seven levels. The highest level contains the Strategic Government Objectives, which are strictly specified and are related to the governmental program.

The next levels include the goals, actions, sub-actions, projects, legislative activities and activities which should be carried out.

At this point, it is worth noting, that all these concentrated and organized information give a great advantage in order to establish a glossary of common terms at all levels of public administration.

At the beginning of its operation, MAZI was initiated with approximately 3000 records. Information is structured in such a way that makes system maintenance easy to perform as it does not require the highest level of details. For instance, it was not deemed necessary to record financial data. In particular, a MAZI record can hold the following information: title, connection with the parent node, connections to prerequisite activities (nodes), percentage of completion and classifying labels. Each record should also contain information for the responsible ministry and one or more other ministries participating in its implementation.

The timeline of each record, together with the responsible ministry, constitute important information. The system uses a color code to label individual tasks depending on their status of completion with respect to their specified timeline.

Each authorized user may be given a wide variety of information and visualizations, such as lists of data, color codes, filters, tree representations, Gantt diagrams. Its most recent feature, which is expected to provide great

value and highlight the importance of MAZI, is the BI reports. These reports allow dynamic representations of data and give users the ability to perform a drill down analysis at their point of interest to extract records from diagrams and summarized data.

We are always eager to enrich MAZI with additional and improved functionality. Additional BI reports and KPIs are in our immediate plans.

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Hellenic National Observatory for Digital Governance

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Abstract

From a policy perspective, Digital Governance is a complex and multifactorial problem, which involves many decision makers and stakeholders. In order to achieve digital transformation, there is a necessary set of actions, which derives from some enabling conditions, such as political priorities and infrastructure (open data, cloud and connectivity). Egovernment elements (national digital map, eIDAS, interoperability, registries, and digital services) require to be implemented while following certain principals. The national digital strategy is the roadmap for this transformation and it is shaped based on the intervention areas of those actions, e.g. education, economics, research, commerce, employment, agriculture, transport and rural development.

The Hellenic National Observatory for Digital Governance is a tool proposed in order to make possible the achievement of all the above. Its primary objective is to document and monitor the actions derived from the digital strategy, ensuring that the policy is implemented as planned. Therefore, this digital tool will provide the means to monitor the actions taken in every intervention area, tackling the existing discontinuity problems, from the conception of an idea, throughout the implementation process of a project and to its actual impact. As a result, useful information can be extracted, which can be used as a portfolio or as a project management observatory to all levels of public administration, as well as to citizens and private sector.

Secondly, there is a need to connect the strategy with the objectives of the EU funding mechanisms, such as the European Regional Development Fund (ERDF), Cohesion Fund (CF), European Social Fund (ESF), European Agricultural Fund for Rural Development (EAFRD), European Maritime and Fisheries Fund (EMFF), Horizon 2020, Connecting Europe Facility (CEF), Competitiveness of Enterprises and Small and Medium-sized Enterprises (COSME), LIFE, Employment and Social Innovation (EaSI), Erasmus+, EU Health Programme. Furthermore, the national strategy needs to be mapped with the European policies guidelines and objectives (Europe 2020 strategy, Digital Single Market, Research and Innovation Strategies for Smart Specialisation), in order to formulate a final action plan. Funding mechanisms also provide benchmarks and objectives. A mapping of different indicators is required to bridge the gap between funding mechanisms, under the digital sovereignty umbrella. The evaluation and assessment of the strategy are both based on KPIs that can link the strategy to funding mechanisms. Therefore, the proposed result chain framework (inputs, activities, output, outcome, impact) will provide key information, not only about the evaluation of the situation, but can also guide policy makers to future decisions. In order to achieve all this, the evaluation of the current status and action plan for the desired future is mandatory. This tool will provide a decision support mechanism, based on prior experience, academic models and statistical analysis in view of DESI index, as well as other international, European or national impact indicators.

Last but not least, the involvement of different stakeholders (EU, academia, government, industry, citizens, media) is mandatory. Since the basic constraint is the cost, while all the stakeholders have their own perspective, common priorities are needed. The “executive state” in Greece could be the starting point of this understanding and the negotiations to come. The observatory, which will act as a multi-criteria decision analysis system, could assist the decision makers by providing information, forecasts and recommended actions, in order to meet their demands and reach a consensus.

A reorganization and digital transformation program for the Greek Local and Regional authorities

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Abstract

The Program "Reorganization and Digital Transformation of 332 Municipalities and 13 Regions" is included in the Operational Program "Public Sector Reform" 2014–2020. The Program consists of the following three Actions with a total budget of € 30.5 million.

Action 1: Reorganization and administrative reform of the Local and Regional Authorities - Process Simplification and standardization - Pilot applications
Action 2: E-Government Infrastructure for the implementation of the new operational models of Local and Regional Authorities
Action 3: Training the staff of Municipalities and Regions in order to enable them to implement the new operational models.

Program owner is the Ministry of Interior. A Program Agreement has been signed between the Ministry of Interior, the Central Union of Greek Municipalities and the Union of Regions of Greece. The Hellenic Society for Local Development and Local Government (EETAA SA) has been appointed as the implementing agency. The first action of the program is currently being implemented and includes two Subprojects.

Subproject 2 is implemented by a contractor and aims to develop a new organizational and operational model of local and regional authorities, using modern information systems. The main activities are a) process simplification, standardization and automation and determination of amendments to the regulatory framework b) redesign of organizational structures and job profiles and development of performance management indicators c) development of information systems and interoperability specifications d) design of training programs for the human resources of municipalities and regions.

Subproject 1 is implemented by EETAA and focuses on “Change management”. The main activities are a) seminar organization to inform the authorities b) formation of thematic networks at local, regional and central level with the participation of employees from Municipalities, Regions and responsible Ministries, c) conducting evaluation surveys of the current situation of local and regional authorities d) collecting comments and recommendations on the deliverables of Subproject 2.

Digital Governance: An Overview

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Abstract

In this lecture an overview of digital governance is provided, which includes the main areas of it, both the traditional and the new emerging ones, and the main types of information systems (IS) used in government: internal efficiency IS, IS for e-transactions with citizens/firms, transparency/consultation IS and public policy formulation IS. Initially the main roles and functions of Government are briefly presented, as they constitute the main targets to be supported or transformed through digital governance IS. The extent and content of the role of government is a topic of a big debate both at the academic level and at the political level, and varies between political ideologies. However, despite the above differences, it is widely recognized by all ideologies that government has some very important roles to play and duties to perform, which are critical for the society and the economy. In order to perform the above duties government agencies have to conduct two main types of activities: design activities, aiming to formulate policies for their areas of responsibility, and execute activities, aiming to implement these policies, which includes transactions with citizens and firms, and processing of them through complex internal operations. In particular, government activity includes initially communication and consultation with the groups of citizens and firms they have to serve according to their missions, in order to identify their needs and problems; then to design public policies for addressing them; next to execute these policies initially by transacting with citizens and firms (who usually submit various types of applications for licenses, benefits, services, etc., or statements); and finally to process these transactions (applications, statements) internally, usually through complex processes and workflows, and make decisions for them.

So, the objective of digital governance domain is to develop various types of IS initially for supporting and later for transforming the above main activities of government agencies. So, as electronic or digital government is defined the use of information and communication technologies (ICT) in order to automate and support the internal works of government agencies, concerning both operations and policy making, as well as their interaction with their external environment (citizens and firms they serve), which includes both transaction and dialogue/consultation with them. A more advanced stage of it is the electronic or digital governance, defined the use of ICT in order to transform and improve drastically the internal works of government agencies, concerning both operations and policy making, as well as their interaction with their external environment (citizens and firms they serve), both the transaction and the dialogue/consultation with them Historically the first generation of digital government/governance aimed to support/transform the internal operations of government agencies, though internal IS, and later (after the emergence of the Internet) their transactions with citizens and firms (by leveraging the high penetration of the Internet). The second generation of digital government/governance aimed to support/transform the communication and consultation of government agencies with the citizens and firms served and affected by them (by leveraging the Internet, and recently the social media), in order to promote a more open, participative and collaborative government. The emerging third generation of digital government/governance has a more ambitious objective: to support/transform the policy formulation processes and approaches of government agencies and promote a more 'evidence-based' and effective policy making.

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AI in Government: unpacking approaches and issues

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Abstract

Artificial Intelligence (AI) provides a potential of radical change to the public sector. As AI differs from traditional automation technologies based on a pre-programmed *if-then* logic (where similar input produce similar results) [1], its learning capabilities make it an ideal technology to be applied to the public sector context, where environmental settings are constantly changing, and pre-programming cannot account for all possible cases. In this presentation, I point out three core potential benefits of AI in government, and highlight three overlooked challenges that might need further attention.

