ERASMUS+ KNOWLEDGE ALLIANCES

Scientific foundations training and entrepreneurship activities in the domain of ICT-enabled Governance

D3.1 Pre-Graduate Modules on ICT-enabled Governance

Deliverable Form	
Project Reference No.	588306-EPP-1-2017-1-EL-EPPKA2-KA
Deliverable No.	D3.1
Relevant Workpackage:	WP3: Development of Training Modules and Curricula
Nature:	R
Dissemination Level:	PP = Restricted to other programme participants
Document version:	V2
Date:	24/05/2019
Author:	Gabriela Viale Pereira, Danube University Krems
Reviewers	Dimitris Sarantis and Alexander Ronzhyn
Contributors:	Noella Edelmann (DUK), Bettina Höchtl (DUK), Lörinc Thurnay (DUK), Dimitrios Sarantis (UNU), Soumaya Ben Dhaou (UNU), Delfina Soares (UNU) Alexander

	Ronzhyn (NEGZ), Maria A. Wimmer (NEGZ), Francesco Mureddo (Lisbon Council), Leif Flak (UiA), Charalampos Alexopoulos (AEGEAN), Yannis Charalabidis (AEGEAN), Zoi Lachana (AEGEAN)
Document description:	This document consist of the first version of D3.1 as an outcome of T3.1, including 10 modules/lectures for undergraduate courses and for supplementing the MOOC on Government 3.0.

Document History

Version	Date	Author (Partner)	Remarks
Draft v0.10	27/03/2019	Gabriela Viale Pereira (DUK)	First version to Quality Assurance Compiling the contribution from the partners
Draft v1.0	07/04/2019	Gabriela Viale Pereira (DUK)	Delivered to Quality Assurance
Final v1.0	10/05/2019	Gabriela Viale Pereira (DUK) Noella Edelmann (DUK)	Revision
Final v2.0	24/05/2019	Gabriela Viale Pereira (DUK)	Final version

Co-funded by the Erasmus+ Programme of the European Union

Executive Summary

This document is the first version of D3.1, which encompasses T3.1 and T3.3 of the WP3. The first version of the deliverable, delivered on M18 of the project, is the result of T3.1 Pre-Graduate Modules on ICT-enabled Governance, including 10 modules/lectures for undergraduate courses and for supplementing the MOOC on Government 3.0. The second version of the D3.1 will include the results of T3.3, which encompasses the development of 10 modules/lectures for executive level (special modules from the Samos Summer School 2019), and will be delivered on M24 of the project.

Co-funded by the Erasmus+ Programme of the European Union

TABLE OF CONTENTS

Co-funded by the Erasmus+ Programme of the European Union

LIST OF FIGURES

Co-funded by the Erasmus+ Programme of the European Union

LIST OF TERMS AND ABBREVIATIONS

Term/Abbreviation	Definition
A2A	Administration to Administration
A2B	Administration to Business
A2C	Administration to Citizen
ABB	Architectural Building Blocks
AI	Artificial Intelligence
D	Deliverable
DEG	Digital Era Governance''
DLT	Distributed Ledger Technology
DM	Data Mining
DMA	Data Market Austria
DPIA	Data Protection Impact Assessment
EIF	European Interoperability Framework
EIRA	European Interoperability Reference Architecture
EIS	European Interoperability Strategy
FCM	Fuzzy Cognitive Maps
FoIA	Freedom of Information Acts
G2B	Government-to-Business
G2C	Government-to-Citizen
G2G	Government-to-Government
GDPR	General Data Protection Regulation
ICT	Information and Communication Technologies
IDA	Data between Administrations
IoT	Internet of Things
IS	Information Systems
IT	Information Technology
ML	Machine Learning
MOOC	Massive Online Open Course
NIF	National Interoperability Frameworks
NLP	Natural Language Processing
OD	Open Data

Co-funded by the Erasmus+ Programme of the European Union

PSI	Public Sector Information
PSR	Public Sector Reform
T	Task

1. INTRODUCTION

1.1 Purpose and Scope

This report is the first outcome of the third work package of the Gov3.0 project. Work package 3 intends to create a state of the art course curricula and modules on ICT-enabled Governance.
The education modules will address different target groups:

- Young students (bachelor programmes)
- Experienced students with special interest (master programmes)
- Professionals that already work in the domain (continuous education)

Based on the extensive knowledge of bachelor education, universities collaboratively developed modules for undergraduate courses that can be integrated into existing curricula.

This document is the first version of D3.1, which encompasses T3.1 and T3.3 of the WP3. The first version of the deliverable, delivered on M18 of the project, is the result of T3.1 Pre-Graduate Modules on ICT-enabled Governance, including 10 modules/lectures for undergraduate courses and for supplementing the MOOC on Government 3.0. The second version of the D3.1 will include the results of T3.3, which encompasses the development of 10 modules/lectures for executive level (special modules from the Samos Summer School 2019), and will be delivered on M24 of the project.

1.2 Approach for Work Package and Relation to other Work Packages and Deliverables

This report was developed using a three phases approach. In the first phase, the training needs and the courses were identified and the main structure of the curricula was designed. The actual development of the lectures took place in the second phase. The lectures were then validated through guest lectures and a workshop. The methodology is described in more detail in section 1.3.

In WP3 the deliverables of the WP1 (T1.1. Baseline Research and T.1.2. Electronic Governance training programmes worldwide) were used as a basis to categorize and select the existing courses to be implemented in the new curricula. The results from WP2 (T2.1 Government 3.0 roadmap) were used to identify latest developments on ICT-enabled governance to form the Government 3.0 course. Finally, the content developed in WP3 will directly supplement the MOOC on WP4. Finally, WP3 is also aligned with WP9 being this deliverable part of the evaluation framework. The results from the first pilot evaluation report will be implemented in the second part of this deliverables.
The overview of the relations between different work packages is presented in

Figure .

Co-funded by the Erasmus+ Programme of the European Union

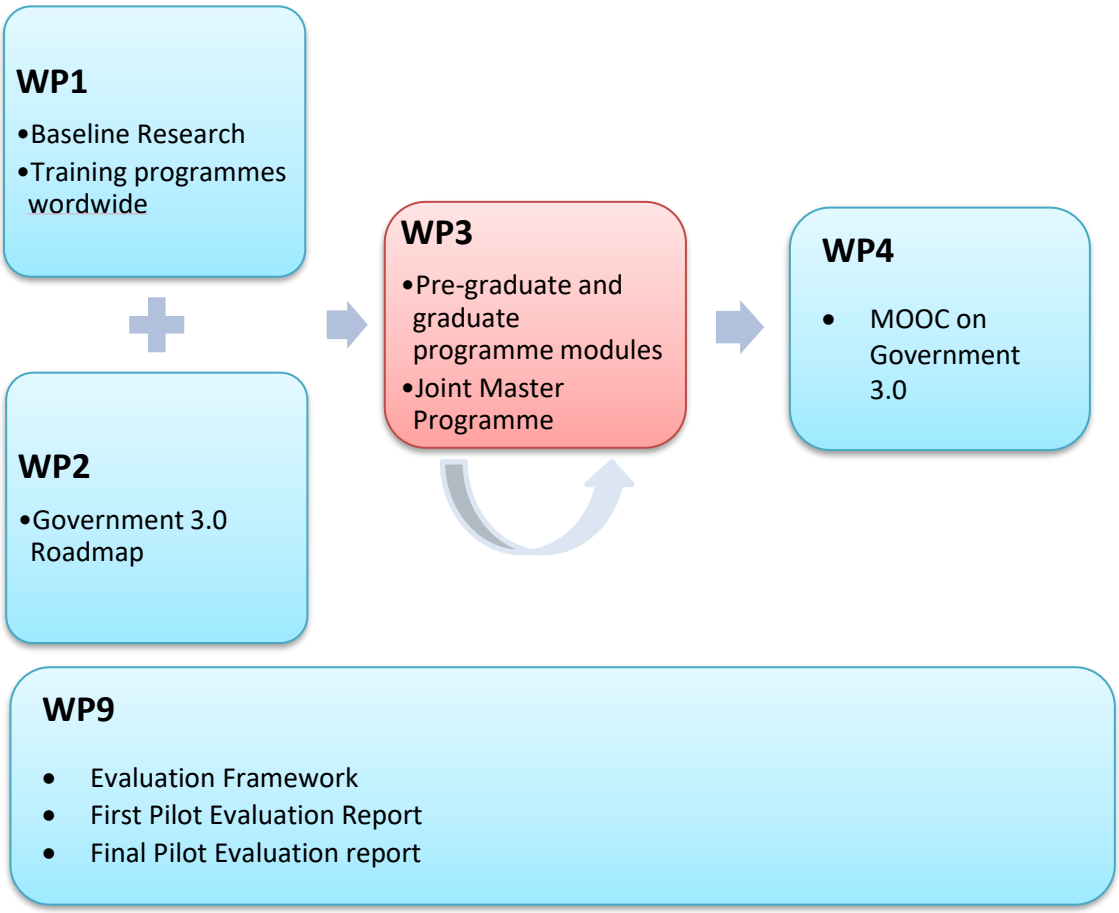


Figure 1: Relationship between work packages in Gov 3.0 project

1.3 Methodology

A training program will be developed within WP3 to provide the basis for developing curricula on Government 3.0 in different levels of education. The implementation of the courses and modules is a continuous process in each partner university. Additionally, the outcome of this deliverable will be used for the next task in the WP3, T3.2, developing a master program and for WP4, recording a MOOC on Government 3.0.

The MOOC on Government 3.0 is an individual open access course framed within 15 training modules. As it is stated in the Consortium Agreement an "Online Course means a set of modules being sequences of instructions to carry out a training lesson convertible into a form executable by a computer, and fixed in any tangible medium of expression. A course is a series of lessons (modules) ranging from 8 to 15. Each lesson will include at least a 10 minutes video, 10 pages of dedicated notes and one exercise for the students."

The course material will be jointly developed by Gov 3.0 core partners during the third year of the project. As it is stated in the Consortium Agreement "Course material means the developed material (videos, exercises, notes, presentations) that enables the execution of an asynchronous or synchronous online course". The course material is developed in T3.1, T3.2 and T3.3 of WP3. This deliverable includes the first 10 developed modules.

Gov 3.0 Project will jointly develop a Master's curriculum and will describe 30 courses for the ICT-enabled Governance domain necessary for the education in different domains such as Public Administration Studies in pre-graduate and post-graduate level. This will be the outcome of T3.2 of WP3.

This deliverable adapted the methodology for curriculum development suggested by Okudan et al. (2005).

Co-funded by the Erasmus+ Programme of the European Union

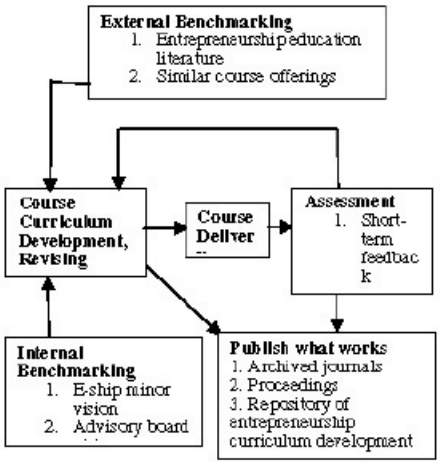


Figure 2: Continuous Curriculum Improvement and Assessment Plan

Source: Okudan, G. E., Kisenwether, E., & Rzasa, S. (2005). A Methodology for Curriculum Development, Revision, and Assessment for Entrepreneurial Skill Development: Stage I-Entrepreneurial Leadership course. In VentureWell. Proceedings of Open, the Annual Conference (p. 193). National Collegiate Inventors & Innovators Alliance.

The first approach was the internal benchmarking were we identified the courses offered by academic partners, which are relevant to e-Government, and how they could be updated. Based on the outcomes of WP1 and WP2, a first selection of modules was performed to define a set of courses and modules to be implemented for the proposed curricula. Based on this a first draft of an EU Master's Program for Digital Government was suggested and 10 modules/lectures for undergraduate level and for the MOOC were described. For each module, the authors developed a description of the lecture in the selected topic and 10 minutes script for the recording of the video for the MOOC.

The first structure of the courses and modules was validated through a workshop with experts (described in section 2.2), which consisted the first phase of the external benchmarking. The second phase was done through the First Evaluation Report (D9.2). The results of these activities will be incorporated in the follow-up version of this deliverable.

1.4 Structure of the Deliverable

This report is divided into 3 sections. The present section (section 1) deals with the scope, methodology and structure of the deliverable. Second section presents the analysis of the collected data through document analysis and workshop to identify existing courses in the partner universities and validate the first structure of the modules. The third section describes the first 10 selected modules to be implemented in the current programs and recorded for the first version of the MOOC. For each described module the description of the lecture is provided, followed by the scripts of the module for the MOOC, with supplementary slides. Finally is presented the next steps for the final D3.1.

Co-funded by the Erasmus+ Programme of the European Union

2. DATA COLLECTED AND ANALYSIS

2.1 Existing Programmes at the Academic Partners

The first activity under T3.1 was the identification by the academic partners of existing ICT-enabled governance-related courses in their universities that could be updated by the project deliverable. At this stage we haven't differ between undergraduate and graduate programs, but potential courses that could be updated with the proposed modules. The partners participating in this activity were DUK (only continuing education), NEGZ (University of Koblenz), UNU, UAgean and UiA.

The analysis of the identified courses was done based on the results from the first deliverables of the project (D1.1, D1.2 and first draft of D2.1) in terms of related courses under the Government 3.0 domain.

The description of the identified courses are based on the levels they were represented in the partner (undergraduate and graduate programs), but do not reflect our understanding of how the modules should be structured.

At undergraduate level, the strongest related program refers to "eGovernment I" and includes the following courses:

- Introduction to e-Government domain
- The Public sector – structure and operations.
- G2C, G2B, G2G services.
- Business Process Management in the public sector and local administration.
- Enterprise Architecture for Government Systems.
- Key infrastructures and government services.
- Local Government.
- World, European and National status (e-Government indexes).
- Issues and principles of open and collaborative governance.
- Systems and methods for electronic participation and electronic democracy.
- Open governmental data: administrative processes and relative ICT tools.
- Social media in the public sector, for provision of services towards citizens and businesses.
- National and Local Government cases.

Additional courses in undergraduate level are:

- Peculiarities of public administration in the use of ICT
- ICT strategies and initiatives
- Information modeling and service structuring in networked applications
- Standardization and interoperability
- Portal developments
- Identity management and security in eGovernment
- Process support, workflow and document management
- E-government solutions in the legal context
- Benchmarking, e-government awards and competitions

At postgraduate level the following courses were identified:

- Digital transformation
- Strategies and trends
- Digitalisation of public sector

Co-funded by the Erasmus+ Programme of the European Union

- Work System Framework for eGovernment
- Smart Cities
- Public sector and social media
- Crisis Management
- Open Big Data
- Block Chain and Smart Contracting
- E-participation
- Public governance and open government
- New Public Management
- Data Science

Additionally, an existing postgraduate program on eGovernment II served as basis for selecting the courses for the current deliverable.

- Basic principles and main issues of open and participatory governance.
- Systems and methodologies for e-participation and e-participation / democracy.
- Policy modeling for impact analysis, simulation of social phenomena, and in-depth decision-making in public administration.
- Open Government Data: Administrative Procedures and Information and Communication Technologies.
- Social networks in public administration and in providing services to citizens and businesses.
- Smart cities: Infrastructure and advanced mobile applications.
- Use of information technology to address major societal challenges (economic crisis, migration, climate change impacts, under-development, etc.).
- Case study: open participatory governance applications.

The main outcome of this phase was a list of modules that started being produced for this deliverable and a first classification of the modules within courses.