Despite the still emerging state of the empirical research literature on the topic, potential benefits of AI in the public sector have been repeatedly highlighted. First, AI technology can be used to relieve public servants from repetitive tasks. Speech recognition, machine translation, computer vision, machine learning, robotics, and natural language processing can free up cognitive resources of public workers [2], allowing governments to focus scarce human resources on activities that require empathy, creativity, and innovation. Second, AI can be applied to reduce corruption of case workers. As AI is a powerful tool to micro-target policy recipients, it allows bypassing the discretion of street-level bureaucrats, and decreasing the opportunities for arbitrariness and corruption. Third, AI-based applications can improve citizen service. For example, AI-guided chatbots enable rich and expressive service interactions between citizens and government in natural language, enabling scalable digital communication channels that can cope with the ambiguity of public service provision [3].

The debate on risks of AI has also now become mainstream. Traditional and social media frequently refer to algorithmic bias and to the dangers of government surveillance in depicting negative scenarios that can stem from the adoption of AI in government. In its recent white paper on AI, the European Commission indicates the public sector as one of the areas where risks are deemed most likely to occur [4]. Empirical research has started to map the challenges of AI in the public sector [5]. While these issues are legitimately focused on, I would like to pinpoint three challenges that are often overlooked.

First, there is the challenge of the impact of data fragmentation introduced by edge computing on the effectiveness of AI. AI systems are only as good as the data they are fed with as input: for the algorithms to provide accurate, reliable quality outputs, there is a need for large quality datasets that are properly governed [6]. Currently, around 90% of data is generated and processed in centralized data centers. By 2025, however, it is predicted that 75% of data will be generated and processed in computing facilities close to the user [7], such as Internet of Things (IoT) devices, cars, home appliances, and smart sensors. This decentralization of data generation and processing can provide numerous benefits, but it also can increase data fragmentation and hinder the possibility to have reliable quality data to enhance AI algorithms for decision-making.

Second, privacy as protection from AI-enabled manipulation is a principle that is often overlooked in considering the impacts of AI. In Europe, the General Data Protection Regulation (GDPR) provides a strong framework to protect privacy-as-confidentiality, for instance by mandating data anonymization of citizens' personal online contents. However, private corporations do not need access to personal content to perform AI-empowered profiling and nudging of the behavior of citizens, which are thus left exposed to the potentially manipulative effect of AI applications.

Third, AI algorithms reinforce the creation of filter bubbles in the online public space. AI applications are extremely efficient at personalizing content feeds, for instance on social media. As a result, the arena of public opinion becomes disfunctionally fragmented. Individuals consume media diets that are tailored to their own pre-existing behaviour and, as a result, lose the ability to engage in meaningful exchanges with other citizens about a shared reality. The resulting echo chambers can lead to opinion polarization and radicalization. Instead of functioning as a digital agora, AI can turn the online space into a constellation of closed communities that are unable to communicate with each other.

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Governance of trustworthy AI

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Abstract

The availability of big and open linked data (BOLD) combined with computational algorithm enables all kinds of new applications [1]. Big data algorithmic systems increasingly play a role in determining outcomes in organizational realms like the welfare, presentation of news or criminal justice systems. Many efforts have been focused on creating better applications using BOLD and Artificial Intelligence (AI), however, the governance of AI has been given less attention or remained in the political realm. Like with most technology developments, organizational transformation is needed to fully profit from big data algorithmic systems. AI governance is a complicated endeavor as the governance should continuously evolve with technologies, systems, data and people [2]. AI governance requires that the whole systems needs to be taken into account as changes in data might affect the outcomes of AI and introduce inadvertent bias, reinforce historical discrimination, favor a political orientation or reinforce undesired practices (ibdi). Furthermore, governance is needed to monitor AI applications and to take action before any problems occur. In this talk various forms of governance are presented and suggestions are given to improve the governance of big data algorithmic systems.

Dr Janssen discussed during the SAMOS Summit2020 that AI governance depends heavily on the type of algorithms, the risks of unfair outcomes, and the context [3]. AI Governance is often viewed as an important factor for creating public value, however, regulation, policies, organizational changes, and deep-knowledge of AI and the situation at hand is needed for being able to govern AI. Governance should offer various forms of defense against mistakes and undesired influences [3]. Dr Janssen advocated the use of a socio-materiality approach [2] and the development of trusted frameworks [3].

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Blockchain supporting Smart Cities development

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Abstract

In the year of global locked down of the planet earth we learn three main lessons; first we identify leaders – enablers of tomorrow, second we recognize the importance of public sector and third we reshape many social experiments and take some concepts out from the archives of innovation.

Ignorance of scientific facts like it was the case in the climate change debates and in the beginning of the C19 pandemic crisis, will hopefully never return back at least in the responsible communities, countries and cities. Cities that are becoming major drivers far away from Twitter posts of new social and economic developments.

Good administration of public services that are digitized and decentralized like in many smart city good practice cases, could minimize the influence of Machiavellian politicians. Blockchain as a new emerging technology, could help to realize societal challenges such us Sustainable Development Goals – SDGs.

Nowadays we have already many good practice cases like Estonian eHealth system, Swedish land registry, Kenya refugee camps Digital ID platform or Vienna Smart city project that use blockchain to measure real energy transaction to the grid. Proper design and development of smart cities could also include blockchain to improve efficiency and transparency of smart city operations.

Presentation provides an insight into Smart City evolution towards 3.0 and how Blockchain as Distributed Ledger Technology goes beyond FinTech industry application. Presentation also provides an insight in which thematic priority areas of European smart cities development blockchain could have an impact in the following years.

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Digital Governance Master Programme. The Gov3.0 Master's Curriculum

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Abstract

Considering the novelty of the Government 3.0 field, there is a need for identifying the capacities and competences of professionals to attend the demands of emergent technologies and transformation in government and society, and therefore framing the training needs for graduates in the area. The ongoing ERASMUS+ research project "Scientific Foundations Training and Entrepreneurship Activities in the Domain of ICT-enabled Governance" (Gov 3.0) goes beyond the existing state-of-the-art in analysing developments from the public and private sector towards establishing the new, important scientific domain of Government 3.0. The work developed under the project aimed at establishing the current baseline of e-Governance curricula and describe its fundamental aspects. The Gov 3.0 Master's Curriculum (D3.2, Ronzhyn, Wimmer et al. 2020) builds upon the knowledge and expertise acquired during the Gov3.0 project, particularly: Report for Electronic Governance Research and Practice Worldwide (D1.1), Worldwide Training Needs on Electronic Governance (D1.2), two versions of the Government 3.0 Roadmap (D2.1, D.2.2) and Pre-Graduate Modules on ICT-enabled Governance (D3.1).

The Joint Master Programme in Government 3.0 is aimed to provide the comprehensive understanding of the domain of digital government with particular focus on the emergent technologies with potential to disrupt the public governance processes. The programme deepens the fundamental understanding of digitalization contexts and related organizational modernization of the public sector, knowledge of information technology systems in the public sector, knowledge of the decision-making systems in public sector and public sector automatization. The programme also aims to provide the graduates the high degree of self-reliance, responsibility and practical skills in the IT areas of public sector as well as foster excellence in the scientific research within the domain. The aim of the programme is to award a master degree (Joint Master), where the courses integration is ensured by a single study guide, unified assessment rules, a single student agreement and a single joint degree.

A framework for re-education of public administration in legal informatics tools and patterns

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Abstract

Legislatures, lawmakers and legal professionals gradually discover legal informatics as a scientific field capable of producing tools and services that have the potential to shape lawmaking and post-legislative scrutiny processes [1]. Yet, with a plethora of software tools and data sources already available for testing and use, stakeholders in public administrations might face several dilemmas in their choice and configuration. This work offers a general framework for re-educating public administrators in the implementation, configuration and operation of state-of-the-art legal informatics products, such as ontologies, data schemes and tools [2].

In general, the public sector may acquire the relevant expertise by hiring new experts, though training courses for relevant internal stakeholders and fast-track education within national schools of governance. The outsourcing of such expertise is not discussed as an option, as legal informatics systems are considered to be critical digital infrastructure. Each of the mentioned options has pros and cons that any administration needs to carefully balance before coming up with a solution for the educational mix. Within the present context, the latter two options are going to be analyzed further.

The parameter space for an educational framework is particularly wide and includes, for instance, the determination of the target groups, e.g. through stakeholder analysis, the timing and duration of capacity building, the choice of coaches or teachers, the means of education, such as live or online courses, Massive Open Online Courses (MOOCs), mentoring, training-on-the-job and more, and not least the nature of systems on which the training shall take place. Moreover, the conditions that influence successful implementation are placed under the light.

For highlighting the above, an innovative use case has been selected, which originates from the Hellenic National School of Public Administration and Local Government, an integral part of the National Center of Public Administration and Local Government in Athens. The School was among the first at a global scale to identify the need to educate the future generations of public officials in legal informatics tools and patterns. In this regard, a legislative drafting laboratory was developed and taught to students who have opted to specialize in digital policy.

The expertise to set up and support such a laboratory is questionable whether it can be found within the public sector. The solution of choice was to make use of the know-how and resources of the Hellenic OCR team [3]. The Team, which technically falls under the description of an expert network, has been established in 2017 as a voluntary, cross-sector and decentralized platform with the goal to transform and study parliamentary control data.

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Workshop on Legal Informatics: The ManyLaws services

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Abstract

The workshop aims at the presentation and evaluation of the novel pan-European open legal data search and retrieval platform and its provided services. The ManyLaws Platform has a few similarities with several existing legal information systems but advances them in the form of introducing advanced visualizations, translation services as well as customized end-user services provision. Legal Web seek to provide and increase access to legal information and relies on such an approach, accessing the data in BOLD system for big data acquisition. Moreover, ManyLaws develops advanced data analytics and text mining, for multilingual resources, to allow users to pose advanced queries, upon which the system will semantically correlate them with the annotated resources, to allow the user to retrieve relevant and detailed results, visualized in intuitive ways, and thus allowing better understanding of legal information [1]. This is achieved using semantic analysis, and comparative visual analytics methods. The main objective of the ManyLaws project is to improve access to legal information across the European Union through the development of an innovative legal data search & retrieval portal making legal information available to everybody in a customizable, structured and easy-to-handle way. To achieve this, the project seeks to conceptualize and build a suitable environment for semantically annotated Big Open Legal Data (BOLD), one that makes it easily searchable and exploitable with customized interactive visualization techniques [2].

The large amount of information about laws that apply in the EU countries currently remains fragmented across multiple national databases, inaccessible systems, mainly consisting of documents (legislation acts, bills, case laws, resolutions, decisions), published in each Member States' language [3]. Moreover, although legal information is generally considered at the core of the open data movement and a major part of public sector information, the legal framework of each member state, as well as the European Parliament regulations, directives or directions are not accessible through the European Data Portal (EDP). Mass customization tools can help to filter and thereby reduce the flood of legal information and make it easier to be followed even for citizens without legal expertise. Despite the rapid evolution of technology to date, there is no system capable of acquiring, storing, integrating and processing such large amounts of legal information, at an advanced level in various languages, using the power of text mining, information processing and visual analytics [2]. The reasons for this are the considerable complexity of law, the variety of legal systems.

The ManyLaws Services

The ManyLaws Legal Web Platform functionality and services have been presented in the workshop. The basic services are listed below.

In terms of search functionality, the ManyLaws platform offers:

- Parallel Keyword search: The user can enter one or multiple keywords to access two different search choices:

- Keyword Search on a national legal framework: The user selects one of the available countries and receives legal data results from the selected country.

- Parallel Search between multiple national legal frameworks: The user selects multiple available countries and receives legal data results from all of them. The process performs parallel translation of search terms, using a suitable legal vocabulary.

- Parallel Search between multiple national legal frameworks and EU legislation: The user selects multiple available countries and EU and receives legal data results from all selected countries as well as EU directives. The process performs parallel translation of the search terms, using a suitable legal vocabulary.

In terms of visualisation services, there are two different types regarding the selected multiplicity of the results from the results list. When the user selects one element:

- Visualisation of the connection between a national law and an EU directive: The user has access to a representation of the relation between the selected national law and an EU directive. The relation has been identified based on the respective metadata fields. This visualisation is presented by the system using a graph where the connection is identified. This functionality allows the user to assess the degree of transposition of an EU Directive in a National Legal framework.

- Comparative analysis of connected/related laws from the same national legal frame: The user has access to a representation of the relations between the selected national law and other national laws. The relations have been identified based on the respective metadata fields. This visualisation is presented in two different ways by the system. The first representation is a graph where the connection is identified. The second representation is done by comparing law texts (2 at a time) in which the common terms are highlighted. This service gives the user the ability to identify correlations, dependencies and conflicts between different laws.

- Timeline visualisation of a law (the evolution of a law during time): The user has access to a representation of the evolution of a law over time. More specifically, a timeline chart represents the identified changes (based on the respective metadata fields) of the selected law within a time frame. Particularly, this functionality will provide a visualisation of the progress and current status of a specific national law (after amendment/extensions) over time.

When the user chooses multiple legal data results from the results list:

- Visualisation of the comparison between chosen laws from the same national legislation: The user has access to a representation of the relations between multiple (up to six) selected laws from the same national legislation. The representation is done by comparing law texts (2 at a time) by highlighting the common terms. This service gives the user the ability to identify correlations, dependencies, and conflicts between manually selected laws from the same national legislation.

- Visualisation of the comparison between laws from different national legal frames: The user has access to a representation of the relations between multiple (up to six) selected laws from multiple national legal frameworks as well as EU legislation. The representation is done by comparing law texts (2 at a time) by highlighting the common terms. All the texts to provide comparable results must be translated to English first. This service gives the user the ability to identify correlations, dependencies, and conflicts between manually selected laws from the multiple national and EU legislation.

- Timeline visualization of multiple laws (during the same time scale): The user has access to a representation of the evolution or changes between multiple selected laws to a common timeline chart. More specifically, a

common timeline chart represents the identified changes (based on the respective metadata fields) of all the selected law during time. More particular this functionality will provide a visualisation of the progress and current status of multiple law (after amendment/extensions) over time and compares these different evolutions by using a common chart.

Evaluation Aspects

The main goal of this workshop is to assess the efficiency and the effectiveness of the ManyLaws platform. A dedicated questionnaire was setup. The following aspects have been transposed to questions and they will be used as a starting point to indicate users' acceptance to the platform:

1. Performance: To assess the rate of response of the system to user queries, even during peak traffic times

2. Usability: To assess the extent to which the ManyLaws portal is easy to learn, operate, and to use in the preparation of inputs and the interpretation of output/results.

3. Accuracy: To assess the extent to which the platform is accurate and delivers relevant results.

4. Reliability: To assess the extent to which the system consistently performs its specified functions and delivers results without failure.

5. Availability: To assess the extent to which the platform is available all the time.

6. Security: To assess the extent to which the system can resist unauthorised, accidental or unintended usage and provide access only to legitimate users.

7. Quality: The system and supporting infrastructure must be validated to the highest reasonable commercial quality standards.

8. Overall: to what extent this system provides substantial assistance and support users' objectives.

Workshop Agenda

The procedure of the workshop is as follows:

- Welcome to ManyLaws workshop, presentation of agenda and introduction of speakers
- ManyLaws project presentation, vision, objectives, consortium, envisioned (feasible) services
- ManyLaws 1st release demonstration:
  - Brief presentation of the European and Greek (graph of correlations + timeline services) as well as European (transposes service) demo scenario from a legal perspective.
  - Demonstration of the European/Greek demo scenario from a functional point of view.
  - Brief presentation of the Austrian demo scenario (keyword-based legal search with translation, graph and timeline visualizations) from a legal perspective.
  - Demonstration of the Austrian demo scenario (keyword-based legal search with translation, graph and timeline visualizations) from a functional point of view.
- Users feedback collection - evaluation questionnaire completion. The questionnaire was setup to assess the efficiency and the effectiveness of the platform at hand.