Co-funded by the Erasmus+ Programme of the European Union

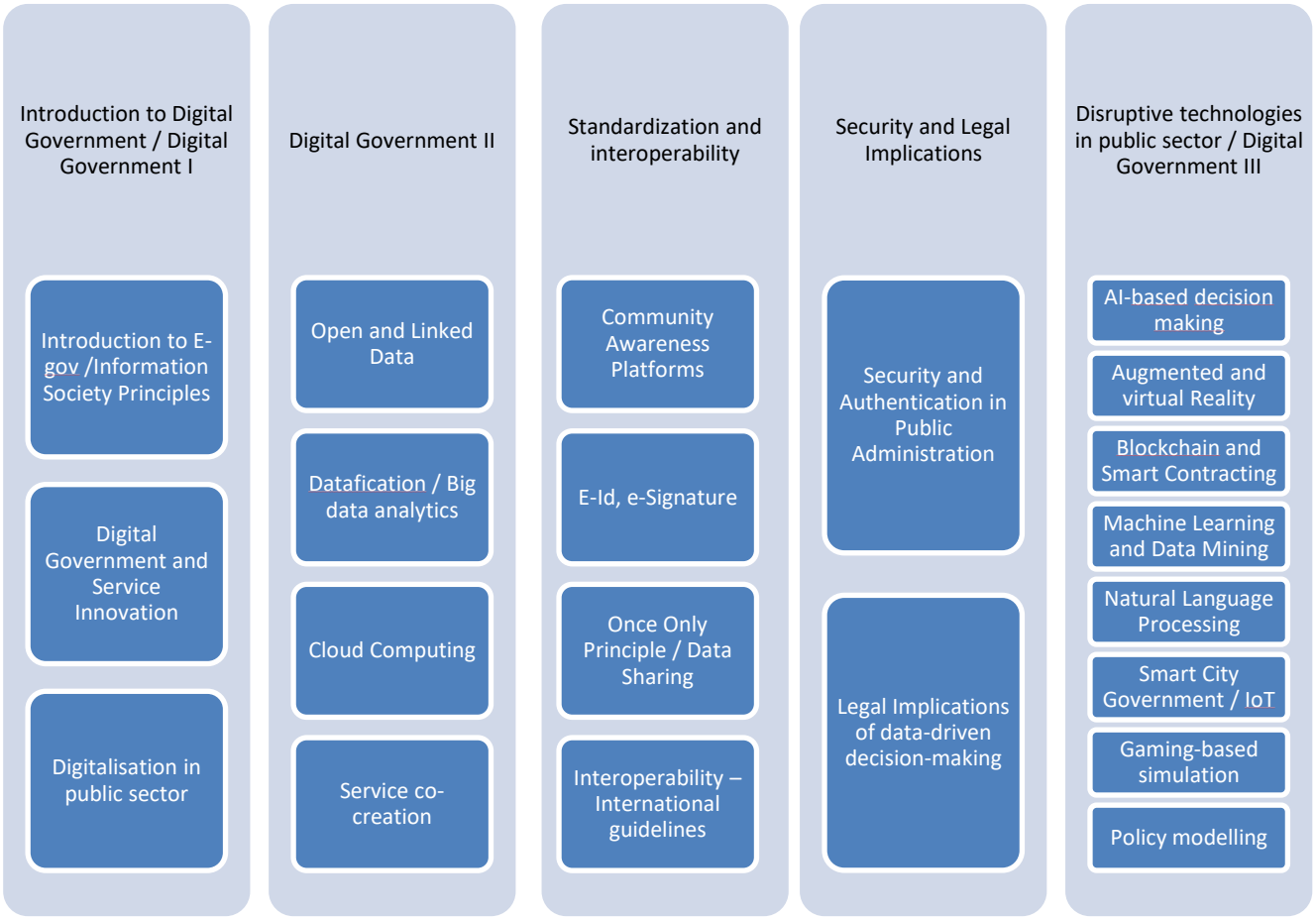


Figure 3. Classification of modules in major courses

The proposed classification was used as the basis for the discussion in the follow up activity that will be described in the next section.

2.2 Workshop at ICEGOV 2019

As part of T3.1, a workshop was organized to validate the classification of courses and modules for the proposed Government 3.0 curriculum. The "On a science base for Digital Government/Transformation" workshop (Annex A) was held as a pre-conference event of ICEGOV 2019, in Melbourne, Australia, on April 2, 2019. The workshop was moderated by three members of the consortium and counted with 10 eGovernment experts from different countries.

In order to address the objectives, the workshop was divided into three distinct activities: 1) Introductory presentation of research findings on training needs 2) Group brainstorming session on the training needs; 3) Interactive discussion on digital transformation in government.

The first session had a presentation by the ERASMUS+ Gov 3.0 project coordinator (UAegean), including the data collected during the first stages of the Gov 3.0 project on training needs within e-Government research field.

At the second part, DUK introduced previous identified courses (Figure 2 of this document) for the Training Programme in Government 3.0. A summary of the modules was presented, followed by a brainstorming session that focused on (a) the content of the modules and relation to Government 3.0; (b) courses that should be included in a Master program; (c) what modules could be included in the courses; (d) the country-specific modules on the post-graduate levels. Considering the number of participants the discussion was done in one single group with all participants.

Co-funded by the Erasmus+ Programme of the European Union

The third part of the workshop was moderated by UiA and consisted of an interactive discussion on the scientific theories and methodological competences related to digital transformation in government. The workshop concluded with a plenary presentation, summarizing the work conducted during the workshop.

Since part I included mainly the introductory presentations, there are no results to be described.

2.2.1 Part II: Training Needs

The outcome of section 2.1 of this deliverable was presented and validated during the workshop. The discussion was structured as follows:

(a) Major courses that should be included in a Master program

- First semester

- Second semester

(b) modules that should be included in the courses

- Digital Government I, II, III

(c) content of the modules and relation to Government 3.0

(d) country-specific modules on the post-graduate levels

Results:

When discussing how to **structure an eGov MSc** the issue of country-specific modules was raised. Among the conclusions is that this issue concerns mostly the developing countries and that addressing local issues will happen through the contextualization of the whole program – inevitably – mainly through the introductory courses.

Main aspects to consider for structuring the master program:

- Roles and skills specific
- Needs and capacity
- Micro certification / accreditation
- The target group is heterogeneous and demand practical work
- Mix the different backgrounds through collaborative projects
- The courses must be flexible to address the different maturity level of the students.
- The programs should be planned to target different profiles and backgrounds and in this way being dynamic to attend the heterogeneous target group

The main conclusion of structuring an e-Government program is that considering the applied and multidisciplinary nature of the e-Government domain, there is a need for a dynamic curriculum where pre-conditions and outcomes must be defined towards a personalized roadmap. The heterogeneity of the target groups, through different profiles and backgrounds, is also to be considered in the contextualization of the modules to the different levels of education programs and regions where they are implemented.

Regarding the **MOOC**, The participants agreed that the core modules could be kept as presented in Figure 2, but specifying the depth and focus of related courses. Most of the modules could include both theoretical and technical branches depending on the scientific background of the student. An intro video could summarize the course and then the material could target both branches and the student will follow the proper one (personalized ways of getting the courses). The focus are on non-technical courses but providing understanding of the technical side/aspects. They should focus primarily on the application ways and results. The suggested structure is: Knowledge of the domain → Understanding → Application

Co-funded by the Erasmus+ Programme of the European Union

When discussing the missing modules in the suggested Program (Figure 2), the participants identified the following topics to be addressed:

- Social Media – this could be included at co-creation module (Gov II) being design as a dedicated module
- Fake news and its impact for policy making – this could be included in Social media (the technological aspect connects with NLP)
- Design thinking and design science/research as fundamental aspect
- Digital inclusions
- Security's management side and cybersecurity
- Privacy
- Ethics as a horizontal course addressing all the disruptive technologies
- Sustainability and societal challenges

Those modules were considered when planning the follow up tasks of WP3, and should be included in the final version of D3.1 and D3.2.

2.2.2 Part III: Science Base creation

The discussion was structured as follows:

- scientific theories,
- methodologies and
- the need for transdisciplinarity related to digital transformation in government.

Results:
The recommendation regarding scientific theories are:

- Classify theories in an ontology (epistemological approach)
- Theories related to public value
- Diffusion of innovation and adoption theory (Systems)
- Basic theories: socio-technical approach and design science
- Identify and focus on core theories

When discussing about the methodologies, the participants identified the following aspects:

- The eGovernment domain lacks its own models and frameworks (e-Government strategy 2006)
- There are little or no validation of existing models
- The number of publications in the field is dropping instead of growing. A possibility is that the eGovernment, as a multidisciplinary domain, do not concentrate the publications in the domain specific journals and conferences, but in many disciplines such as Information Systems, Public Administration, Legal Informatics, and so on.

The need for transdisciplinarity addressed the following aspects:

- e-Government is an applied discipline and multi-disciplinary in its nature
- Training on the trans-disciplinarity and inter-disciplinarity is needed
- The domain is not mature enough for inter/trans-disciplinarity
- Focus on the achievement form the many disciplines - different methodologies to achieve the same result

Co-funded by the Erasmus+ Programme of the European Union

3. DESCRIPTION OF THE MODULES

Each module includes the reader (a description of the lecture), the scripts for recording a module for the MOOC, and supplementary slides (optional).

3.1 Course 1: Introduction to Digital Government – Digital Government I

3.1.1 Module 1: Introduction to e-Government and Information Society Principles

Compiled by Dr. Dimitrios Sarantis, UNU (Portugal), Soumaya Ben Dhaou, PhD, UNU (Portugal) and Dr. Delfina Soares, UNU

3.1.1.1 Reader

Introduction

The course on introduction to e-Government and information Society principles aims to present the main concepts, the roots as well as the fundamentals of e-Government. The course's basic premise is that the use of ICT in Government is not an end in itself. The course approach is not a techno-centric perspective focusing on adoption, application and implementation of technology, but a tool to achieve the reform, transformation, and modernization of the overall state governance activity, to:

- provide better information and services to the public
- improve the efficacy and efficiency of an agency, and inter-agency government operation
- promote active participation, democracy, and citizenship
- ensure transparency, inclusiveness, and equality

This course will start by defining e-Governance vs. e-Government, followed by a brief description of the roots and historical evolution of the concept of e-Government as well as the introduction of the fundamentals of e-Government.

Definition of e-governance and e-government

Over the last two decades information and communication technology has impacted and changed various aspects of the government, its governance and the public service delivery. Digital information and service exploded in variety and volume and became today the norm. It is created and used in different ways in order to generate value to a diversity of stakeholders. However the continuous changes and the increasing expectations of the stakeholders and the connected society increase the complexity and the vulnerability to issues of privacy and security. This fast evolving environment impacts the public services and it is a continuous challenge for the government.

It is important to start by defining the main concepts and to clearly distinguish between the two concepts of e-Government and e-Governance.

The concept of e-government is a term adopted by the National science foundation in 1999. Broadly defined, the definition highlights the use of Information Communication technology to support and improve public policies and government operations and to engage citizens as well as to provide comprehensive and timely services. The definition proposed by the OECD (2003, 2008) as presented in the previous slide is completed by the World Bank adding "citizen empowerment through access to information. As highlighted by Dawes (2008), Both definition together provide a broad view that is encompassing e-Government service and administration but also democratic processes and the relationship.

The e-government is the transformation of government to provide efficient, convenient and transparent services to the citizens and businesses through information and communication technologies. There is different types of e-government through the transformation of relationships. Firstly, this transformation is defined in reference to the external relationships between the government with citizens and the government to business. Secondly, internal relationships refers to the inter-relationship with the Government and with employees. All these relationships are bidirectional and can be within a country or border-crossing.

The e-governance is defined as the use of Information communication technology (ICTs) to support public service government administration, democratic process, and relationships among citizens, civil society, the private and the state.

- Policy Framework
- Enhanced Public Services
- High Quality and cost effective Government operations
- Citizen engagement in democratic processes
- Administrative and institutional reform

While e-government, according to the National Science Foundation in 1999, is defined as the use of ICTs to support and improve public policies and government operations and engage citizens as well as to provide comprehensive and timely services. This definition is completed by the OCDE that consider e-government as the use and of information and communication technology and particularly Internet, as a tool to achieve a better government (OECD, 2003), meaning the achievement of better policies outcomes, higher quality services, greater engagement with citizens, and advancing the public reform agenda (OECD, 2008), as well as the citizen empowerment through access to information (World Bank). Simply said, the E-Government is a Phenomenon that seeks the reform, transformation and modernization of the State activities and operations, invariably associated to the use of IT as a facilitator and a driver of the intended transformations eclectic and holistic.

Often, there is direct relationship between the two elements of e-government and e-governance based on the use of three main sphere. Firstly the e-administration is linking between the formal politics and the public administration. Secondly, the e-democracy which relate between the formal politics and the civil society. Finally, e-service. Each sphere, and each relation between the spheres, constitutes a fundamental space in State government activity, in which IT can be used to facilitate and promote State modernization and transformation. It can be presented as a phenomenon:

- Narrowly related with the conduction of initiatives that aim to contribute to the reform, transformation and modernization of the State
- Invariably related with the use of IT as a facilitator and a catalyzer for the intended transformations
- Eclectic and holistic
- Requires a vision of the “e-Government ecology”

It is the conduction of the multiple government State activities in a renewed, transformed and strongly IT-supported way. In these sense, it is particularly essential to plan by defining the e-government strategy.

The e-government strategy is a set of comprehensive documents that provide a vision, indicate a direction, set a pace, create a set of methodologies, lay down priorities, enable resource mobilization, facilitate adoption of holistic approach, define KPIs and monitoring. It is essential to align e-Government efforts along the development priorities of the State. It permits as well to ensure systematic approach in implementation and an optimal utilization of scarce resources. The e-government strategy allows to move progressively away from politically champion-led approach to an institutionalized approach in e-Government (Projects don’t happen by ACCIDENT any longer, but by design). It contributes to increase a higher success rate.

E-Government context of development : Public service Reform

The e-Government phenomenon is born in the context of reinvention of the government and of a pressing need to reform, transform and modernize the public administration, the public service and the government as holistically. There was as well expectation that the government adapt to the changing and digitized environment and adopt the Information Communication technology. The e-Government phenomenon started seeking to reform and transform the states activities and operations based on the use of IT as a facilitator and a driver of the transformation.

In the early 90’s the “reinventing Government” movement started giving roots to the public service reforms (Osborne and Gaebler, 1992). This movement is calling for a radical change of the Government in terms of Design, structure and

Co-funded by the Erasmus+ Programme of the European Union

processes. The transformation of the government from bureaucratic design to an entrepreneurial approach which is mission and customer driven and results-centered.

IT played a central role in the reinvention of the government. Government agencies redesigned workflows and integrated IT applications to support. This is the early use of the e-Government concept to facilitate and improve the access to the government.

There is three main roots of the public service reforms: The raise of new Ideology, the public sector crisis and the political will and power. The first root of the public service reform is associated with the crises in the public service. For example, a non-sustainable public expenditure is problem of Input. Waste, delay, mismanagement and corruption within the public service; Decisions taken separated from the interests of citizens are examples of problems of process. Problems of outcome can be related to when public service is not delivering what is supposed to deliver. Basically, the public service fail on his role (What it is doing) and on public service and organisation (How it is doing it).

The second root of public reforms lays on new ideology. Neo-Liberal thinking emphasizes: Economic efficiency of the markets, the forces of the competition as well as individual decisions. In this perspective market was seen as the best regulator and the government role was reduced and presented as negative. This new ideology is saying something not only about the change in the role of the public service but also in the way it is managed and organized. This new ideology propose changes in the role of the government but some of these changes are against the government: such as There should be a “rolling back of the state” (replace it with private institutions); or state government should just exist to help markets to function more effectively and efficiently and The remaining state institutions should be opened up to true market forces of competition (PS should be provided as similar as possible of private sector).

The third root is related to the political will and power. The sense of crises and the new ideology are needed but not sufficient to induce a reform. The political will to enact a reform are mandatory. Citizens, politicians and public servants are essential ingredients to government transformation, even though in some cases they don’t have the same targets. Local and global capital requested for operational and business cost reduction and international organizations pressing for reform, motivate the transformation.