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The Interoperability Academy/ Digital Governance and Interoperability curriculum

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Abstract

The European Commission, driven by the need to develop digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services, established the ISA/ISA² Programmes. The programmes support actions focused on the development of digital solutions in the area of interoperability. The ISA/ISA² Programmes but also the Connecting Europe Facility (CEF) Programme have generated a number of materials/solutions related to interoperability for which they have also produced many learning resources. To present all the available material in an organised manner and to increase the implementation of the European Interoperability Framework (EIF), an eLearning platform, so called 'Interoperability Academy', was developed. The eLearning platform is part of the 2019.06 Interoperability Academy action which aims to improve the digital skills in the public sector and contributes to higher impact of the ISA² Programme. The trainings offered, are mainly focused in the area of interoperability targeted at civil servants and young professionals. The Academy will be hosted in a larger pan-European eLearning platform, the EU Academy. The first course on the eLearning platform will be the EIF online training. Thus, the aim of the workshop is to present the EIF course and seek feedback from experts in the interoperability field. The reason the EIF course was selected as the first one to be released on the EU Academy platform is because it sets the basis and raises awareness around the importance of interoperability for the delivery of integrated public services. Covering a broad spectrum of the main EIF components, it provides a holistic overview and a solid understanding of the key areas of European interoperability which is essential in achieving fully integrated digital public services. Through video animations, real-world scenarios and practical cases, the course is meant to be accessed by different profiles working in the digitalisation and integration of mainly public services domain, i.e. policy makers, professionals, academics, civil servants. Therefore, the workshop was designed to be highly interactive in order to engage participants in course activities and gauge their feedback. This is important to continuously improve the

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Massive Open Online Course on Open Data. The TODO Online Training Programme

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ABSTRACT

The TODO H2020 project has created a first version of a MOOC on open data basics. It will be further enhanced with best practices of using Open Data in Croatia. This full Massive Open Online Course (MOOC) for Open Data Starters will be developed and organized in the second half of the project. The MOOC, an online course aimed at large-scale interactive participation and open access via the web, will be used as a tool to share the project outcomes to students and participants around the world. The new MOOC will build on the successful MOOC on Open Government organized by TUDELFT, which will be further improved and extended by integrating different project outcomes (e.g., the online training program materials developed in WP2). As such, the MOOC will be tailor-made for open data starting countries in general and Croatia most specifically.

The online training program for the entire UNIZG (33 faculties) has been created targeting mostly the early-stage researcher. It covers the fundamental and more advanced areas of open data research and practice. The training program itself consists of three modules, each covering one month: (1) an introductory module in which research staff and ESRs will be introduced into the basics of open data and the (components of the) open data ecosystem, combined with small exercises to assess the understanding of the material taught, (2) an advanced module of online lectures on covering in-depth the assessment of open data ecosystems, and the development of an open data ecosystem assessment framework, and (3) a module in which the developed assessment framework will be applied to the open data ecosystem in Croatia.

All project researchers will participate in training and understand terms, concepts and approaches to open data ecosystem. The Online training program will introduce the open data ecosystem holistically, the open data life cycle model, and its different individual components.

The OTP aims to upgrade the general open data knowledge base of UNIZG scientific staff including ESRs. It should further ensure that all project participants share a common knowledge base on open data and use the same open data vocabulary.

After this course the researchers are able to:

1. remember the basics of open data and the (components of the) open data ecosystem
2. recognize and anticipate relevant legal and organisational issues evolving around the acquisition, processing, dissemination and use of open data
3. recognize and anticipate relevant technical issues evolving around the acquisition, processing, dissemination and use of open data
4. understand the needs of potential users of open data and design strategies for addressing these needs
5. apply the concepts, processes and main components of open data ecosystems to support data access, data reuse and data sharing between stakeholders
6. design an open data ecosystem evaluation method

7. critically evaluate the performance of an open data ecosystem
8. conduct research in the open data domain.

Artificial Intelligence and Machine Learning in Digital Governance

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Abstract

Artificial Intelligence (AI) includes a group of techniques that enable computers to perform tasks of higher intelligence, approaching the human one, by learning from their environment, and then using the knowledge they have extracted from it for taking or proposing action. While the first generation of AI was based on pre-defined by humans ('Symbolic AI'), usually extracted from experts (expert systems), the second generation of AI is based on the extraction of such rules by computers, through advanced processing of past historic data ('Statistical AI'). In this second generation of AI the most representative and widely used techniques are definitely the Machine Learning (ML) ones. They enable exploiting past historic data we possess for a number of units (e.g. individuals, firms, etc.), which include for each unit the value of an important outcome variable Y, as well as the values of some other variables-characteristics X1, X2, Xn of the unit, which might affect the outcome, or might be possible causes of this outcome, such as demographics, etc. (these data are called 'training data'); using these data we estimate (train) a model Y=Y(X1,X2..Xn), which for some ML techniques can be visualized as a decision tree.

There are some ML algorithms for the case that the dependent variable takes a small number of discrete values (usually 2-3), with each of them usually constituting the 'class' to which a unit can belong with respect to the dependent variable. These algorithms are called 'classification' algorithms, and the main categories of them are: Decision Trees Classifiers, Artificial Neural Networks Classifiers and Deep Learning, Support Vector Machines Classifiers, Nearest Neighbor Classifiers, Bayesian Classifiers and Random Forest Classifiers. Furthermore, there are some other ML algorithms for the case that the dependent variable is continuous. These algorithms are called 'regression' algorithms and estimate a prediction model having the form of a linear equation Y = b0 + b1*X1 + b2*X2 + …+ bn*Xn (or even a non-linear one). The main categories of regression algorithms are Ordinary Linear Regression (OLS), Non-linear Regression, Binary Logistic Regression, Ordinary Regression and Nominal Regression.

More training data (i.e. data from more units: value of dependent variable + values of the independent variables from a large number of units) result in higher prediction accuracy of the models estimated from them (= higher probability of correct prediction of the value of the dependent variable for a new unit). Though most of the AI techniues, and in particular the ML ones, exist for several decades, it is only recently that there has been a very high interest in their 'real life' application and exploitation, mainly by private sector firms, and to a lower extent by government agencies, due to: a) availability of large amounts of data for more effective training of AI algorithms (in order to extract more reliable models); b) advances in computing power and reduction of its cost; and c) substantial improvements of AI algorithms.

In particular, AI has started being used in a variety of public sector thematic domains for various purposes, for instance in education, for the prediction of applicants for teacher positions who will be more effective and successful, in order to support making the optimal recruitment decisions, in social policy, for the prediction of higher risk youth concerning criminal activity, in order to target prevention interventions, in healthcare, for diseases' diagnosis and treatment planning, in public security, for predictive police patrolling, in order to use more effectively scarce human resources, in taxation, for discovering firms/individuals who evade taxes, etc. Research in this area has identified four main types of AI use -exploitation in government: i) for 'relieving' (AI performs mundane tasks, and frees public servants' time for more valuable tasks); ii) for 'splitting up' (AI takes a part of a job, and leaves public; servants to do the remainder (e.g. a finalization or 'fine-tuning')); iii) for 'replacing' (AI

carries out an entire job performed by public servants); and iv) for 'augmenting' (AI technology provides support to public servants for performing a cognitive job more effectively, by complementing their skills).

However, some issues have been identified concerning the use of AI in government. If training data used by AI algorithms for constructing (training) prediction models are not representative, then the resulting models can be biased towards or against some predictions, specific citizens' or firms' groups. Also, in many cases the prediction provided by such models for a new unit is a 'black box' one: it is not clearly justified; however, this is a problem because government organizations have to justify fully their decisions, so such AI-based predictions should be used only for some purposes in government, but not for some others. Another issue is that for many decisions (e.g. concerning granting various allowances or financial assistance) the criteria (e.g. characteristics of applicant citizens and firms to be taken into account for making decisions, and even the decision rules) are defined by law, so corresponding rules have to be predefined (entered) directly by humans (like in 'Symbolic AI') and not extracted from data.

Finally, as an example has been presented the research we have conducted concerning the use of government data (from taxation and statistical authorities) and ML techniques for predicting individual firms' vulnerability to recessionary economic crisis.

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Open Government Data: Lifecycle & Evaluation

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Abstract

Creating value by opening and using data is the ambition for many governments. The open data landscape consists of a many, interacting stakeholders that are using all kinds of software and tools to process data. The stakeholders play different roles, and their engagement is necessary. Often by combining various datasets value is created. The objective of the opening of data range from transparency, accountability to stimulate innovation by firms. The global landscape shows that countries take various approaches and are in various stages of development. Various instruments are available to measure and benchmark open data efforts. There is no single recipe to create value from data. Some apps are successful, whereas most data is not used. Opening of data might come at a risk. Privacy or sensitive data might be opened, or incurred conclusions might be drawn from data. Measures to reap the benefits of open government data (OGD) and avoid the dark site are needed. Finally, recent developments are sketched which shape the open data landscape.

This lecture covers the two main issues of open government data domain towards the advancement of implementations and the ecosystem around it. These issues are: (a) the lifecycle of OGD and (b) the evaluation models and metrics for measuring different aspects of OGD.

Since the process of OGD publication affects the re-use of them and hence the generation of value from them, in this chapter we are going to identify the major step towards publication and usage analysing different scenarios from the publisher's side. After its publication procedure we are going to identify the outer cycle of use and re-use analysing usage scenarios about different kind of data (linked or big) as well as scenarios in different contexts: the researcher's and the pro-sumer's views. This chapter will also present an extended OGD life cycle regarding the publication plan resulting the two levels of the cycle: (a) steps towards publication of open data ensuring transparency-by-design (open licence etc.), quality-by-design (metadata, data structures, timeliness etc.) and the appropriate functionality (type of data, APIs, user collaboration and feedback, data analysis and visualisation and (b) steps towards exploitation, value generation and re-use. The communication and feedback steps of the cycle and its associated social media mechanisms (Web 2.0 functionality) is the one that closes the feedback loop. Finally, 3 principals for open data have been identified and presented.

Different models and procedures have been used for the evaluation of OGD and their portals examining different aspects of them. In this chapter we are going to identify the subjective and objective measures for the evaluation of OGD as well as the platforms offering them. Indicators for the measurement of impact achieved in the form of open data benchmarks will be analysed and proposed for each case of the life cycle. Furthermore, an analysis of the current assessment models will be presented with pros and cons in each case. This chapter will present and analyse the existing evaluation models in the information systems domain. It will also showcase different aspects of evaluation through application examples. A taxonomy of measures and metrics was created towards the evaluation of quality of open data, their portals and their functionalities. Finally, guidance for constructing an evaluation framework is provided incorporating different evaluation aspects.

The Open Government Data Lifecycle: The Ecosystem Approach

Different terminologies have been suggested towards the description of various models of open data. The open data life cycle, the open data value chain or the open data process are terminologies illustrating different

purposes – practical guidance or analytical understanding – and foci. Whereas value chain models focus more on the creation of value during open data usage, the life cycle models aim to structure the handling of the data itself. Existing process models focus on activities within public administrations, such as generating (create/gather), editing (pre-process and curate) and publishing the data without paying too much attention on the outside-use and re-use processes.

In order to fully exploit the benefits of open data, traditional "one-way street" open data practices and initiatives should be replaced by an open data ecosystem, i.e. an approach to open data that focuses not only on data accessibility, but also on the larger environment for open data use—its "ecosystem". An open data ecosystem can be defined as a cyclical, sustainable, demand-driven, and environment-oriented around agents that are mutually interdependent in the creation and delivery of value from open data.

Because of these many interdependencies, open data ecosystems should be studied as a whole, by investigating both the user and the publisher sides of the life cycle as well as the relation to each other. In other terms, interdisciplinary open data research should investigate the open data life cycle in all its phases and address open data developments in different domains. The open data life cycle is a conceptualization of the process and practices around handling data, starting from its creation, through the provision of open data to its use by various parties. In addition, the characteristics and interests of different stakeholders involved are hardly recognized and considered. Analysing different data life cycle models from technological (data curation, big data and linked data) and stakeholders (publishers and users) perspectives, this chapter introduces an advanced open data life cycle model based on all the above identifying associated tools for each stage of the cycle, as well as, the transitions and interdependencies between different phases. Moreover, the advent of Linked and Big Data as well as the collaboration capabilities of Web 2.0 paradigm reformed the landscape of open data since they introduced enhanced capabilities. These advanced capabilities, in their turn, introduced different concepts, solutions and complexity in the data re-use, storing, analysis, and publication processes.

[1] introduces the new requirements for open data provision and usage in terms of different technologies (linked and big data) along with the accompanying impediments as well as an overview of the existing life cycle models for open data presents an accumulative model derived from the conjunction of the two different stakeholder sides as well as the duality of the users' roles in an open data ecosystem. It also defines different tools and methods in each step of the open data life cycle concerning the requirements of different types of data.

Evaluation Models and Metrics for Open Government Data

Evaluation of Open Data is a systematic determination of open data merit, worth and significance, using criteria governed by a set of standards. It is an essential procedure trying to ignite a learning and innovation process leading to a more effective data exploitation. Examples of questions to be answered by open data evaluation could be: what is the current status of published data against the best practices identified, how effectively these data are published or used, what are the most valuable data for users, what are the problems and barriers discouraging the publication and use of open data and in which extend these barriers affects users' behaviour towards data usage. The answers on these questions will affect the next developments of an open data portal or initiative and the publication procedure.

A big challenge in the open data domain is how to evaluate open data in general and the platforms or infrastructures offering it and what are the metrics to be evaluated against to. For this reason, the value proposition of open data towards economic benefits for both governments and businesses and transparency for citizens has to be forecasted and evaluated. Different models and validation procedures have been used for the evaluation of open data and their provision portals examining different aspects of them. An aspect of evaluation could be the ability of both publishers and users to adopt and/or accept innovation or technology. Other aspects of evaluation could be the data maturity level or the quality of the published data. Another important aspect is the evaluation of impact originated and value created (net benefits) from the publication, use and reuse of open data. In order to assess

those diverse aspects, several evaluation models and frameworks were developed in the domain of information systems.

[2] studies the developed evaluations models in the information systems domain providing insights about the targets of the evaluation procedure. Following these evaluation models, a first set of metrics and measures compiled targeting open data functionalities. As a next step, we were furthering our study to already developed metrics existing in the literature and classified them in specific categories. The main reason is the development of an overall assessment taxonomy, which includes every dimension of the quality of Open Data and their sources. Furthermore, [2] clarifies the distinction between the subjective and objective models for the evaluation of open data based on the identified evaluation models from the domain of Information Systems. Subjective are those models that concentrate on collecting users' opinions about a system towards the prediction of future behaviour or net benefits based on its perceived usefulness for the users. Objective models are those which are based on predefined metrics and values of them towards the assessment of specific benchmarks regarding the evaluated aspect (e.g. impact and readiness assessment).

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Data-Centric Policy Making

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Abstract

The lecture is based on a set of case studies and applications in the following domains: data strategies, policies and governance, which includes initiatives in the public sector both at the strategic level, such as data strategies, data strategies, data governances and data, management plans; and at organisational level, aimed to create units or departments, and to elaborate new processes and role; disruptive technologies: policy modelling and simulation. Regarding this last topic, we will consider initiatives to improve policy analysis through new data sources, robust and reliable models to perform "what-if" scenarios, predictive analytics and hypothesis testing, and tools allowing policy makers to carry out scenario analysis through intuitive interfaces. data technologies: new architectures, frameworks, tools and technologies to be used by public administrations to gather, store, manage, process, get insights and share data. This domain includes the study of how data are governed as well as data collaboratives, and in particular stresses the joint analysis of governance and technologies.

The cases are depicted in the cases below.

DOMAIN	APPLICATION
Data strategies, policies and governance	Barcelona Data Commons
	Data Agenda Government in the Netherlands
	New Zealand Data Strategy and Roadmap
	Secondary use of health and social data (Finland)
	Udbetaling Denmark
Policy modeling and simulations	New Area Wide Model II
	World Energy Model
	PRIMES - Price-Induced Market Equilibrium System
	GAINS - Greenhouse gas - Air pollution Interactions and Synergies
	MESSAGE - Model for Energy Supply Strategy Alternatives and their General Environmental Impact
	27 COVID-19 predictive models
Data technologies	The New Zealand (NZ) government's Integrated Data Infrastructure (IDI) and associated tools
	Reproducible Analytical Pipelines (RAP) methodology used by administrations in the United Kingdom (UK)
	Findata, a Finnish agency to enable the secondary use of social and healthcare data in the research, public, and private sectors
	KOKE, an analytics solution for fraud detection in use by the Estonian Tax and Customs Board

The analysis of the cases provided the set of policy take-outs depicted below.