According to Osborne and Gaeble, tall, sluggish, over-centralized, and preoccupied with rules and regulations government designs don't work well. "We designed public agencies to protect the public against politicians and bureaucrats gaining too much power or misusing public money. In making it difficult to steal the public's money, we made it virtually impossible to manage the public's money. In attempting to control virtually everything, we became so obsessed with dictating how things should be done - regulating the process, controlling the inputs - that we ignored the outcomes, the results. Osborn and Gaebler recommend Entrepreneurial Government", government that can - and must - compete with for-profit businesses, non-profit agencies, and other units of government. They recommend the following ten principles of reinvention:

1. Steering rather than rowing
2. Empowering rather than serving
3. Injecting competition into service delivery
4. Transforming rule-driven organizations
5. Funding outcomes, not inputs
6. Meeting the needs of the customer, not the bureaucracy
7. Earning rather than spending
8. Prevention rather than cure
9. From hierarchy to participation and teamwork
10. Leveraging change through the market

A new paradigm of society can be applied to reinvent government in the information age. As Alvin Toffler stated: “The illiterate of the 21st century are not those who can’t read or write, but those who refuse to learn, re-learn and learn again”. On the same wave length, Peter Drucker said: “In a fast-changing world, what worked yesterday probably doesn't work today’. One of the fathers of modern management theory herein argues that much of what is now taught and believed about the practice of management is either wrong or seriously out of date.

Co-funded by the Erasmus+ Programme of the European Union

This New Paradigm of society is associated to the domination of services over other economic sectors, a niche instead of mass market and the emergence of a post-bureaucratic form of organization. These increased the importance of information and the value and visibility in the society but for the government as well. Government has been, and remains, the single largest collector, user, holder and producer of information. Information is a central resource for all staff levels and all activities. Work of government is information-intensive.

Digital Government Development

We could claim that digital government has been developed and evolved over the past decades. If we define Public Sector Reform in a narrow perspective it is often associated with the ideology of the "New Right". Changes in the way public sector runs "Reinvention is only the latest initiative in the enduring cycle of reform".

During the 70's the public service reforms start to include the use of Information technology. If we define PSR in a narrow perspective, PSR is often associated with the ideology of the "New Right". It has changed the way Public service runs "Reinvention is only the latest initiative in the enduring cycle of reform".

During 80s, the concept of government reinvention appears. According to Heeks, we can define Public Sector Reform (PSR) widely as "a change within public sector organizations that seeks to improve their performance", in this way PSR is an ongoing process since the inception of institutions. We start using concepts for the public services such as Reinventing government; Revitalising government ; Reengineering government; (Osborne and Gambler 1992).

Between the 90s and 2000s, e-Government concept dominates, as a movement of radical change from bureaucratic government towards an entrepreneurial government. Technology and policy foundations prevail in the early 90s and service expansion, information management and IT management consolidation dominate in late 90s.

Digital Transformation appears in 2010, defining Digital Government not as an end goal, but as a mean to accomplish affordable and sustainable government services.

For 2020s, with the emergence of the new technologies, smart sustainable government integrates intensive data analytics. It focuses on gathering and using data about citizens and their environment for delivering government policies and services.

In modern government importance of information has been drastically increased as well the value and visibility of information systems in society and within public administration. Government has been, and remains, the single largest collector, user, holder and producer of information.

We can classify information in government areas in four types.

The first type is the information to support internal management, information about staff, budgets and accounts. The efficiency and efficacy of processes are enhanced by the use of online communication and cooperation which allows for the sharing of databases and resources and the fusion of skills and capabilities. It renders information regarding compensation and benefit policies, training and learning opportunities, and civil rights laws in a readily accessible manner.

The second type is information to support public administration and regulation, information that records the details of the main "entities" in any country: people, business enterprises, buildings, land, imports/exports, etc. Public administration conducts business with natural persons, legal entities and entrepreneurs. Therefore, the data entities natural person, legal entity and entrepreneur are considered to be crucial. Another important type of data is spatial information localizing various object types, such as real estate, addresses, etc. Such data is registered in public administration basic registers: Natural persons register – natural persons; Legal entities and entrepreneurs register – legal entities and entrepreneurs; Spatial information register – spatial information defined in directive INSPIRE 2007/2/EC29.

The third type is information to support public services. This information differs according to the particular service, for example, school staff records and patient records.

Finally, information that is made publicly available, like press releases, consultation papers, policies, laws, regulations, information that government collects, like demographics or economics statistics and information that government is

Co-funded by the Erasmus+ Programme of the European Union

required to supply, like performance indicators, audited accounts and responses to requests from citizens or journalists or politicians.

Information technology may have different roles in digital transformation. It may automate existing human-executed processes, it may assist existing human-executed processes, or it may create new IT-executed processes.

Looking at the main benefits of IT use to the reform process; it is cheaper since the same thing is produced at a lower total cost; it is more productive since more is produced at the same total cost; it is quicker, since the same thing at the same total cost is produced but in less time, it is better, since the same thing at the same cost in the same time is produced but to a higher quality standard and finally it is more innovative since new outputs are produced.

In this regard, managers in particular should make decisions and choices about their potential future operations appropriately. Consequently, managers should decide how to approach information and IT within the reform process. What may be considered necessary in each case? In such situations managers must use their accumulated knowledge and expertise to evaluate and deduce imperfect information in choosing the best course of action in the light of their organizational objectives. In most of the organizations such decisions made by the managers will be supported by information of varying degrees of accuracy and usefulness gleaned from the organization's information systems

Heeks and Davies (2005) proposed the Four eyes Models that is defining how managers approach Information and IT within the Reform process. This model describes four approaches to the reform of the government with IS/IT.

The first two approaches are the denial of the role of IS in the reform process due to lack of IT cost and the risks. In general, government officials are highly reluctant to risks and suspicious because of the high rate of failure. This type of behavior remains prevalent among PS officials today and in developing countries are more in the "isolate approach." They attached to other reasons: such as the status quo, not a priority because of the lack of political, social and economic stability; high level of corruption; difficulty to develop infrastructure and human development. There is several barriers to this phases: the skills and knowledge; Finance, Risk, Doubt, and the infrastructure.

The idolize approach: Here the public service officials are over-aware of the IT/IS potentials. They believe that the IS/IT will transform Government Business. The focus is on IT, and that leads some project to a spectacular failure. The reform and the change expected didn't occur, and most of the project failed on disuse. Among the drivers supporting the idolise approach there is the image of IT as reform solution. The presentation of cases of success is an example. The second drivers is the pressure from other external institution which is also contributing to an IT image-making. The third driver is associate to the fact that there is continuous novelty and unfamiliarity of IT innovations which requires from government to spend more and more to keep in pace with IT novelties. The fourth driver is the "me too" attitudes, officials have follow a mimetic attitude toward IT to be part of certain group.

The last approach of the model "Integrate," the government officials consider IT as an enabler. They recognize that information plays a central role in the full government. IT is relegated to a secondary purpose of facilitator and not an end in itself. Some barriers limits the integrate approach. Firstly, the technical barriers are an important barrier such as existence of legacy systems. The second barriers is related to the amount of resources invested that lead to the reinforcement of the existing vertical and horizontal organizational boundaries. The third barrier is related to the lack of information, knowledge and skills. The fourth is the barriers linked to the quality and type of data such as outdated, inconsistent, incoherent data. Finally, the last barrier is structural and cultural.

The issues related to IT and e-Government remains very similar which related the system of skills, the issue related to implementation and the issue impact. The e-Government needs systems skills more than technical skills and it requires hybrid skill more related to an IS profile. E-Government needs more redesign and re-engineering not only automation. Top management support is essential for e-government implementation success. E-Government project implementation are strongly influenced by politics. In terms of impact. The e-Government affects clerical not professional and managerial jobs. e-Government impact assessment fail to account for total cost of ownership.

Conclusion

Co-funded by the Erasmus+ Programme of the European Union

Despite the expenditure and almost three decades of e-Government development, the improvements are limited, and expenses in IT/IT are growing. However, there are other reasons for failures. A lot of IT projects keep sometimes failing because of the adoption of IT-driven approaches. Limited skills development is also a problem. e-Government requires more hybrid systems skills related to IS profile more than technical skills. The e-Government implementation remains a challenge as well. E-Government needs a redesign and not just automation. The top management support plays as well an important role as well as political involvement. The e-Government

The impact measurement is very complex and challenging to achieve in e-Government. However, we can notice that e-Government affects mainly clerical works and less professional and managerial jobs.

The basic premise here is to maintain technology neutrality and e-Government must be approached from an IS and not an IT perspective; focusing on information more than the technology that should remain as a mean and integrated and subservient to IS which is itself subservient to the reform agenda.

References

OECD. Organisation for Economic Co-operation and Development (2003), The egovernment Imperative, OECD egovernment Studies, France.

OECD (2008). Belgium: OECD Country Report. Paris: OECD E-government Studies.

Dawes, S. S. (2008). An exploratory framework for future e-government research investments. Proceedings of the Hawaii international conference on system sciences.

Osborne, David, and Ted Gaebler. 1992. Reinventing Government. New York: Plume Books.

Heeks, R. (Ed.). (2001). Reinventing government in the information age: International practice in IT-enabled public sector reform (Vol. 1). Psychology Press.

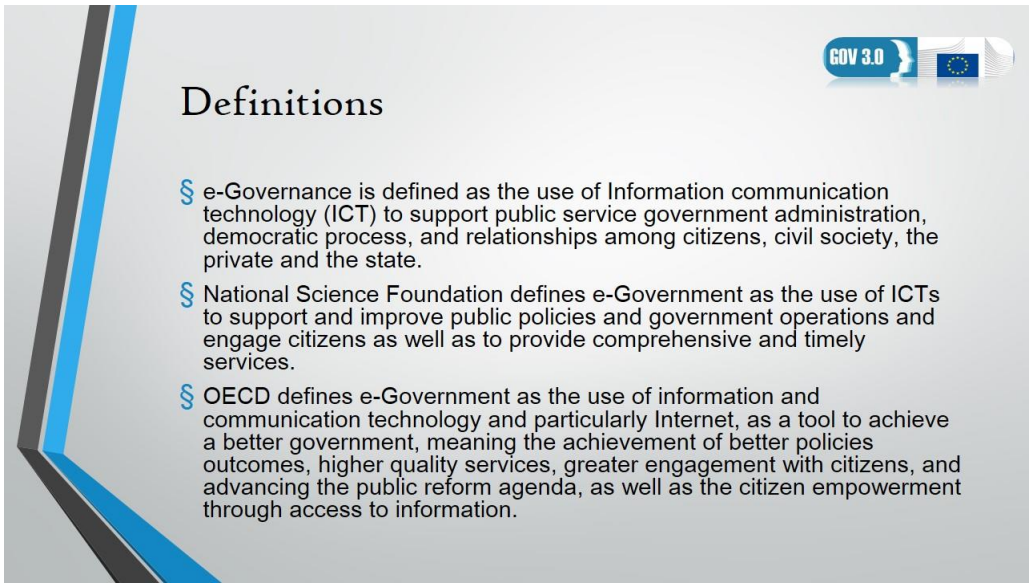
Heeks, R., Davies, A.: Different approaches to information reform. In: Heeks, R. (ed.) Reinventing Government in the Information Age: IT Enabled Public Sector Reform, Routledge, London, pp. 22–48 (1999)

3.1.1.2 MOOC

Hello, I am Dimitris Sarantis, I am a Postdoctoral Fellow at the Operating Unit on Policy-Driven Electronic Governance at the United Nations University in Guimaraes, Portugal.

In my presentation, I will introduce you to e-Government, and I will present the basic principles of Information Society. e-Governance is defined as the use of Information communication technology (ICT) to support public service government administration, democratic process, and relationships among citizens, civil society, the private and the state.

Co-funded by the Erasmus+ Programme of the European Union



What does e-Governance mean to citizens?

It means using ICTs to deliver quick and interactive public services for citizens, achieving productivity gains in the public administration and cutting the red tape of enterprises. But e-Governance goes beyond services delivery. Transparent and interactive administration bring citizens closer to the government. Participation in the democratic process is stimulated.

More philosophically, this means that e-Government includes two complementary aspects for citizens. On the one hand, we are seen as well-informed and better-served citizens. On the other hand, we are regarded as participative citizens. e-Democracy is thus a natural part of the e-Government strategy. In essence, it implies putting the citizen at the heart of government. Placing citizens and businesses at the center. This way is challenging the public sector to innovate. e-Governance is, therefore, a driver for change in administrations back-offices.

e-Governance requires the proper transformation of the administrative organization in the aspects of setting organization objectives, such as organizational planning, structures, rules, government staff, and technology support.

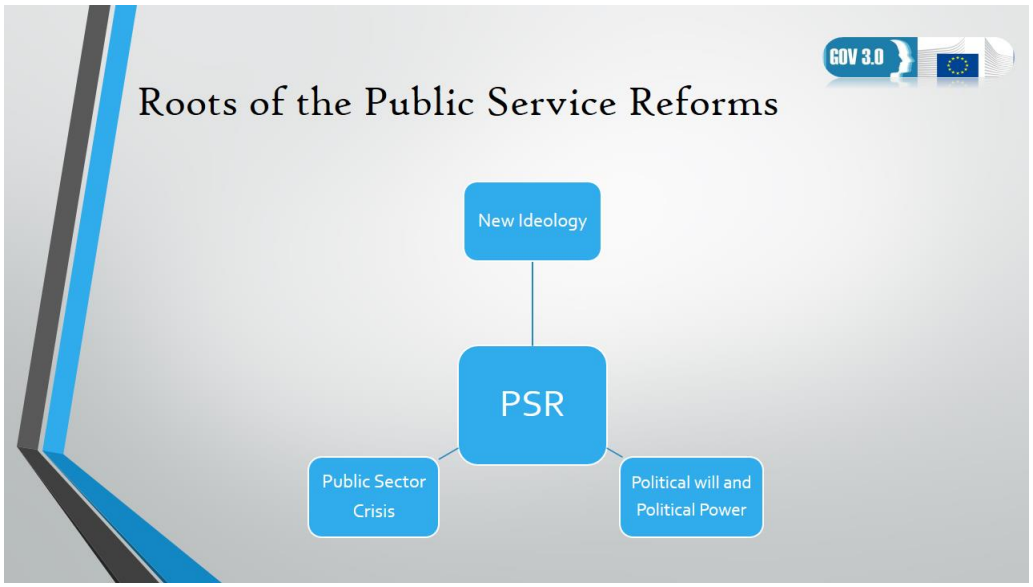
What is e-Government?

Two definitions help us to understand better the e-Government concept.

National Science Foundation defines it as the use of ICTs to support and improve public policies and government operations and engage citizens as well as to provide comprehensive and timely services.

OECD defines it as the use of information and communication technology and particularly Internet, as a tool to achieve a better government, meaning the achievement of better policies outcomes, higher quality services, greater engagement with citizens, and advancing the public reform agenda, as well as the citizen empowerment through access to information.

Co-funded by the Erasmus+ Programme of the European Union



But e-Government is not coming alone. It appears because of the need for Public Sector Reform. Public Sector Crisis, New Ideology and Political Will, and Political Power are three of the primary roots of the Public Sector Reform.

Public Sector Crisis may results from unsustainable public expenditure. Governments search for effective policies to encounter growing costs and fiscal pressures. Processing problems like public money waste, delays, mismanagement and corruption within the public sector are exacerbating this situation. In such cases, public decisions taken are not aligned with citizens' interests. As an output public sector does not deliver what it is expected and finally it fails.

New ideology is another root of e-Government. Neo-liberal thinking proposes a government reform which will help markets to function more effectively and efficiently. State institutions should be opened up to actual market forces of competition, and their operation should be as similar as possible to private sector.

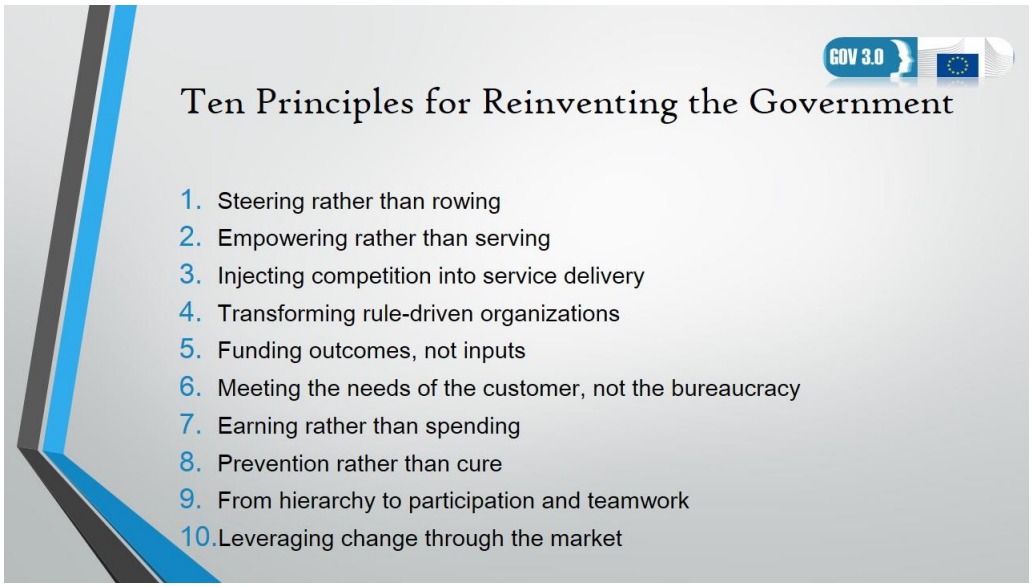
A "sense of crisis" and a "new ideology" are necessary, but not sufficient conditions to induce the reform. Political will and power to enact reform are also mandatory. Citizens, politicians and public servants are essential ingredients to government transformation, even though in some cases they don't have the same targets. Local and global capital requested for operational and business cost reduction and international organizations pressing for reform, motivate the transformation.

e-Government transformation attempts to address specific aims. In order to increase efficiency, e-Government transformation reduces public sector expenditures and process inefficiencies. Decentralization of decision-making might help to reduce costs and improve flexibility and responsiveness of decision making.

Greater use of information and communications technology and e-Government can increase governmental transparency. This, in turn, may invite citizen participation, foster e-Governance, and facilitate e-Democracy. Transparency is a measure that contributes to a better administration of public work and open government, where public information is communicated to the public. Finally, better transparency means less corruption and improved accountability. e-Government systems improve human resource management as well as budgeting and dealing with citizens.

Restructuring processes, enables public enterprises to work as market-oriented firms by changing the legal environment in which they operate. This is achieved through organizational restructuring of management (corporatization), decentralization and in some cases partial privatization.

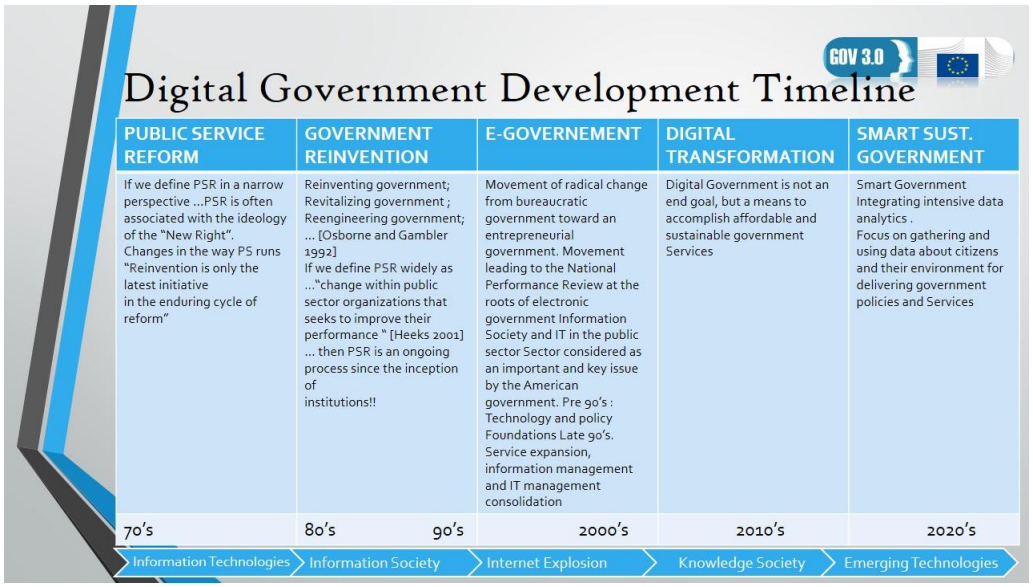
Co-funded by the Erasmus+ Programme of the European Union



According to Osborne and Gaeble, tall, sluggish, over-centralized, and preoccupied with rules and regulations government designs don't work well. "We designed public agencies to protect the public against politicians and bureaucrats gaining too much power or misusing public money. In making it difficult to steal the public's money, we made it virtually impossible to manage the public's money. In attempting to control virtually everything, we became so obsessed with dictating how things should be done - regulating the process, controlling the inputs - that we ignored the outcomes, the results. Osborn and Gaebler recommend Entrepreneurial Government", government that can - and must - compete with for-profit businesses, nonprofit agencies, and other units of government. They recommend the following ten principles of reinvention:

1. Catalytic Government (steering rather than rowing)
2. Community-owned Government (empowering rather than serving)
3. Competitive Government (injecting competition into service delivery)
4. Mission-driven Government (transforming rule-driven organizations)
5. Results-oriented Government (funding outcomes, not inputs)
6. Customer-driven Government (meeting the needs of the customer, not the bureaucracy)
7. Enterprising Government (earning rather than spending)
8. Anticipatory Government (prevention rather than cure)
9. Decentralized Government (from hierarchy to participation and teamwork)
10. Market-oriented Government (leveraging change through the market)

Co-funded by the Erasmus+ Programme of the European Union



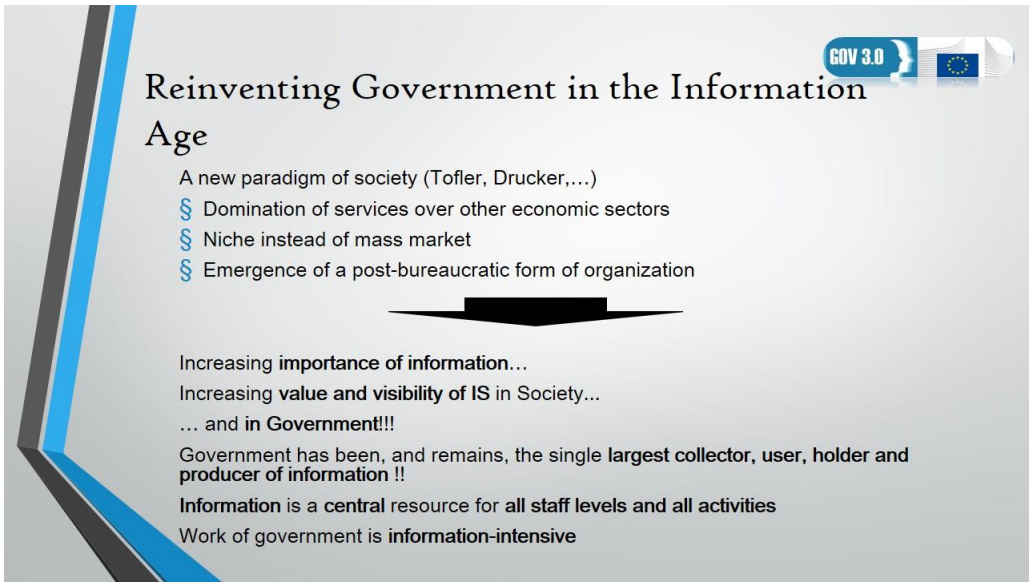
We could claim that digital government has been developed and evolved over the past decades. If we define Public Sector Reform in a narrow perspective it is often associated with the ideology of the "New Right". Changes in the way public sector runs "Reinvention is only the latest initiative in the enduring cycle of reform".

During 80s, the concept of government reinvention appears. According to Heeks, we can define Public Sector Reform (PSR) widely as "a change within public sector organizations that seeks to improve their performance", in this way PSR is an ongoing process since the inception of institutions.

Between the 90s and 2000s, e-Government concept dominates, as a movement of radical change from bureaucratic government towards an entrepreneurial government. Technology and policy foundations prevail in the early 90s and service expansion, information management and IT management consolidation dominate in late 90s.

Digital Transformation appears in 2010, defining Digital Government not as an end goal, but as a mean to accomplish affordable and sustainable government services.

In 2020s, with the emergence of the new technologies, smart sustainable government integrates intensive data analytics. It focuses on gathering and using data about citizens and their environment for delivering government policies and services.

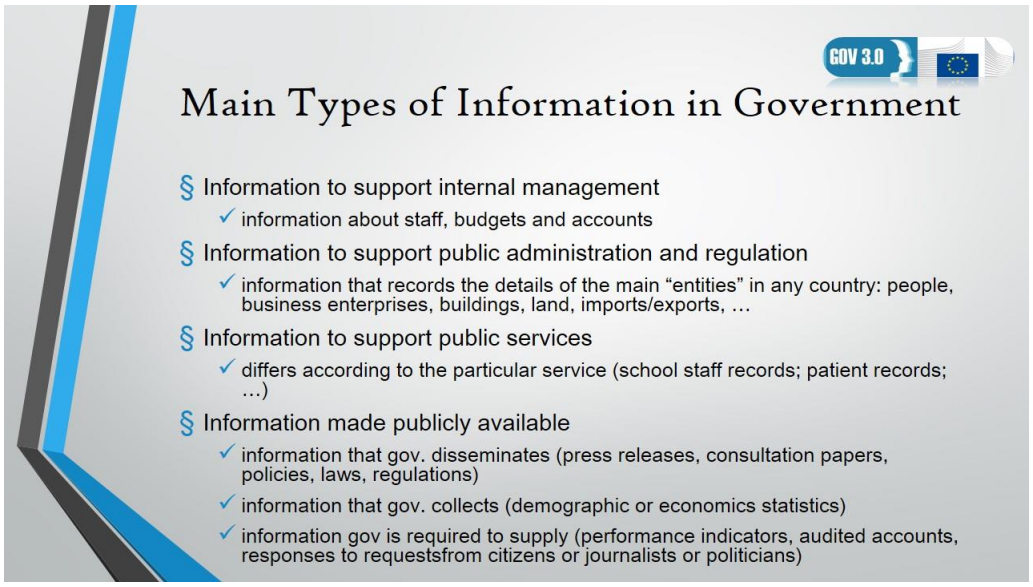


A new paradigm of society can be applied to reinvent government in the information age. As Alvin Toffler stated: "The illiterate of the 21st century are not those who can't read or write, but those who refuse to learn, re-learn and learn again".

Co-funded by the Erasmus+ Programme of the European Union

On the same wave length, Peter Drucker said: “In a fast-changing world, what worked yesterday probably doesn't work today’. One of the fathers of modern management theory herein argues that much of what is now taught and believed about the practice of management is either wrong or seriously out of date.

Domination of services over other economic sectors, niche instead of mass market and emergence of a post-bureaucratic form of organization, are the basic characteristics of this new paradigm.



In modern government importance of information has been drastically increased as well the value and visibility of information systems in society and within public administration. Government has been, and remains, the single largest collector, user, holder and producer of information.

We can classify information in government areas in four types.

The first type is the information to support internal management, information about staff, budgets and accounts. The efficiency and efficacy of processes are enhanced by the use of online communication and cooperation which allows for the sharing of databases and resources and the fusion of skills and capabilities. It renders information regarding compensation and benefit policies, training and learning opportunities, and civil rights laws in a readily accessible manner.

The second type is information to support public administration and regulation, information that records the details of the main “entities” in any country: people, business enterprises, buildings, land, imports/exports, etc. Public administration conducts business with natural persons, legal entities and entrepreneurs. Therefore, the data entities natural person, legal entity and entrepreneur are considered to be crucial. Another important type of data is spatial information localizing various object types, such as real estate, addresses, etc. Such data is registered in public administration basic registers: Natural persons register – natural persons; Legal entities and entrepreneurs register – legal entities and entrepreneurs; Spatial information register – spatial information defined in directive INSPIRE 2007/2/EC29.

The third type is information to support public services. This information differs according to the particular service, for example, school staff records and patient records.

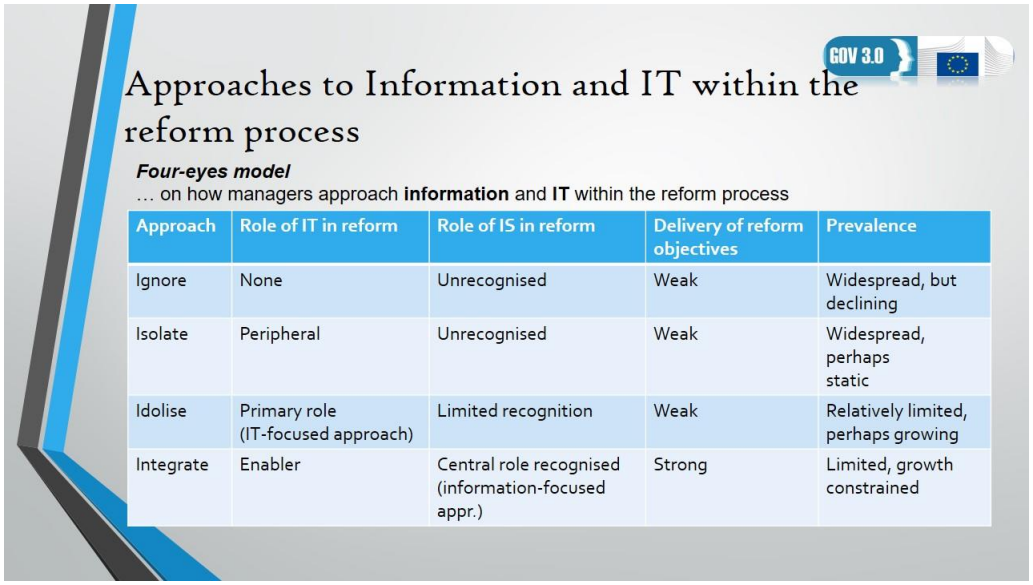
Finally, information that is made publicly available, like press releases, consultation papers, policies, laws, regulations, information that government collects, like demographics or economics statistics and information that government is required to supply, like performance indicators, audited accounts and responses to requests from citizens or journalists or politicians.

Information technology may have different roles in digital transformation. It may automate existing human-executed processes, it may assist existing human-executed processes, or it may create new IT-executed processes.

Co-funded by the Erasmus+ Programme of the European Union

Looking at the main benefits of IT use to the reform process; it is cheaper since the same thing is produced at a lower total cost; it is more productive since more is produced at the same total cost; it is quicker, since the same thing at the same total cost is produced but in less time, it is better, since the same thing at the same cost in the same time is produced but to a higher quality standard and finally it is more innovative since new outputs are produced.

Information is a fundamental constituent of nearly every activity in a public organization, so much, that its function has become transparent. Without a firm grasp of how it creates, transforms and uses information, a public organization would lack the coherent vision to manage and integrate its information processes. While it is also factual that most of the organizations rely on several different information technologies to support their information processes, managers may be aware that there is also a large amount of information and knowledge that is not captured by or represented for example in computer-based information systems.



Approach	Role of IT in reform	Role of IS in reform	Delivery of reform objectives	Prevalence
Ignore	None	Unrecognised	Weak	Widespread, but declining
Isolate	Peripheral	Unrecognised	Weak	Widespread, perhaps static
Idolise	Primary role (IT-focused approach)	Limited recognition	Weak	Relatively limited, perhaps growing
Integrate	Enabler	Central role recognised (information-focused appr.)	Strong	Limited, growth constrained

In this regard, managers in particular should make decisions and choices about their potential future operations appropriately. Consequently, managers should decide how to approach information and IT within the reform process. What may be considered necessary in each case? In such situations managers must use their accumulated knowledge and expertise to evaluate and deduce imperfect information in choosing the best course of action in the light of their organizational objectives. In most of the organizations such decisions made by the managers will be supported by information of varying degrees of accuracy and usefulness gleaned from the organization's information systems.