Data strategies Policy Take Outs

- Start with the problem, not with the technology. Building a data strategy does not necessarily entail an investment in a technological data analytics platform, and certainly it does not start with it. Very few strategies include such investment, and those who do are typically vertically focussed on specific sectors or organisations. On the other hand, there are not many examples of successful whole of government data analytics platform, but there is room for focussed centralised technological components.
- Analyse permanently user needs. Users include both data holders and data re-users, both internal and external. Too often user needs remain assumed or based on anecdotical evidence. Not only it is necessary to formally analyse them in the first place, but perhaps more importantly to constantly monitor them over time to adapt to how solutions are used.
- Co-creation is a fundamental component of the strategy. Bringing internal and external stakeholders onboard is a necessary (not sufficient) condition of success. But it is equally important to keep stakeholders onboard after the strategy is launched, during the implementation. Other government agencies need to see the benefit to share data and to conform to the required standard and processes, because there are costs in doing so.
- It is not sufficient to consult and co-create with stakeholders: what matters is delivering results. There is a lack of business case for data innovation. Existing strategies should focus, on delivering short term results via small scale pilots on topical issues. But pilots should be the beginning of service delivery and their results should be well documented and shared. The problem is not only the difficulty in demonstrating impact – the ultimate benefits in terms of quality of public service.
- In order to ensure delivery, it is crucial to take a practitioner led approach. The most successful strategies are those were data experts in public administrations are brought together and given a visible role in the process, as in the Netherlands with the creation of a cross department sounding board with data analysts and policy experts. There is a permanent gap between data experts and decision makers, and for data strategies to work, data experts should be empowered.
- Create a data culture across department and institutional level. Data-driven innovation requires cultural change, training and bringing in new resources from the outside. New centre of competences have to be created. Data training should be provided to all civil servants, and in particular to decision makers. But it also requires the reinforcement of internal capacity and the creation of effective communities of practice.
- Because it's a long-term process, expectations need to be managed correctly and hype should be avoided. Delivering data driven innovation requires extensive work for access, preparation and cleaning, but also for processing and reprocessing. It is important for data leaders to raise realistic expectations from other stakeholders and to start by focussing on data availability. Pilots should be selected based on two criteria: a genuine need and access to available data.
- A robust ethical framework is crucial and can be instrumental to innovation. The results are long term, and it is important to avoid crisis in the short term that would "put back the clock". The safeguards can work hand in hand with more data reuse, by creating a shared data stewardship culture. Actions for data protection compliance should be integrated with those on increased data literacy: in fact, the lack of a data culture is damaging for both data protection and data innovation. But an ethical approach goes beyond compliance with data protection and includes also what is done with the data.
- Monitoring should be present and structured but not drive the process. Milestones and KPI should be core part of any strategy – and it is currently very rarely the case. KPI should not concern only outputs, but also the inputs and the process, such as the percentage of datasets in line with the required standards, the access to base registries, and the number of departments taking part in the different activities.

Modelling and Simulation Policy Take-Outs

- Timely collection and transparency of data. Data to be collected and updated at regular and timely intervals, transparent procedures for the data collection, provide stakeholders with access to results and outputs used to develop the different scenarios, in order to ensure comparability.

- Transparency and openness of assumptions and models. Openness of assumptions and modelling structure improves the comparability of the analysis and projections produced and increases trust when informing the policy making activity.
- Use and re-use of data and software modules. Models should be built in modules, to be made available to researchers for re-use and recombination. This allows researchers and practitioners to download, re-adapt and re-use the modules for their analysis, therefore conceiving new applications.
- Perform validation and sensitivity analysis exercises. The results of many modeling exercises have been deeply influenced by the modeling and estimation techniques used. Need to apply different modelling and estimation techniques to the same set of data, as well as changing the values of the input and internal parameters of to determine the effect upon the model output.
- Generate collaborative model simulations and scenarios. Clearly the collaboration of several individuals in the simulation and scenario generation allows for policies and impact thereof to be better understood by non-specialists and even by citizens, ensuring a higher acceptance and take up.
- Develop easy to use visualizations. Policy makers should be able to independently visualize results of analysis, make sense of data and interact with them. This will help policy makers and citizens to understand the impact of containment policies: interactive visualization is instrumental in making evaluation of policy impact more effective.
- Consider carefully the sources of uncertainty in the model. Uncertainty can be statistically related, related to parameters in the model that are difficult to estimate (e.g. the rate of transmission), concerning the data used (e.g. data on fatality rate might be not precisely measured), or of a more conceptual level (e.g. assuming a representative agent).
- Tailor the model to specific questions you are trying to address. SIR models use few data inputs and can be useful to assess the epidemic outbreak in the short term. Such models cannot be used to depict uncertainty, complexity and behavioural change. Strategic models encompass multiple scenarios assessing the impact of different interventions are able to capture some uncertainty underlying the epidemic outbreak and the behaviour of the population and are the foundation for policy making activity.
- Use models properly. Models are not a commodity that provide a number which the policy makers use to take decisions. There needs to be a full understanding of the subtleties involved, the levels of uncertainty, the risk factors. You need in-house data and model literacy embedded in the policy making process.

Data technologies Policy Take Outs

- Put user needs before organisational needs. The European Commission should aim to meet the needs of both consumers of public sector data products, and the needs of the analyst users that produce it. Clearly the needs of consumers (be they individual citizens, businesses, public bodies, or decision makers) to have access to timely and accurate information is critical to any data infrastructure and analysis strategy. However, it is also important to recognise analysts as a user group with distinct and often varying needs, and often the capability to meet their own needs if given sufficient flexibility.
- Work in the open and foster reusability. The European Commission should embrace open ways of working and embed the same approach to Member States. In two of the case studies that we examine in this analysis, working in the open has been a major contributor to success. The decision in NZ to work openly has led to significant cost savings among other public sector bodies who do not, as a result, need to repeat the same work.
- Adapt to data readiness. The Commission should recognise that different public sector bodies have different needs and capabilities and a ‘one size fits all’ approach to data analysis tools and infrastructure is unlikely to be appropriate. It is also important that tools and infrastructure are interoperable, support common standards (for example data formats), and should be able to scale to support future needs.
- Use Open Source. The organization and the Member States should start prioritising the use of open source technologies in future developments. Software companies and researchers routinely publish their research and tools freely under open source licenses. These tools are almost uniformly written in open source languages. Allowing analysts to use the same open source tools ensures that they can keep up to date with developments in the field. This is critically important as public sector bodies increasingly adopt machine learning and artificial

intelligence: the field moves so quickly that what was once considered to be cutting edge can be obsolete in a matter of months.

- Invest in data capability at all levels. Member states should recognise the need to invest in the capabilities of their personnel in order to keep pace with these changes. The RAP project provides a good example of this. Because the project relied predominantly on open source software, it did not imply a big new capital investment, but did require capability building both among the analysts who would use and develop the tools, and among the managers responsible for them.
- Break down silos. The commission should work to break down the siloing of data within public sector organisations, and encourage Member states to do the same, whilst prioritising proportionate measures for data security and protection that ensure that the public trust that their data are being well managed. However, member states should be aware that citizens may be concerned about the collation of data sets within government servers, and the release of this data to organisations outside of the public sector.

Data-Centric Policy Making

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Abstract

The data explosion is affecting all aspects of the society and the economy – and public administration is no exception. Data is a fundamental resource for carrying out all government activities, from regulation to service provision. And governments everywhere and at all levels are looking into the opportunities of data driven innovation, and in many cases experimenting with it. IDC estimates that central government is the fifth largest industry of the of the big data analytics market, covering about 7% of the expenditure, and fastly growing. A recent study by Deloitte (2016) identified 103 cases of big data analytics in government. In that regard, the Communication on "Data, Information and Knowledge management" calls for a more strategic use of data, information and knowledge. In this context, a data strategy and a related Action Plan have been set-up in 2018, with the objective of transforming the EC in a data-driven organisation. The eight actions of the Action Plan are centered around 5 different dimensions: data, people, technology, organisation, policy. The data strategy highlights indeed that these dimensions need to mature and evolve harmonically to deliver a real transformation on how data is used in the decision-making processes. In 2019, an operational governance framework has been set up to closely follow-up the implementation and the evolution of the Action Plan. The 2016-2020 ISA² (Interoperability solutions for public administrations, citizens and businesses) programme funded with a budget of 131 million euro, aims to support the development of digital solutions that enable public administrations, businesses and citizens in Europe to benefit from interoperable cross-border and cross-sector public services. But where do we stand? What kind of data strategies, models and technologies are implemented by the public administrations around the world? To answer these questions, the authors study in depth three domains in relation to data analytics in government. The first domain is data strategies, policies and governance, which includes initiatives in the public sector both at the strategic level, such as data strategies, data strategies, data governances and data, management plans; and at organisational level, aimed to create units or departments, and to elaborate new processes and role. The second domain is disruptive technologies and in particular policy modelling and simulation, considering initiatives to improve policy analysis through new data sources, robust and reliable models to perform "what-if" scenarios, predictive analytics and hypothesis testing, and tools allowing policy makers to carry out scenario analysis through intuitive interfaces. The third and final domain concerns data technologies: new architectures, frameworks, tools and technologies to be used by public administrations to gather, store, manage, process, get insights and share data. This domain includes the study of how data are governed as well as data collaboratives, and in particular stresses the joint analysis of governance and technologies. In that regard, the speaker will present 14 case studies: five for the domain data strategies, policies and governance, five for the domain policy modelling and simulation, and four for the domain data technologies. Apart from that, the speaker will take the opportunity to provide a critical review of predictive models used to tackle the COVID-19 epidemics.