Classifying the possible managerial approaches on how managers approach information and IT within the reform process we could say that the first one is to ignore it. They believe that IT has no role in reform, a belief which is widespread but declining. Public officials, politicians and managers lack IT awareness and skills and they are reluctant to discuss and support reforms that involve IT. They consider IT as a costly and risky mechanism which is prone to failure. The second approach, the isolated one, where information technology is assigned a peripheral role in the government reform and information systems role is not recognized, is a wide spread and static belief. In the third approach, the idolize one, IT has a primary role and information systems have limited recognition. The prevalence of this approach is relatively limited but perhaps growing. IT appears as a reform solution and success cases are advertised. There is a pressure from other external institutions which have already implemented relative successful initiatives.

The integrate approach considers information technology as an enabler and assigns a central role in information systems. They contribute significantly in the reform process. The prevalence of this approach is limited with a constrained growth. Existence of legacy systems constitute technical barriers. In some cases the amount of money already invested is a deterrent factor since it leads to the reinforcement of the existing vertical and horizontal organizational boundaries. Lack of information-related skills and outdated, inconsistent and incoherent data are additional issues which have to be resolved.

Co-funded by the Erasmus+ Programme of the European Union

3.1.2 Module 2: Digital Government and Service Innovation

Compiled by Dr. Noella Edelmann, Danube University Krems (Austria)

3.1.2.1 Reader

Introduction

The consulting company McKinsey recommends knowing exactly what digital means:

"*Even as CEOs push forward with their digital agendas, it's worth pausing to clarify vocabulary and sharpen language. Business leaders must have a clear and common understanding of exactly what digital means to them and, as a result, what it means to their business (…).*"[1]

"Digital" actually means encoding information in binary symbols and transmitting it across connected devices, and the word actually comes from the Latin "digitus", it means „finger". The word "digital" is used to describe a certain group of people (e.g. digital natives), society (digital society), country (digital nation), way of governing a country (digital government) or way of doing things (digitalizing), but it also tells us about technological innovations, including smart homes, drones, wearable technology, the Internet of things, implants, robots and that our lives may be changing fundamentally.

McKinsey adds:

"It's tempting to look for simple definitions, but to be meaningful and sustainable, we believe that digital should be seen less as a thing and more a way of doing things. To help make this definition more concrete, we've broken it down into three attributes: creating value at the new frontiers of the business world, creating value in the processes that execute a vision of customer experiences, and building foundational capabilities that support the entire structure."[2]

Here we consider the key concepts digital government and service innovation and address some relevant dimensions such as the social aspects of digital government transformation, co-production, and transparency.

Contents

Social media technologies are understood as those internet-based technologies such as "*digital platforms, services and apps built around the convergence of content sharing, public communication, and interpersonal connection*" (Burgess, Marwick, & Poell, 2017 p.1) that allow users to "*easily create, edit, evaluate, and/or link to content or other creators of content*" (Kaplan & Haenlein, 2010; p. 61) or "*facilitate interactions between users by providing them with opportunities to share information, opinions, and interests*" (Khan, Swar, & Lee, 2014 p.607). Web 2.0, social media and digital networks represent some of the current societal trends, along with others such as the consumerization of information and communications technology, the empowerment of consumers, the move from hierarchical to network-based forms of organizations, demographic changes, the rise of the knowledge worker, the importance of creativity, innovation and informal learning (Serrat, 2017).

In social terms, the concept "digital" is frequently discussed and hotly debated, for example: what is the difference between "digital/virtual" and real? Can these be distinguished? Is there a need to distinguish between them when talking to others? Should activities be distinguished according to whether they are digital or not?[3] According to Sonia Livingstone[4] many argue that the answer is 'yes', that there is a difference and the quality of our experiences with media is changing. She adds that our experiences are based on and represent important changes in the business of media, companies' business models, customer relations and the data collected about us.

The widespread proliferation of the new Information and Communication Technologies (ICT) has spurred organizations across all sectors to develop strategies to harness and exploit the benefits that these new tools bring to manufacturing, service delivery, customer relations, and human resource development. These strategies usually involve the explicit transformation of key business operations so as to have an impact on product development, internal workflow processes,

[1] https://www.mckinsey.com/industries/high-tech/our-insights/what-digital-really-means
[2] ibid
[3] https://blogs.lse.ac.uk/parenting4digitalfuture/2015/05/26/why-label-our-time-and-life-digital/
[4] ibid

organizational structures, as well as core company values and concepts. In the business context, Berman (2012) contends that digital transformation strategies in the private sector can be summarized as:

- A redefinition of the customer value proposition: through the application of information and analytics, organizations can reshape the customer value proposition by enhancing, extending or redefining the value of the customer experience;
- A reshaping of the business and operating model: to build on existing infrastructure and add new digital capabilities;
- A combination of those two approaches: by simultaneously transforming the customer value proposition and organizing operations for delivery.
- Matt, Hess, and Benlian (2015) identify four dimensions or elements that digital transformation strategies have in common, independent of industry or firm. These are:
- The use of technologies, pertaining to changes in the attitude of the organization towards technology, the technologies finally adopted and adapted, and the ability of the organization to exploit the characteristics of the chosen technology;
- The changes accruing to value creation, pertaining to the expected and actual impact of digital technology strategies on value chains, how new digital activities deviate from core business models, and what the outcome could be;
- Changes in organizational structure, pertaining to the variations occurring within a firm's organizational set-up necessitated by the incorporation of new digital technologies and related activities;
- A consideration of the financial aspects driving transformation, and the ability of a firm to finance the adoption of new technologies, especially in the face of changing business models and internal structural readjustments.

At the same time, the availability of digital tools and the digital transformation of organizations outside the public sector are changing citizen's expectations of governments' ability to deliver high-value and real-time digital services.

Digital Government

The US National Performance Review (1993)[5] "*focused on how government should work, not on what it should do*"[6] and has evolved to reflect how government find solutions to social, economic, political and other problems and how they transform themselves (Janowski, 2015). Governments aim to transform public administration in order to adapt to the changing environment and address societal challenges, and, although management changes are underway, some visions of what digital government may achieve seem over-optimistic as they hope that bureaucracy will be banished or that the "virtual state" will be the outcome (Dunleavy, Margetts, Bastow, & Tinkler, 2006).

Digital government concerns the use of information technology to improve government operations and the service offered to citizens. It is widely recognized that the new technologies "*…have the potential to significantly transform the way in which governments perform their functions and relate to citizens, businesses, and other governments*" (Luna-Reyes & Gil-Garcia, 2014 p. 546). The advent of the Internet and pervasive personal computing has encouraged public bodies worldwide to transform their internal workflow processes, modes of service delivery, and channels of communication with their stakeholders using technology as a central tool. In other words, the digital transformation of government is the application of ICTs to make changes to institutional structures, organizational arrangements and internal workflow processes (Weerakkody, Omar, El-Haddadeh, & Al-Busaidy, 2016) and by transforming the external relationships between governments and other political, economic and social actors (Luna-Reyes & Gil-Garcia, 2014).

Thus government's use of information technology on the one hand aim to create public value by achieving organizational change, improving service delivery to citizens, understanding users' needs (Luna-Reyes & Gil-Garcia, 2014) and on the other hand, to increase governments' responsiveness and openness (Lindgren & van Veenstra, 2018). Other objectives can be a reduction of costs, the development of (better) policies, increasing efficiency and effectivity. Furthermore, Lindgren and van Veenstra (2018) suggest that ICTs can be employed to:

- To sustain multiple or even shifting public values;

[5] https://govinfo.library.unt.edu/npr/library/nprrpt/annrpt/redtpe93/2342.html
[6] https://govinfo.library.unt.edu/npr/library/papers/bkgrd/brief.html

Co-funded by the Erasmus+ Programme of the European Union

- Support collaboration in networks;
- Ensure public accountability;
- Ensure enabling mechanisms;
- Involve different stakeholders (especially users, through co-creation)
- Support agile development;
- Increase transparency and openness;

Given the large, complex societal problems governments face, problems that can no longer be resolved by governments on their own, the use of digital tools must be able to support government collaboration with external and internal users, and other organizations (Lindgren & van Veenstra, 2018; Luna-Reyes & Gil-Garcia, 2014), that is, to achieve a collaborative governance based on partnerships, collective action and coproduction (Linders, 2012).

It is clear that ICTs and changes based on technology will have a major impact on public administration and governments, leading to *"''digital-era governance''(DEG), which involves reintegrating functions into the governmental sphere, adopting holistic and needs-oriented structures, and progressing digitalization of administrative processes"* (Dunleavy et al., 2006 p. 467). (Dunleavy et al., 2006) explain that the use of technologies such as the internet and web-based processes involves the redesign of back- office functions, procurement concentration and specialization, network simplification, streamlining regulatory overviews and avoiding "balkanized" policy areas At the same, the internet and internet-based applications are to allow citizens, businesses, and other civil society actors to access and to connect directly to state systems whilst at the same time ensuring backup and help-desk systems. But in order to achieve this transformation, a cultural shift in the organization is necessary for technology to make a difference (Serrat, 2017). Therefore, the internet, e-mail, and the Web and IT systems certainly play a role in back-office processes and management systems, between government agencies and civil society, in the interaction with citizens, but should not do so in a technologically deterministic manner, rather, *"via a wide range of cognitive, behavioral, organizational, political, and cultural changes that are linked to information systems"* (Dunleavy et al., 2006 p.468). Typical DEG activities are government agency mergers, cohesive agencies, a reduction of quasi-governmental agencies, cooperative and community-based structures, and taking the responsibility for activities that had been outsourced to the private sector. The use of IT supports "*a transition to fully digital modes of operating for many government sector agencies"* (Dunleavy et al., 2006 p.478) but technological determinism can be avoided by having a wide focus that includes the following dimensions:

1. Reintegrating the elements and public services that NPM had split into separate hierarchies and offloaded onto citizens and other civil society actors;
2. Holistic reforms based on needs and that simplify and change the relationship between government agencies and their clients based on larger administrative blocks, re-engineered processes, and the development of a more agile government that can respond quickly to changes in the social environment;
3. Digitization changes to help achieve productivity gains by ensuring that electronic channels are not just supplementary to conventional administrative and business processes, but are used to transform the government agency

Dunleavy et al make that clear that although IT is central to the changes in public management, these changes also have indirect effects inside the government sector, the way society handles information and sets norms, but at the same time, external factors will impact government. According to Dunleavy et al, DEG "*offers a perhaps unique opportunity to create self-sustaining change, in a broad range of closely connected technological, organizational, cultural, and social effects"*(p. 467), it *"highlights the central role that IT and information system changes now play in a wide-ranging series of alterations to how public services are organized as business processes and delivered to citizens or customers*" (p.468).

The public sector certainly is moving away from old management practices (such as New Public Management) and moving towards Digital Era Governance (Dunleavy et al., 2006). It is necessary to make use of the digital opportunities and resources and the Tallinn Declaration[7] (signed 6 October 2017 by all the European Union Member States and EFTA countries) states:

[7] https://ec.europa.eu/digital-single-market/en/news/ministerial-declaration-egovernment-tallinn-declaration

Co-funded by the Erasmus+ Programme of the European Union

"*digital progress is transforming our societies and economies to the core, challenging the effectiveness of previously developed policies in a broad range of areas as well as the role and function of the public administration overall. It is our duty to anticipate and manage these challenges to meet the needs and expectations of citizens and businesses." (p.2).* Siim Sikkut (CIO of Estonia) makes clear that digital governments are possible and that they work: following Estonia's 20 years of experience, the country continues to aim to improve policy, the way the country is governed, the way services are delivered.[8] Experiences gained so far in Estonia can help other countries, but as technology moves ahead, governments need to get together and agree on the next steps. The Tallinn Declaration can be seen as an action plan that encourages governments to move forward, provide digital services that are seamless, secure, open, transparent and interoperable. As Sikkut argue, the challenge is, of course, implementation; but it is also necessary to support the generation of new ideas, experimentation and the results gained, and finally, to share the ideas and results with others.

The Role of Technology and Digital Tools in Digital Government

Social media may originally have been seen as and used for entertainment and youth activities, driven mainly by innovative citizen use, but the popularity of social networking sites has significantly contributed to new forms of open collaboration, alternative forms of innovation creation and to a change in business models and industries (Ines Mergel, 2014; 2015). According to Serrat (2017) social media should be used in the public sector for several reasons: first of all, the public sector bears social responsibility for embracing change, and in turn, social media will be used to evaluate the public sector; secondly, the applications offer opportunities to achieve user-oriented, transparent, accountable, participative, inclusive, responsive, joined-up, networked, and efficient government; and thirdly, public sector organizations must meet people where they are, which, increasingly, is online. Ines Mergel (2014) suggests that a change of paradigm in public administrations can be seen, moving from a "need-to-know" to a "need-to-share" information (p.64), a paradigm that includes dimensions such as openness, conversations, inclusion, co-creation, and real-time feedback cycles. Mergel points out that enhancing such information flows means ensuring that:

- Individuals have access (rights) to existing information;
- Individuals are able to participate in the creation of information and knowledge;
- Individuals are able to archive and search for content.
- In order for individuals to be able to access this information and content means that digital governments must consider the role of transparency.

Criado and Rojas-Martín (2016) see social media in the public sector as helping to overcome hierarchies and bureaucracy by increasing the relational capital of public organizations, impacting the legitimacy of public action by meeting the needs of citizens, involving citizens in public decision-making processes, and achieving transparency and openness. The characteristics of social media, such as interactivity, immediate feedback, ubiquity[9] are seen as supporting collaboration, co-creation, and re-shaping the relationship between government and other stakeholders (Criado & Rojas-Martín, 2016; Knox, 2016; Ines Mergel, 2016), increasing the smartness of public action (J. C. Bertot, Jaeger, & Grimes, 2010), helping the public sector find *"innovative new ways to deliver public value"* (Linders, 2012 p.446) and to *"increase participation, transparency, and interagency collaboration in the public sector"* (Ines Mergel, 2014 p.33). European governments, for example the UK,[10] Austria,[11] but also at the meta-government level, the European Commission,[12] advocate the use of social media in government and public administrations and develop guidelines for their staff to use - this highlights their recognition of how social media is increasingly part of (modern) life, and that governments should not miss the opportunities afforded by social media.

The Role of Transparency

[8] https://www.youtube.com/watch?time_continue=1&v=l9AG0-f9vbs
[9] https://blogs.lse.ac.uk/parenting4digitalfuture/2015/05/26/why-label-our-time-and-life-digital/
[10] https://www.gov.uk/guidance/social-media-playbook
[11] https://www.ref.gv.at/fileadmin/user_upload/Soziale_Medien_Leitfaden_1-0_20180129.pdf
[12] http://ec.europa.eu/ipg/go_live/web2_0/index_en.htm

Co-funded by the Erasmus+ Programme of the European Union

Open, transparent, and accountable government is not a new concept, it represents the basis of an informed citizenry. According to Alexander Trechsel (in Edelmann, Parycek, Krimmer, Buchsbaum, & Pieber, 2018) advances in social media, data analytics, coding, citizen engagement approaches, open and big data, and citizens' demands all lead to an unprecedented open government context that is increasingly ongoing, interactive, and based on an iterative transparency cycle between the public and governments. Access to information is central in a digital world, and citizens have both the right and means to access information, in particular their own (as set out in the General Data Protection Regulations).[13] The emergence and proliferation of digital tools and the digital transformation of organizations has led to several initiatives, reforms and new principles, such as Open Data and Open Governance (e.g. the Open Government Partnership).[14] If digital transparency is guaranteed and enabled from the top, citizens can participate in public processes. As mentioned by Ines Mergel (2014), data made accessible to citizens allows them to work with the data, enrich, enhance and also control them.

Openness, however, requires that governments establish a range of approaches, processes, infrastructure, and policies to ensure that citizens, civil society, and others have access to government information data today and in future too. Governments must move on beyond simply posting documents on government websites towards the proactive dissemination of information, government activities, decisions and deliberations in multiple formats using multiple channels so as to ensure that citizens are aware of what their governments are doing (J. Bertot, Estevez, & Janowski, 2016). There are several barriers to openness and transparency though, often these barriers are created by the institutions themselves (Rumbul, 2016). Trechsel (see Edelmann et al., 2018) points out that digitalization to ensure transparency not only challenges the administrative culture, it is also expensive and bears risks. It is also associated with the issue of legitimacy: whilst access to general information is not seen as a problem, the storage, the processing and the accessing of personal data by the state and citizens, has raised questions regarding the ownership of data and privacy.

Transparency and allowing citizens access to large amounts of data or information may not always be the best solution. Citizens cannot read all the information available in order to understand how this relates to one's own (e.g. political) views and information overload is known to have detrimental effects. In some cases, ensuring access to data and transparency may even be problematic for both governments and the wider public: the format of the information, as well as the timing of the accessibility to the information may represent transparency in some cases, but may be useless, obscure and even dangerous in other cases. In other words, transparency is not just about accessing (more) information, but also about the quality of information, the need for informational shortcuts and tools such as information aggregators.

Service Innovation

Innovation in the public sector is important: "*Innovation in the public sector can help create value for society*" (Serrat, 2017 p.559), and public service requires various forms of innovations that bring together government agencies, businesses, non-profit organizations, universities, citizens and other actors to participate in the provision, consumption and intermediation of public service delivery (J. Bertot et al., 2016). But public sector innovation is not the same as innovation in the private or non-profit sectors: governments are often bureaucratic by design and incremental in their approach to change, are embedded in a legal, regulatory and administrative frameworks that require policy changes in order to implement innovation, frameworks that are understood as impediments to reform, creativity, and entrepreneurship (J. Bertot et al., 2016). Nonetheless, Lindgren and van Veenstra (2018) argue that digital governments can support the development of innovative public digital services in order to address societal issues, support organizational change and development, involve the stakeholders and achieve public value. The transformation of government involves complex, multi-dimensional processes that often require a long period for change to occur, and the digitalization of public services is one of the main means used to achieve this transformation (Lindgren & van Veenstra, 2018).

Innovative digital services can be digitization of existing services that are delivered to end-users using several delivery channels or through multi-service centers and if necessary, adapting the service provision and knowledge to local contexts. Digital public services are routinely produced by the national, state or local governments and delivered to citizens,

[13] https://eugdpr.org/

[14] https://www.opengovpartnership.org/

Co-funded by the Erasmus+ Programme of the European Union

businesses and other organizations (J. Bertot et al., 2016). But service innovation can go beyond the mere digitalization of public services and include innovation in the delivery of services and the development of services that are open, transparent and involve the users (Loeffler & Bovaird, 2018). To avoid technological determinism, it is important to consider service innovations not only the implementation of information technology, as services are to be understood as encounters between providers and users (Radnor, Strokosch, & Osborne, 2018), may involve several stakeholders, and are integrated in processes and workflows, the organization and the legal framework (Lindgren & van Veenstra, 2018).

In addition, service innovation and development is associated with a multitude of challenges, such as understanding the users' needs and expectations, engaging stakeholders in various phases of service development and engaging in contradictory and ambiguous organizational contexts whilst at the same time considering economic and democratic values. Developing digital public services means ensuring the participation of different users (also known as co-creation or co-production, see Voorberg, Bekkers, and Tummers (2015) and also requires an ongoing assessment of what constitutes the public value, from the perspective of the users and the organizations involved. During all stages of public service innovation, Janowski (2015) argues that government organizations are under pressure from various economic, social, political and other external factors, and have to respond to these factors by innovating with the digital technologies available at the time. J. Bertot et al. (2016) therefore suggest that digital public service innovations be evaluated by considering innovative public services along the following dimensions:

- Transparent: Citizens know about service decisions made by government;
- Participatory: Citizens can participate in government decisions;
- Anticipatory: Government initiates service delivery to citizens;
- Personalized: Citizens choose how they wish to receive services;
- Co-created: Government and citizens engage in collaborative service delivery;
- Context-aware: Service providers are aware of the service delivery context;
- Context-smart: Service providers utilize context awareness for better service delivery.

Co-production and Stakeholder Involvement for Innovative Public Digital Services

The transition from standard to innovative provision of digital public service is reflected by the ability of government organizations to engage and interact proactively with citizens and other recipients of electronic public services. In most OECD countries, governments acknowledge the need to move away from being only a provider of services towards developing close partnerships with relevant stakeholders (Löffler, in Edelmann et al., 2018). Stakeholder and user involvement, also known as co-production, denotes a shift from agency-centered to citizen-centered (or business-centered or stakeholder-centered) processes, where citizens or businesses organize their own interactions and outputs with government agencies (Dunleavy et al., 2006). Co-production represents an intensive form of citizen engagement and stakeholder involvement, with a focus on both citizens' voices and actions and new opportunities for effective involvement in public issues. In particular, it has the potential to improve social inclusion by making better use of the strengths, capabilities and assets of service users, communities and professionals working in public services in order to improve outcomes and/or efficiency. For instance, the key ''production'' work for preparing recycled materials for processing is done by citizens and businesses, leaving a simpler and cheaper collection and transport task for the government to complete (Dunleavy et al., 2006), the involvement of citizens in crime prevention (Alford, 2009) or by contributing to information about a crime. Examples of co-production using digital tools are the apps "FixMyStreet" (originally developed for the UK, no worldwide)[15] or the Austrian "Sag's Wien",[16] where citizens can inform the government agency of a problem that needs to be resolved (e.g. a broken lamp on a street, fly-tipping in the area).

In coproduction, public service providers and commissioners can work together with citizens through co-commissioning, which is about deciding together on priority outcomes, co-planning strategies or contributing resources (e.g. through crowdfunding), co-delivery, where stakeholders work together, and co-assessing, that is, evaluating to which degree

[15] https://www.mysociety.org/community/fixmystreet-in-the-uk/

[16] https://www.wien.gv.at/sagswien/

Co-funded by the Erasmus+ Programme of the European Union

priority outcomes and key governance principles have been achieved (Löffler in Edelmann et al., 2018). Co-production though should not be limited to the implementation or evaluation of services but can also contribute to the design of public digital services (Bason, 2018; Heijlen, Crompvoets, Bouckaert, & Chantillon, 2018): users can be involved in co-designing new solutions or new services together. Often there is a discrepancy between what public managers think service users need with what service users themselves state what they want (Willis, Douglas, Dunstan, & Pavey, 2003). Given that "*nobody knows better how services can be improved than the people who use them and the front-line staff who provide them*",[17] it is clear that whilst improved outcomes that stem from the co-production of citizens with public service organizations are important, it is just as important that government agencies commission such co-production initiatives with service users and/or local communities. Digital tools can help to connect people with each other to facilitate collective coproduction, but their implementation too has to be co-designed with service users so that the technologies are tailored to the specific target groups of public policy (Löffler, in Edelmann et al., 2018). The Governance International Co-design Toolkit[18] for example, suggests that this process should start from (user) experiences in order to frame the issue concerned from the user's perspective. This is then followed by exploring, experimenting and evaluating the new solutions. Not all tested solutions will be successful but those seen as being beneficial will be able to evolve.

However, there are several barriers to effective user and community co-production. In general, barriers can include the lack of skills of public managers and frontline staff to collaborate with citizens, a lack of strategic objectives in public stakeholder involvement initiatives, and the lack of adequate evidence of the benefits of co-production (Voorberg et al., 2015). In addition, co-production requires resources from citizens and from the public sector. With digital governments, citizens and businesses will increasingly be able to co-produce outputs using electronic processes, leaving agencies to provide only a facilitating role (Dunleavy et al., 2006). The introduction of digital technology, particularly social media, and engagement techniques such as crowdsourcing can be seen as those resources that help create innovative opportunities for citizen participation, government-citizen interaction and co-production initiatives that allow service users to help themselves (J. Bertot et al., 2016). Associated with this kind participatory innovation is the ability of citizens and governments to engage with one another through digital technology and to move beyond one-way government-to-citizen communication. Increasing the level of co-production is not easy: only if citizens think they can make a difference then they are more likely to engage. The rapid growth of social media (e.g. Twitter) suggests that many citizens believe that this technology increases their ability to make a difference as it allows them to present their views, and, as social media are often used by the general population, it allows for a broader range of participants (Löffler, in Edelmann et al., 2018). At the same time, it also requires the government's capacity to absorb and incorporate citizen feedback into its deliberations and policy-making processes (J. Bertot et al., 2016).

Future Public Service Innovations

Future service innovations in the public sector can be, as described by J. Bertot et al. (2016) anticipatory digital public services, personalized services, context-aware digital public services and context-smart services.

J. Bertot et al. (2016) see anticipatory digital public services as those digital services that are able to anticipate citizen needs. They suggest that the anticipatory element of the service can draw on demographics, life circumstances or other contextual factors and use data sources, data analytics, predictive analysis, but also depends on a relationship between citizens and governments based on trust and the regular sharing of information. Personalized services, according to J. Bertot et al. (2016), refer to those one-on-one digital public services between governments and citizens based on customization, user profiles and authentication. They argue that such services represent the use of e-Commerce models based on user profiles, preferences, and choices.

Context-aware digital public services, sometimes referred to as ubiquitous government, refer to digital services that use applications that are flexible, adaptable, cross-platform, and capable of acting autonomously on behalf of citizens. J. Bertot et al. (2016) suggest that they represent those digital services that sense the user's context (e.g. work, home or vehicle)

[17] http://www.govint.org/co-design/

[18] http://www.govint.org/co-design/

Co-funded by the Erasmus+ Programme of the European Union

and accordingly provide the relevant content and services. They point out that these services rely on a combination of intelligent code and bots, digital, sensors on devices and geo-locations interact with citizens. Context-smart services on the other hand, encompass digital public services that provide actions at the moment they are needed. Here, the authors point out that the difference these services is that context-smart services do not rely only on context-related information only, but use intelligence too.

Conclusion

The transformation of digital government and the development and delivery of innovative public services requires not only the use of digital tools, or the integration and learning across contexts, locations, devices, data sources, governments, industries and services (J. Bertot et al., 2016) but also the transformation of organizations, workflows and processes, the development of policies, structures and other coordinating or governance mechanisms (Lindgren & van Veenstra, 2018) and the involvement of the users, as well as constant evaluation to see whether the set aims are being achieved.

References

Alford, J. (2009). *Engaging public sector clients: from service-delivery to co-production*: Springer.
Bason, C. (2018). *Leading public sector innovation: Co-creating for a better society*: Policy Press.
Berman, S. (2012). Digital transformation: opportunities to create new business models. *Strategy Leadership, 40*(2), 16-24.
Bertot, J., Estevez, E., & Janowski, T. (2016). Universal and contextualized public services: Digital public service innovation framework. In: Elsevier.
Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government information quarterly, 27*(3), 264-271.
Burgess, J., Marwick, A., & Poell, T. (2017). *The SAGE handbook of social media*: Sage.
Criado, J. I., & Rojas-Martín, F. (2016). Adopting social media in the local level of government: Towards a public administration 2.0? In *Social Media and Local Governments* (pp. 135-152): Springer.
Dunleavy, P., Margetts, H., Bastow, S., & Tinkler, J. (2006). New public management is dead—long live digital-era governance. *Journal of public administration research, 16*(3), 467-494.
Edelmann, N., Parycek, P., Krimmer, R., Buchsbaum, T., & Pieber, L. (2018). *Eastern Partnership eDemocracy - Politics in the Digital Age*. Retrieved from Krems, Austria:
Heijlen, R., Crompvoets, J., Bouckaert, G., & Chantillon, M. J. A. S. (2018). Evolving Government Information Processes for Service Delivery: Identifying Types & Impact. *8*(2), 15.
Janowski, T. (2015). Digital government evolution: From transformation to contextualization. In: Elsevier.
Khan, G. F., Swar, B., & Lee, S. K. J. S. S. C. R. (2014). Social media risks and benefits: A public sector perspective. *32*(5), 606-627.
Knox, C. C. (2016). Public administrators' use of social media platforms: Overcoming the legitimacy dilemma? *J Administration Society, 48*(4), 477-496.
Linders, D. (2012). From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Government information quarterly, 29*(4), 446-454.
Lindgren, I., & van Veenstra, A. F. (2018). *Digital government transformation: a case illustrating public e-service development as part of public sector transformation.* Paper presented at the Proceedings of the 19th Annual International Conference on Digital Government Research: Governance in the Data Age.
Loeffler, E., & Bovaird, T. (2018). From participation to co-production: widening and deepening the contributions of citizens to public services and outcomes. In *The Palgrave handbook of public administration and management in Europe* (pp. 403-423): Springer.
Luna-Reyes, L. F., & Gil-Garcia, J. R. (2014). Digital government transformation and internet portals: The co-evolution of technology, organizations, and institutions. *Government information quarterly, 31*(4), 545-555.
Matt, C., Hess, T., & Benlian, A. (2015). Digital transformation strategies. *J Business Information Systems Engineering, 57*(5), 339-343.
Mergel, I. (2014). *Social media adoption: Toward a representative, responsive or interactive government?* Paper presented at the Proceedings of the 15th Annual International Conference on Digital Government Research.

Co-funded by the Erasmus+ Programme of the European Union

Mergel, I. (2015). Open collaboration in the public sector: The case of social coding on GitHub. *Government information quarterly, 32*(4), 464-472.
Mergel, I. (2016). Social media institutionalization in the US federal government. *Government information quarterly, 33*(1), 142-148.
Radnor, Z., Strokosch, K., & Osborne, S. P. (2018). Co-Production and the Co-Creation of Value in Public Services: A Perspective from Service Management 1. In *Co-Production and Co-Creation* (pp. 18-26): Routledge.
Rumbul, R. (2016). Developing transparency through digital means? Examining institutional responses to civic technology in Latin America. *JeDEM-eJournal of eDemocracy Open Government, 8*(3), 12-31.
Serrat, O. (2017). Innovation in the public sector. In *Knowledge Solutions* (pp. 559-568): Springer.
Voorberg, W. H., Bekkers, V. J., & Tummers, L. G. J. P. M. R. (2015). A systematic review of co-creation and co-production: Embarking on the social innovation journey. *17*(9), 1333-1357.
Weerakkody, V., Omar, A., El-Haddadeh, R., & Al-Busaidy, M. J. G. I. Q. (2016). Digitally-enabled service transformation in the public sector: the lure of institutional pressure and strategic response towards change. *33*(4), 658-668.
Willis, M. H., Douglas, G. G. A., Dunstan, E., & Pavey, S. (2003). *Evaluation of Pocklington day services in the West Midlands: Final Research Report for Thomas Pocklington Trust*. Retrieved from Birmingham:

3.1.2.2 MOOC

Hello, I am Noella Edelmann, I am a senior scientist at the Department for E-Governance and Public Administration at the Danube University in Krems, Austria.
In this MOOC I would like to focus on digital government and service innovation, in particular what they mean and some important social aspects or implications that I think are important and need to be considered

Web 2.0, social media and networks are some of the current societal trends. Social media technologies are the internet-based technologies such as digital platforms, services and apps that we use to communicate, interact, to share content and do other interesting things.

The word “digital” can be used to describe a certain group of people (such as digital natives), a society or country, but also a way of governing a country or the way we do something. It tells us something about technological innovations, such as smart homes, drones, wearable technology, the Internet of things, robots and that our lives are changing fundamentally.