Practical Lesson on Data Analysis in R

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Abstract

Tree growth models project the growth and evolution of forest ecosystems by increasing the size of each simulated tree in the forest on an annual or larger periodic basis [1]. The idea behind the lesson was to examine weather influences for tree growth in Vienna, which was derived from a research paper back in 2013[2]. The quantitative data was taken from the national open data portal. According to Ubaldi [3], the two main elements of open government data are:

- government data, which is any data and information produced or commissioned by public bodies
- and open data, which is data that can be freely used, re-used and distributed by anyone, only subject to (at the most) the requirement that users attribute the data and that they make their work available to be shared as well.

The Administration of the City of Vienna is maintaining a tree catalogue dataset made available as an open dataset. In line with the original idea, the average annual growth of the stem perimeter of a tree measured in one meter height is correlated with the age of the tree and the weather conditions, namely sunshine, rainfall and temperature. The weather conditions are covered by another open government dataset offered by the Central Institute for Meteorology and Geodynamics in Austria. The dependent variable is the average annual stem perimeter growth and the independent variables are age of the tree, sunshine, rainfall and temperature. The following data science approach [4] is used for structuring the analysis of the open datasets:

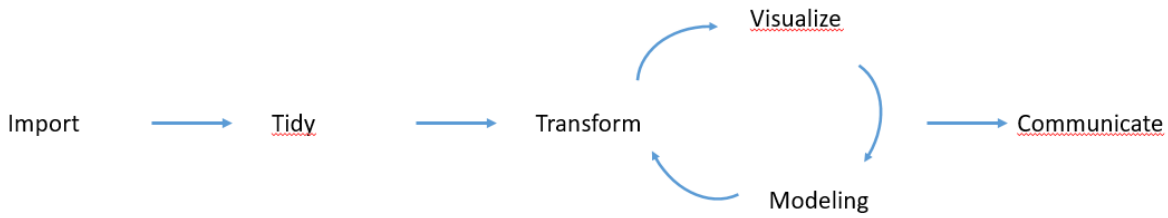

Fig. 1: Data Science Cycle [4]

Learning objectives

By the end of this lecture, the student will be able to:

- Utilize the phases of the data science cycle to structure your own data science project
- Understand the elements of Jupyter notebooks to communicate your data science project
- Communicate some strengths of the R programming language
- Recognize the importance of open datasets to progress in evidence based reasoning

Results

For this lesson the author prepared a Jupyter notebook in R, which can be accessed at: https://www.kaggle.com/gregor888/tree-analysis-vienna/

Jupyter notebooks consist of a sequence of cells, where each cell is formatted in either markdown (for writing text) or in a programming language of your choice (for writing code).

In Figure 2, the average yearly perimeter growth values (black dots) is compared to the average annual sunshine hours (yellow line), rainfall (blue line) and temperatures (red line) normalized between zero and one for all trees planted between 1955 and 2018. The stem growth seems to be higher for younger trees and the temperature and sunshine duration increased during the last decades. Rainfall increased as well, but with higher variations especially in the last decade.

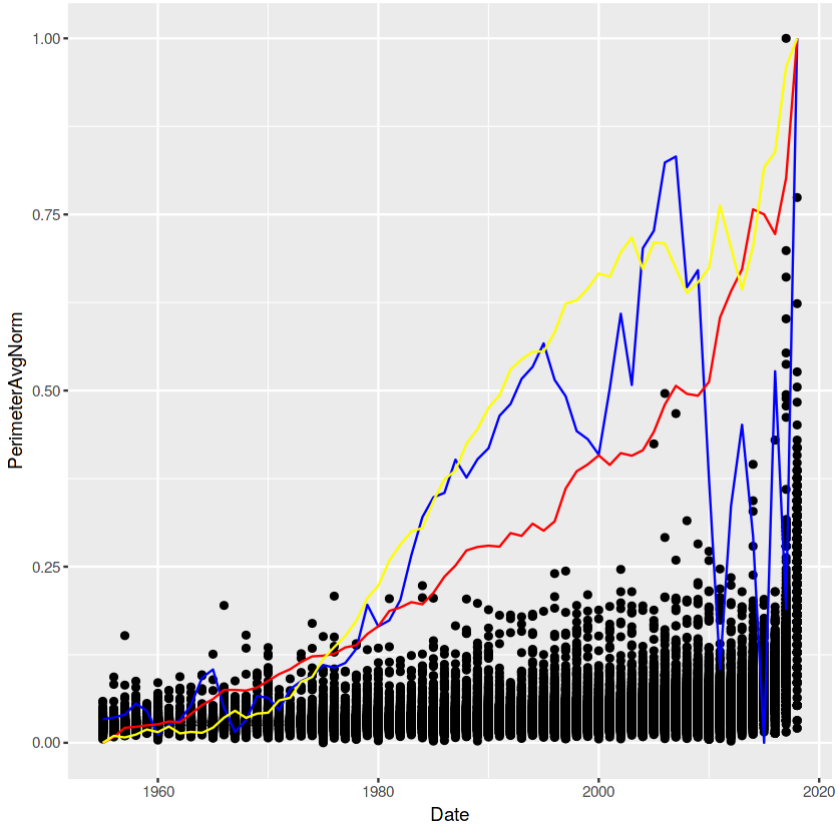

Fig. 2: Tree Growth in Vienna

This notebook creates two linear models. The first compares tree life years with the annual average tree stem growth, the second compares all available independent variables tree life years, rain, sun and temperature. Both models show that the significance of all independent variables is very high, with each significance level < 0,001. The adjusted R-squared values are 0,266 for the first simpler model and 0,7525 for the second more complex model. R-squared and adjusted R-squared are statistics derived from analyses based on the general linear model. It represents the proportion of variance in the outcome variable which is explained by the predictor variables in the sample (R-squared) and an estimate in the population (adjusted R-squared) [5]. This means that 75% of the variance of the outcome variable annual stem growth rate can be explained by the predictor variables life years, sunshine, rainfall and temperature used in the second model.

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AI Decision Making for Allocating Government Grant Funds

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Abstract

An important element in government administration is decision making. Currently, only a minority of government decision makers use a formal approach; but politics, intuition and coincidence are increasingly being replaced by formal, structured decision making. It has been found that a structured, formal decision-making process results in better outcomes. Further, the continued development of e-Government is leading to the use of autonomous decision making based on Artificial Intelligence (AI). A formal process is even more important when designing a system to make decisions autonomously.

A case study is presented demonstrating the benefits of autonomous decision making to allocate government grant funds. The Office of Justice Programs (OJP), part of the U.S. Department of Justice, developed an autonomous decision process to allocate grant funds amounting to some $2 billion annually to about 2,000 grantees. The process substantially reduced the time to select grantees to receive funds. OJP now allocates its resources based on hard data rather than subjective opinion. Efforts are ongoing throughout all government to achieve more objective mission management and replace intuition with objectivity.

Autonomous Decision Making

Large and small decisions are being made constantly at all levels in government. As John Pearson notes, [1] public administrators typically make decisions through a two-step process. First they need to determine the requirements of the applicable law. If the law allows them to use their discretion, they generally make decisions like most people: taking into account the facts and the relevant values, they seek to maximize utility. However, for most routine government decisions, the law does not provide for discretion. For example, the social security benefit for an individual is based on a complex formula emanating from legislation.

The continued development of information and communications technologies (ICT) and e-Government solutions is expected to lead to the use of autonomous decision making, based on Artificial Intelligence (AI). AI programs are designed to learn, reason, and make decisions; they can carry out activities such as monitoring, discovering, predicting, and interpreting. In many areas, AI is superior to humans in decision making. Successful decision making calls for a formal process. Computer reasoning based on logic and deduction, optimization and decision making enables autonomous systems and decision support aids. Although ICT offers substantial benefits for government operations, there is a high failure rate when governments attempt to adopt ICT for government purposes. Structured participatory processes are available, but government entities seldom use them in decision making. Thus, this aspect needs to be considered when developing autonomous decision making systems.

As Sundberg and Larsson [2] note, successful decision making needs a formal process involving several factors, including:

- Defining and weighting objectives
- Analyzing stakeholders
- Planning activities and allocating resources
- Identifying and assessing risk

- Setting indicators for measuring outcomes
- Determining if objectives were met, as input to subsequent decisions

A formal process is even more important when designing a system to make decisions autonomously.

Much government decision making has been based on politics, intuition, and coincidence. Now these factors are being replaced by formal, structured decision making. It has been found that a structured, formal decision making process results in better outcomes, i.e., a rational decision-making process increases the likelihood that the objectives of the program are fulfilled.

A Deloitte study [3] finds that if a government formulates metrics to measure the results of its operations, then it can employ data-driven analytics to make better decisions and allocate resources for optimal results.