The consulting company McKinsey recommends knowing exactly what digital means – let me quote them: “It’s tempting to look for simple definitions, but to be meaningful and sustainable, we believe that digital should be seen less as a thing and more a way of doing things. To help make this definition more concrete, we’ve broken it down into three attributes: creating

Co-funded by the Erasmus+ Programme of the European Union

value at the new frontiers of the business world, creating value in the processes that execute a vision of customer experiences, and building foundational capabilities that support the entire structure."

So the key words in this definition are creating value, customer experiences and capabilities. As we will see in this MOOC, these are important dimensions in digital government and service innovation too.

Organizations across all sectors develop and use strategies to exploit the benefits of digital tools. Four dimensions are seen as important:

First, the use of technologies. This is seen as the implementation of technologies, the attitude towards them and the organization's ability to use the characteristics of the technology chosen;

Secondly, to create value. This is about deciding the value the technology is expected to create and how the use of technology changes an organization's main business model.

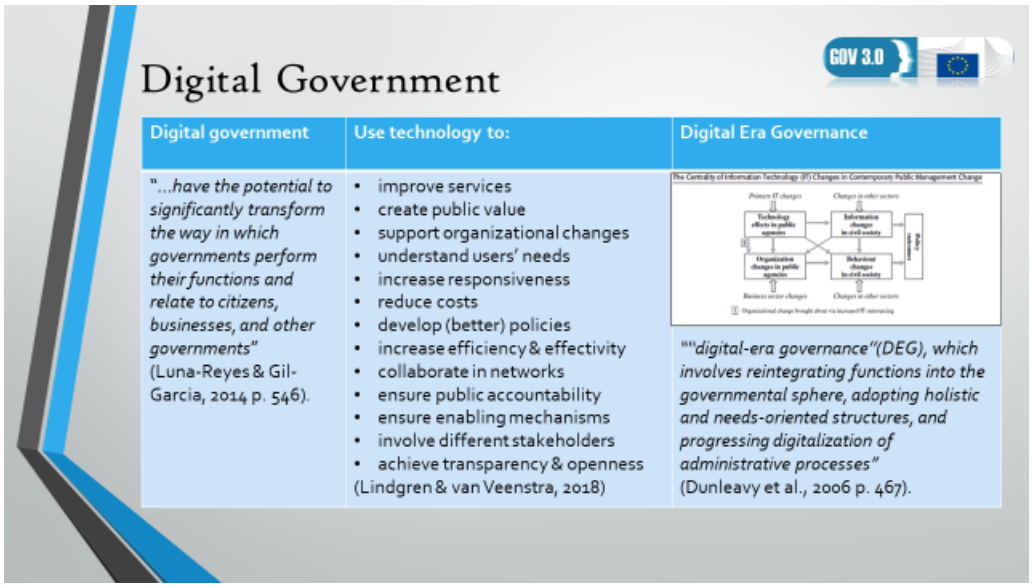
A third dimension is that the use of digital technology may lead to a change in the organizational structure and the way activities are carried out.

Finally, it is important to consider the financial aspects. The organization has to consider whether they can finance the technology and what other financial impacts the implementation of such technology has on the organization.

What is interesting to see is that the digital tools that we use every day change our expectations about the public sector, how public services are provided and how these are developed.

Governments are responding to our expectations and are trying to adapt to the changes in the environment. Some think that we can use digital technology to abolish bureaucracy and have a virtual state, but this may be over-optimistic.

Co-funded by the Erasmus+ Programme of the European Union



The idea of a digital government began in 1993 under the Clinton presidency. This was called the National Performance Review and it described how government "should work" rather than "what it should do". Digital government is about using information technology to improve government operations, to make changes both inside and outside the government. The overall aim of a digital government is to create public value by being more efficient and effective, and to reduce costs and there are of course several ways to achieve this. Digital technologies are used to help reach these goals. So digital tools are used to help transform the organization, the ways things are done inside the organization, the relationships between the government and others, as a way to know and understand the users, to be more accessible or more transparent.

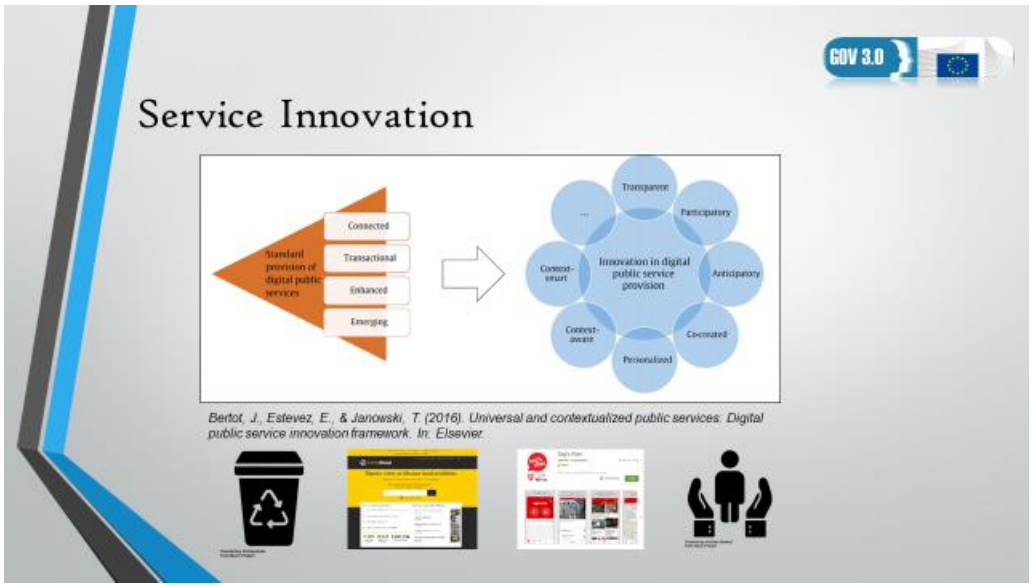
So on the one side, governments look at how to use technology to perform their operations, improve their processes and workflows and the services offered. This can help to reduce costs, develop better policies, to be more efficient and effective. On the other side, it is about governments interacting with the staff inside government agencies, between agencies, with citizens and others outside the organization. This interaction is important as the people working inside the organization know how to do things. But interaction with others, for example citizens who are outside the organization is also important as they know what they need and may be able to contribute knowledge to help improve the organization and the services offered.

Technology can be used to sustain public values, to collaborate in networks, ensure accountability, involve stakeholders and users, make the organization agile and responsive, be transparent and open.

Dunleavy calls this 'digital-era governance' 'but we have to be careful not to fall into the trap of technological determinism. We need to remember that digital tools can be useful, but change can only occur by changing the culture or the social aspects. Digital technology certainly plays a central role, but digital government also requires a change in legal frameworks and the environment so that new activities are possible. For example, digital technology can help make an organization more transparent by providing the outlet or platform to access the documents, but the tools will not make a government more transparent if people are unable to read the materials or are not allowed to look at them.

The idea of an open and transparent government is nothing new, but in order to implement digital transparency citizens must be able to participate in the process. Governments have to ensure processes, infrastructure and policies that grant access to the information. At the same allowing citizens access to large amounts of data or information may not always be the best solution and in some cases it may even be dangerous.

Co-funded by the Erasmus+ Programme of the European Union

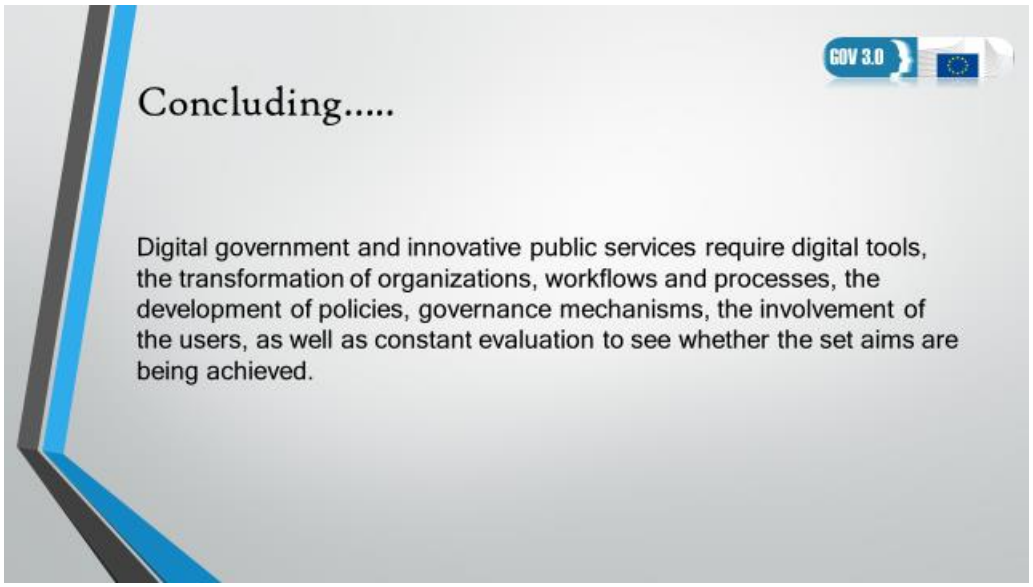


Innovation in the public sector is important but it is not the same as innovation in the private sector. Although governments are embedded in legal and administrative frameworks that require policy changes in order to implement innovations, making changes slower, digital governments can use the technologies to be innovative. Service innovation can mean many things. It can be the digitalization of existing services. It can also be the development of new services. It can also mean a new way of delivering a service. And finally it can be about developing a new service together with the end-users. This last case is called co-production, and I will tell you more about this later.

When thinking about digital technology and new or innovative services, it is important to avoid technological determinism as all public services need to be considered as encounters between the providers and users. So one of the challenges in the development of innovative services is the need to understand users. What service do users need? Public organisations have a lot of knowledge. But sometimes they do not know everything about those who will be using the service. Many governments have understood that they need to move away from a role as being the only one who can provide services. Co-production represents an intensive form of citizen engagement and new opportunities for effective citizen involvement in public issues. It makes use of the strengths, capabilities and assets of service users, communities and professionals working in public services in order to improve outcomes. For instance, the key ‘‘production’’ work for preparing recycled materials for processing is done by citizens and businesses, leaving a simpler and cheaper collection and transport task for the government to complete. Examples using digital tools are the “FixMyStreet” app originally developed in the UK and now used world-wide, or “Sag’s Wien” in Austria, apps where citizens can inform the government agency of a problem that needs to be resolved (for example, reporting a broken lamp on your street, or if you see fly-tipping occurring in your neighbourhood). In future, users will decide on how services should look like and what technology should be used to deliver them.

Innovative public service innovations aim to be personalized, transparent and participatory. In future though they will also be context-aware and context smart.

Co-funded by the Erasmus+ Programme of the European Union



Digital government and the development and delivery of innovative public services require not only the use of digital tools, the integration and learning across contexts, locations, devices, data sources, governments, industries and services but also the transformation of organisations, workflows and processes, the development of policies and other coordinating governance mechanisms as well as need constant evaluation to see that the set aims are being achieved.

Thank you for attending this MOOC, I hope you enjoyed it. If you have any questions, here are my contact details!

Goodbye!

Co-funded by the Erasmus+ Programme of the European Union

3.1.3 Module 3: Standardization and Interoperability

Compiled by: Dr. Alexander Ronzhyn and Prof. Dr. Maria A. Wimmer, Das Nationale E-Government Kompetenzzentrum: NEGZ (Berlin, Germany)

3.1.3.1 Reader

Introduction

Today, with the increase of complexity of interactions, especially across country borders, the issue of effective cooperation becomes critical. The effectiveness of Information Society determined by the ability of components to 'talk' to each other, or to interoperate (CENELEC, 2011). To save money and time companies and institutions should work with each other as seamlessly as possible. This can be realized through interoperability and standardization.

Contents

Defining Interoperability

Already in 2003, EU defined interoperability as “the means by which the inter-linking of systems, information and ways of working, whether within or between administrations, nationally or across Europe, or with the enterprise sector, occurs” (The Commission of The European Communities, 2003, p. 6).

This definition has been refined in the New European Interoperability Framework (EIF) in 2017. The New EIF defines interoperability as “the ability of disparate and diverse organisations to interact towards mutually beneficial and agreed common goals, involving the sharing of information and knowledge between the organisations, through the business processes they support, by means of the exchange of data between their respective information and communications technology (ICT) systems” (European Union, 2017a, p. 5).

It is necessary to distinguish Interoperability from some related concepts (European Commission, 2008, p. 5):

- From integration: which is about the centralisation of loosely coupled systems
- From compatibility: which is about the interchangeability of tools in a particular context
- From adaptability: which is about changing the tools by adding additional capabilities as needed, particularly on an ad-hoc basis

In contrast to the three concepts outlined above interoperability has some important properties:

- Interoperability is neither ad-hoc, nor unilateral (nor even bilateral) in nature. It is a shared value of a community.
- Interoperability refers to inherent capabilities on top of individual systems and tools.
- It is a quality that can be measured with a series of quantifiable characteristics (metrics).

Standardisation

Standard is a technical specification, adopted by a recognised standardisation body, for repeated or continuous application, with which compliance is not compulsory, and which is one of the following:

- International standard: a standard adopted by an international standardisation body.
- European standard: a standard adopted by a European standardisation organization.
- Harmonised standard: a European standard adopted on the basis of a request made by the Commission for the application of Union harmonisation legislation.
- National standard: a standard adopted by a national standardisation body (European Parliament and the Council of the European Union, 2012, Chapter 1, Art. 1).

Standards are technical specifications that support the development of open and competitive markets for the benefit of both consumers and industry. Standards help to reduce costs, anticipate technical requirements, and increase efficiency. The European Commission recognises the positive effects of standards in areas such as trade, the creation of Single Market for products and services, and innovation (European Commission, 2016).

As a basic principle, European governments determine the legal framework and provide requirements (regulatory, policy, etc.), but leave it to industry to develop technologies that will satisfy those requirements (Openforum Europe, 2017). Standardisation plays an increasing role for interoperable services of the Digital Single market (European Commission, 2015). It can help direct the development of new technologies in both private and public sectors.

An essential instrument of standardization is the EU Rolling Plan for ICT Standardisation. It is developed by the European Commission collaboratively, with advice from the EU Multi-Stakeholder Platform on ICT Standardisation. The EU Rolling Plan provides an overview of the needs for ICT standardisation activities to be undertaken in support of EU policy activities and concentrates on technologies of "horizontal importance" that have wide impact across different technical areas. It "details the requirements for ICT standardisation, articulates them in the form of actions and provides a follow-up mechanism for the actions" (European Commission, 2018a, p. 3). The most recent 2018 Rolling Plan for ICT Standardisation (European Commission, 2018a) mentions interoperability extensively, underlining its importance for policy making, provision of cross-border services and e-government services.

While standards play crucial role for realising interoperable solutions, availability of standards however is not sufficient for interoperability (European Commission, 2015), as available standards still need to be integrated in the solutions and services provided by the suppliers.

Interoperability in Europe

The European Commission first recognized the need for interoperability between public administrations when it established the Interchange of Data between Administrations (IDA) programme in 1995 to promote the development of trans-European telematic networks for data interchange.

The eEurope Action Plan 2005, adopted in 2002, led to the creation of The European Interoperability Framework V1.0 having as purpose:

- to promote and support the delivery of European public services by fostering cross-border and cross-sectoral interoperability;
- to guide public administrations in their work to provide European public services to businesses and citizens;
- to complement and tie together the various National Interoperability Frameworks (NIFs) at European level (European Commission, 2017b).

Consequently, the Interoperability Solutions for European Public Administrations (ISA) programme (2010–2015) and its follow-up ISA² programme (2016–2020), were the main instruments to implement the new versions of the European Interoperability Strategy (EIS) and EIF through a portfolio of updated actions focused on improving digital collaboration between public administrations in Europe (European Union, 2017b). The EIF V2.0 was published in 2010 widening its area of intervention to include the legal and administrative environment, advances in various eGovernment programmes in Member States and ICT developments (European Union, 2017b). Finally, the New EIF was published in 2017, revised under ISA² programme.