Case Study: DOJ OJP

The Office of Justice Programs (OJP) is an agency of the U.S. Department of Justice. OJP does not carry out law enforcement or justice activities itself. Rather, the office offers state-of-the-art knowledge and practices to federal, state, local, and tribal justice systems. OJP focuses on crime prevention through research and development assistance to state, local, and tribal criminal justice agencies. Its activities cover law enforcement, corrections, and juvenile justice through grants and assistance to crime victims. OJP works in partnership with the justice community to identify the most pressing crime-related challenges confronting the justice system, and providing information, training, coordination, and innovative strategies and approaches to address these challenges. It focuses on a science-based, "smart-on-crime" approach.

An example is seen in public safety grants at the U.S. Department of Justice's (DoJ) Office of Justice Programs (OJP). For many years, during the summer grant "season," about $2 billion would be distributed to some 2,000 grantees. In the past, there was no standard approach for determining who received grants. The individual grant managers used their own judgment, basing their decisions to a great extent on their knowledge of the applicants.

OJP's goal is to administer a grant awards process in a fair, accessible, and transparent fashion and to manage the grants system in a manner that avoids waste, fraud, and abuse.

Then, about 2011, OJP began introducing objective measures into the grant review process and automated the process. The new system resulted in increased accuracy and consistency of decisions, as well as a more efficient review process. The time for a grant manager to capture grantee data in the database was reduced from 30 minutes to almost zero, and grant applications could be reviewed quarterly instead of annually. OJP now allocates its resources based on hard data rather than subjective opinion.

Efforts are ongoing throughout the government to achieve more objective mission management and replace intuition with objectivity. This effort emanates from the 1993 Government Performance and Results Act (GPRA), which requires federal agencies to include performance management as part of their strategic planning.

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Robotic process automation in local government: a system for efficiency, or just another system to handle?

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Abstract

Robotic Process Automation (RPA) is currently marketed as an easy way for organizations to automate well-structured and repetitive administrative processes [1]. In the Swedish context, RPA is promoted by the Swedish Association for Local Government and Regions (SALAR) to increase efficiency in local government. The underlying idea is that employees in local government spend undue time and resources on administrative tasks that could be handed over to software, and that the use of RPA can lead to cost-reductions and a better work environment for the employees [2]. In response, many municipalities are currently implementing RPA software to support their administrative processes but struggle to find appropriate ways of organizing this development.

This presentation covers results from an ongoing research project on the implementation, use, and consequences of automation and RPA in a set of Swedish local governments (municipalities) (see [3][4][5]). We build on qualitative case studies set in three municipalities, combined with in-depth interviews with RPA suppliers and representatives of the Swedish Association for Local Government and Regions. Through an interpretive analysis approach [6], we investigate how the municipalities understand and prepare ground for automation in general, and RPA specifically. We further investigate how the implementation of RPA impacts different stakeholders [7] in the organization and what values [8] RPA can create for these stakeholders.

Our results show that RPA can indeed cut lead times for case handling processes when implemented on the right processes; but assessing beforehand what processes are 'right' for RPA is difficult. It is also more difficult and time-consuming to implement RPA than the municipalities anticipated. Successful RPA implementation requires that knowledge and resources concerning the processes at hand are combined with IT resources and technical know-how – this trait challenges the existing organization of roles and financial arrangements in the organizations, as well as creates a need for new roles and competencies. Thus, our results indicate both possibilities and challenges associated with RPA for local government organizations and call for further research on this topic.

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Approaches and use of AI in the public sector by the European Member States: Analysis of National AI Strategies

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The potential of AI for enhancing social benefits and economic growth has been stressed in many research papers and policy documents, with governments across the world aiming to best prepare their country for the introduction of AI, and to some extent, be the leading country in AI. Governments are actively introducing policy initiatives and measures to make it easier for businesses to develop and use AI technologies, as many of the AI strategies describe. In this respect, governments have been placing forward various proposals to stimulate and facilitate the research on Artificial Intelligence, the development of new solutions and the adoption of these technologies within their economy and society. The public sector, in this respect, is only mostly regarded as a facilitator or a regulator of AI technologies in the private sector, rather than an active user of this technology to improve their various governance functions. Even if there is interest by public agencies to use AI technologies, they have to overcome the various barriers public organizations face in using AI for societal benefit, limiting the active and sustainable deployment of these technologies. This presentation presents ongoing research, which analyses 21 AI strategies to identify which initiatives the administration put forward to facilitate the development and adoption of AI in their own administrations.

Responsible Use of AI in Governance

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Abstract

The “Responsible AI” movement, over the past years, has been raising awareness of the potential threats of AI to a “healthy development” of society, and there is an ongoing discussion to what extent normative regulations are required to control the use of AI. The California Legislature, e.g., in 2018, has formally adopted the Asilomar Principles on beneficial AI, thus laying the foundation for a regulatory framework taking into account values like information privacy, accountability, judicial transparency, and respect for human dignity. A bill for an Algorithmic Accountability Act has failed at the U.S. Congress. The initiatives taken at the international level so far, in particular by OECD and UNESCO, are focusing on ethical recommendations instead of normative regulations.

At the level of the European Union, even though the European Parliament already in 2017 has undertaken some initiative towards preparing a civil-law framework for robotics, the focus for some years has also been more on discussing ethical than regulatory approaches. The High Level Group on AI, in April 2019, published ethics guidelines for trustworthy AI. At the same time, in a highly competitive global business environment, there is a strong demand for politically supporting AI development rather than legally restricting it. The public consultation on the Commission’s White Paper of 2020, however, indicated a public demand for normative regulations strong enough to have the Commission prepare a draft regulation submitted in April 2021 to the legislative procedure to take place in the Council and the European Parliament. This draft regulation chooses a risk-based approach, prohibiting AI systems that would cause what it calls an “unacceptable risk” through violating Union values, and making “high-risk” AI systems subject to conformity assessment and supervision. The reactions have been ambivalent, and there is yet much work to do. Anyway, the claim of the EU to be “spearheading the development of new global norms” remains questionable.

While AI thus is a challenge to democratic governance, at the same time it also offers new opportunities to supporting democratic legislative processes. The law-making process, in an informed society, is facing the requirement to be “evidence-based”, factual evidence being deemed the prerequisite to guarantee the quality of legislation. On the other hand, the elementary concept of democracy to have the political will of the people represented in the law-making process, implies a potential tension between irrational political conviction and rational, evidence-based argument. In this context, the potential of AI algorithms to influence or determine – or “manipulate” – information flows and information selection affects both the irrational and the rational foundations of law-making. The more data is available – and the amount of data produced is growing exponentially –, the more the support of machines is required to turn data into information, and finally into knowledge. The responsible use of these AI based services requires digital literacy, whose promotion therefore is one of the major societal and political challenges. For law-makers, specific tools will be required that, in a transparent manner, would allow them, in particular, to assess the potential impact of policies and normative regulations under consideration, as well as evaluating the actual impact of regulations adopted, with regard to the normative impact, i.e. the impact on the normative system, as well as the societal impact, i.e. the impact on the socio-economic system.

Establishment of Sustainable Data Ecosystems

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Abstract

"Data ecosystems for geospatial data - Evolution of Spatial Data Infrastructures" is an ELISE study, run by the Luxembourg Institute of Science and Technology (LIST) in close collaboration with the Joint Research Centre (JRC) of the European Commission.

The purpose of this study is to identify and analyse a set of successful data ecosystems and to address recommendations that can act as catalysts of data-driven innovation in line with the recently published European data strategy.

The overall approach described in this presentation is based on the identification and documentation of a set of case studies of existing data ecosystems and use cases for developing applications based on data coming from two or more data ecosystems, based on existing operational or experimental applications. Following a literature review on data ecosystem thinking and modelling, a framework consisting of three parts was designed. An ecosystem summary is drawn, giving an overall representation of the ecosystem key aspects. Two additional parts are detailed. One dedicated to ecosystem value dynamic illustrating how the ecosystem is structured through the resources exchanged between stakeholders, and the associated value. Consequently, the ecosystem data flows represent the ecosystem from a complementary and more technical perspective, representing the flows and the data cycles associated to a given scenario. These two parts provide good proxies to evaluate the health and the maturity of a data ecosystem.

Five of the identified case studies and use cases were selected for in-depth analysis: (1) Local data ecosystem, (2) Tracking technologies for the supply chain ecosystem, (3) Geospatial Data Marketplace, (4) Smart Agriculture ecosystem, and (5) Disaster management ecosystem.

The resulting recommendations are presented in four complementary categories related to (i) the governance of the ecosystems, (ii) the engagement of the relevant stakeholders, (iii) the technical dimensions, and (iv) the overall economic sustainability.

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