Interoperability is named a valuable asset in Digital Single Market strategy (adopted by the Commission on 6 May 2015) for "ensuring effective communication between digital components like devices, networks or data repositories. It also means connecting better along the supply chain or between industry and services sectors. It means more efficient connections across borders, between communities and between public services and authorities. E-government services that are being developed in different Member States should be able to communicate with each other and not develop in isolation" (European Commission, 2015).

"Tallinn Declaration on eGovernment" (Tallinn Declaration, 2017) signed in 2017 mentions "interoperability by default" as one of the policy action lines and an important principle for designing national interoperability frameworks, which should be based on the EIF and adhere to EIF for cross-border digital public services.

European Interoperability Framework

Co-funded by the Erasmus+ Programme of the European Union

The EIF is “a commonly agreed approach to the delivery of European public services in an interoperable manner. It defines basic interoperability guidelines in the form of common principles, models and recommendations” (European Union, 2017a).

The EIF is a generic framework that is meant to be used by any public administration in the European Union and provide guidance for interoperability on all levels from local and regional to European. It provides a core of interoperability elements to the national and domain-specific interoperability frameworks. National interoperability frameworks, when aligned with the EIF can be developed in a coordinated way, while at the same time having the flexibility to address country- or domain-specific requirements.

The New European Interoperability Framework was released in 2017. The objective of the EIF is to provide guidance, through a set of recommendations, to the public administrations of the EU member states on how to:

- improve the governance of the governments’ interoperability activities;
- establish cross-organizational relationships;
- streamline processes supporting end-to-end digital services;
- ensure that the new and existing legislation do not compromise the interoperability efforts (European Union, 2017a).

The EIF covers three types of interactions: administration to administration (A2A), administration to business (A2B) and administration to citizen (A2C). It describes 1 conceptual interoperability model, 4 levels of interoperability, 12 interoperability principles and 47 recommendations.

Twelve **interoperability principles** are aimed to establish the general behaviours and approaches to interoperability. The principles concern the context of EU actions on Interoperability (e.g., Subsidiarity and proportionality), main principles that guide the implementation (e.g., openness, transparency), user needs and expectations (e.g., inclusion, security and privacy), foundations of cooperation between the administrations (e.g., preservation of information). In the EIF, specific recommendations are provided along the principles. These provide more specific guidance of how the principles can be realized on practice.

Four **layers of interoperability** are legal, organizational, semantic and technical. They are described in detail further down in this lecture. The decisions are made through interoperability governance which is a cross-cutting element, connecting all four layers, being realized both on the national and European levels.

Finally, the **conceptual model for integrated public services** is meant to provide guidance for planning, development, operation and maintenance of the public services by the member states. The conceptual model promotes the idea of interoperability by design (model should guide the design of the public services) and comprises loosely coupled service components that are interconnected through shared infrastructure (European Union, 2017a). The model is presented in Figure , refer to the (European Union, 2017a, Chapter 4) for the detailed description of the individual components.

Co-funded by the Erasmus+ Programme of the European Union

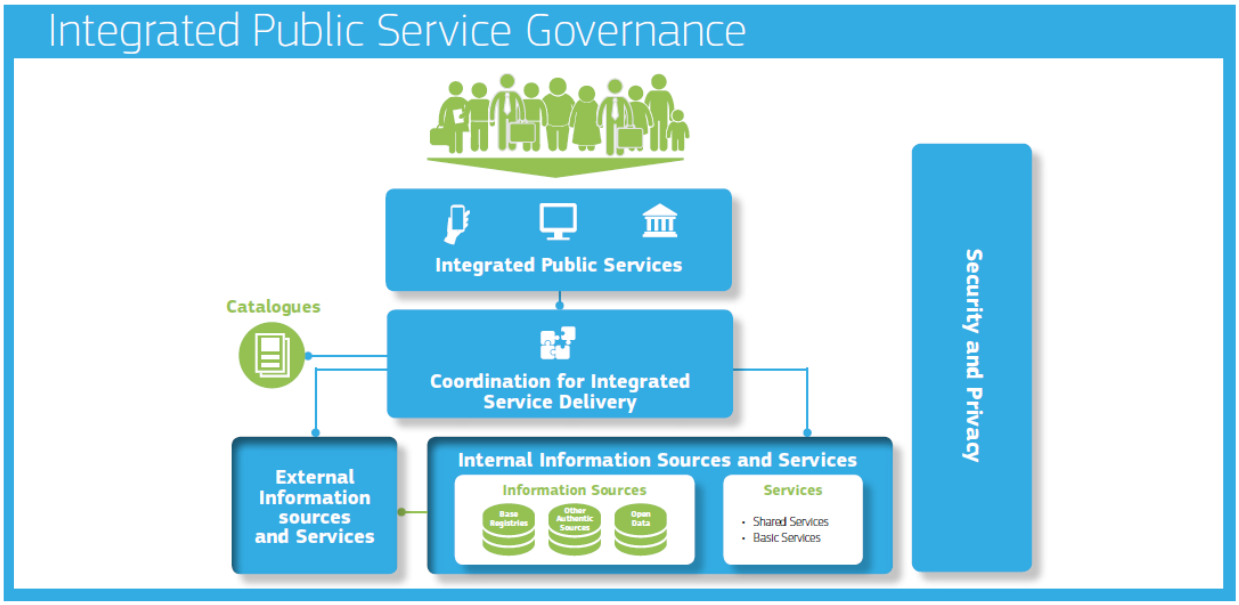


Figure 4: Conceptual model for integrated public services, EIF, (European Union, 2017a)

Levels of interoperability and Interoperability Governance

The EIF describes the four levels of interoperability: legal, organisational, semantic and technical, presented in Figure . For effective practical implementation of cross-border public services, each of the levels should be taken into account.

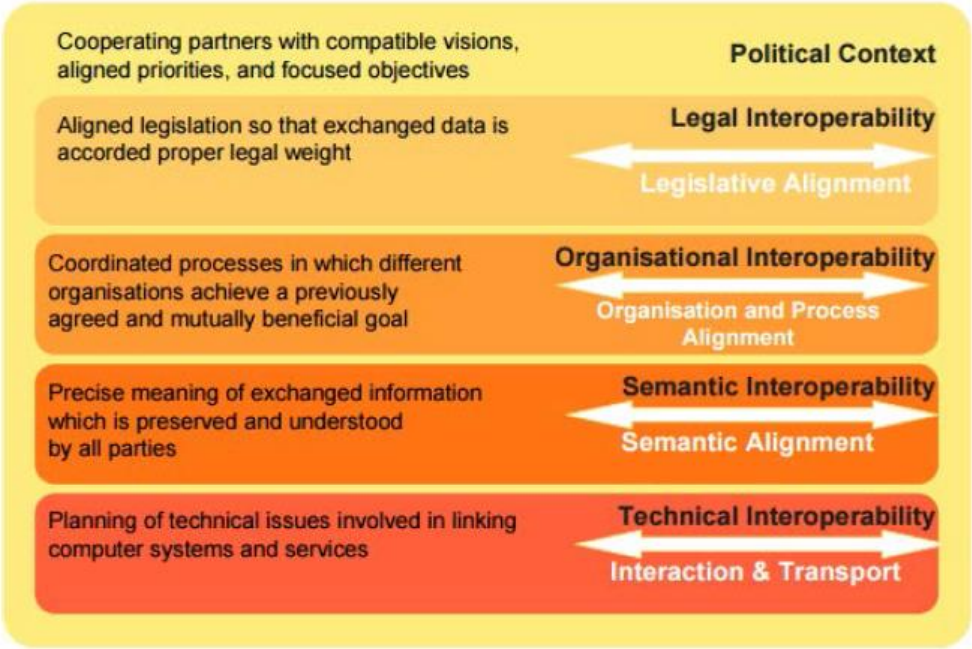


Figure 5: EIF levels of interoperability, source: EIRA (European Commission, 2017b)

The following description of the interoperability layers is adapted from the description provided in European Interoperability Reference Architecture (EIRA) (European Commission, 2017b).

Legal interoperability

Co-funded by the Erasmus+ Programme of the European Union

Each public administration involved in the provision of a public service, works within its own national legal framework. It may happen that certain incompatibilities between legislation in different countries can make working together and delivering cross-border services more complex or even impossible. Legal initiatives may be needed to address such situations. When information is exchanged across national borders during the provision of a public service, the legal validity of such information must be maintained across borders and data protection legislation in both originating and receiving countries must be respected.

Legal interoperability covers the broader environment of laws, policies, procedures and cooperation agreements needed to allow the seamless exchange of information between different organisations, regions and countries., thus allowing the delivery of cross-border public services

Organisational interoperability

Organisational interoperability is concerned with how organisations, such as public administrations in different EU Member States, cooperate to achieve their mutually agreed goals. In practice, it implies integrating business processes and related data exchange. Organisational interoperability also aims to meet the requirements of the user community by making services available, easily identifiable, accessible and user-focused.

Semantical interoperability

Semantical interoperability enables organisations to process information from external sources in a meaningful manner. It ensures that the precise meaning and format of exchanged information is understood and preserved throughout exchanges between the parties. In the context of the EIF, semantic interoperability encompasses the following two aspects:

- Syntactic interoperability refers to the packaging and transmission mechanisms for data. It is about describing the **exact format** of the information to be exchanged in terms of grammar, format and schemas. Syntactic interoperability is a prerequisite for semantic interoperability.
- Semantic interoperability is about the **meaning** of exchanged data elements and the relationship between them. It includes the vocabulary to describe data exchanges and ensures that data elements are understood in the same way by communicating parties.

Technical interoperability

This level covers the technical aspects of linking information systems. Technical interoperability is about the ability of two or more information and communication technology applications, to accept data from each other and perform a given task in an appropriate and satisfactory manner without the need for extra operator intervention.

It includes aspects such as interface specifications, interconnection services, data integration services, data presentation and exchange, etc. While public administrations have specific characteristics at political, legal, organisational and, partly, semantic level, interoperability at the technical level is not specific to public administrations. Therefore, technical interoperability should be ensured, whenever possible, via the use of formalised specifications, either standards pursuant to EU Directive 98/34[1] or specifications issued by ICT industry fora and consortia.

Interoperability governance

In order to realise cross-border interoperable public services, it is necessary to address all the four layers of interoperability. This can be done through interoperability governance. Interoperability governance can be defined as “decisions on interoperability frameworks, institutional arrangements, organizational structures, roles and responsibilities, policies, agreements and other aspects of ensuring and monitoring interoperability at national and EU levels” (European Commission, 2017a, sec. 3.1).

The main functions of interoperability governance are:

[1] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A31998L0034

Co-funded by the Erasmus+ Programme of the European Union

- Supporting public service provisioning by providing and managing generic interoperability enablers at different interoperability levels.
- Ensuring that these enablers and corresponding artefacts are aligned with objectives on policy level.
- Ensuring the sustainability of existing and new interoperability enablers, artefacts and body of knowledge on interoperability (Wimmer, Boneva, & di Giacomo, 2018).

Interoperability governance functions need to be integrated in the management of public services to align the strategic interoperability objectives with the concrete implementation of solutions on each of the four levels (Wimmer et al., 2018).

EIRA

European Interoperability Reference Architecture is a reference architecture, which provides a guide for public administrators in their work to develop interoperable European public services. The EIRA uses the ArchiMate language as modelling notation and is aligned with the EIF, complying with the context given in the European Interoperability Strategy. The EIRA aims to ensure common understanding of interoperability between stakeholders by providing common language, building blocks and specifications that can be used in the design and documentation of interoperable solutions (European Commission, 2018b).

The EIRA has the following main components meant to support interoperability:

- **A common terminology**. Controlled vocabulary allows clear and unambiguous communication between the parties involved in designing, evaluating and documenting solutions used to deliver interoperable public services.
- **Architectural Building Blocks (ABBs)** relevant to interoperability. ABBs are the re-usable packages of functionality defined to meet certain business needs. These ABBs are used by organisations and realised through Solution Building Blocks (SBBs). SBBs are the concrete implementations of the capabilities of one or more ABBs. Interoperability specifications in EIRA provide the requirements that need to be met by SBBs when implementing the ABB, in order to ensure interoperability.
- Seven **ArchiMate views**. The views allow focussing on specific aspects of interoperability. The four views correspond to the four levels of interoperability defined in the EIF (with two views on technical level: application and infrastructure), complemented with a high-level overview view and underpinning view (European Commission, 2018b).

> ***Reference Architecture*** *is a document or set of documents which provide recommended structures and integrations of IT products and services to form a solution. The reference architecture embodies accepted industry best practices, typically suggesting the optimal delivery method for specific technologies* (Hewlett Packard Enterprise, 2018).

EIRA is supported by the Cartography Tool[2]. It is a plug-in for the modelling tool Archi for modelling IT solutions based on EIRA structure. EIRA and Cartography Tool support interoperability and the reuse of IT solutions by public administrations.

Conclusion

Finally, it is worth mentioning some of the challenges associated with the implementation of interoperability:

- Collaboration across national boundaries with the need to link heterogeneous systems
- Stand-alone solutions with proprietary formats hamper working together in seamless government settings
- Inertia of bureaucratic systems, unwilling to adopt new systems and ways to operate (Saekow & Boonmee, 2009)
- Systems in place often remain in operation while being equipped with networking capabilities (the need for integrating legacy systems turns out to be expensive and highly complex endeavour)

[2] https://joinup.ec.europa.eu/release/cartography-tool/v201

Co-funded by the Erasmus+ Programme of the European Union

•

Additional materials

EIF:

https://ec.europa.eu/isa2/eif_en

https://ec.europa.eu/isa2/publications/european-interoperability-framework-eif_en

European Interoperability Framework for Pan-European Egovernment Services: Draft document as basis for EIF 2.0: http://ec.europa.eu/idabc/servlets/Docb0db.pdf?id=31597

https://ec.europa.eu/isa2/sites/isa/files/eif_brochure_final.pdf

EIRA:

Video introduction to EIRA: https://www.youtube.com/watch?v=RWhoy3ilYEA

EIRA and Interoperability: https://joinup.ec.europa.eu/sites/default/files/document/2017-01/how_does_eira_support_interoperability_v1_0_0.pdf

EIRA 2.0.0 overview: https://joinup.ec.europa.eu/solution/eira/distribution/eira-v200-overview

Explanatory video – EU Single Digital Gateway:

https://www.youtube.com/watch?v=Znkoz0-P3sc

On history of interoperability in Europe:

State of Play of Interoperability in Europe - Report 2016: https://ec.europa.eu/isa2/sites/isa/files/docs/publications/report_2016_rev9_single_pages.pdf

Examples of national standardization initiatives:

XÖV (DE): http://www.xoev.de/

ELAK & EDIAKT (AT): https://www.ref.gv.at/EDIAKT-EDIDOC.599.0.html

OIO (DK): http://arkitekturguiden.digitaliser.dk/introduction-national-enterprise-architecture-denmark

References

CENELEC. (2011). Information and Communication Technology. Retrieved March 14, 2019, from http://www.cenelec.eu/aboutcenelec/whatwedo/technologysectors/Informationandcommunicationtechnology.html%0A

European Commission. (2008). *European Interoperability Framework for Pan-European Egovernment Services: Draft document as basis for EIF 2.0*.

European Commission. (2015). A Digital Single Market Strategy for Europe. *COM(2015) 192 Final*. http://doi.org/10.1017/CBO9781107415324.004

European Commission. (2016). Internal Market, Industry, Entrepreneurship and SMEs: Benefits of Standards. Retrieved March 12, 2019, from https://ec.europa.eu/growth/single-market/european-standards/policy/benefits_nn

European Commission. (2017a). *Annex 2 to the Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 'European Interoperability Framework - implementation strategy.'* Brussels.

European Commission. (2017b). European Interoperability Reference Architecture (EIRA). Retrieved from https://joinup.ec.europa.eu/release/eira/v200

European Commission. (2018a). *2018 Rolling Plan for ICT Standardisation*.

European Commission. (2018b). *How EIRA supports interoperability v1.0.0*.

European Parliament and the Council of the European Union. (2012). Regulation (EU) no 1025/2012 of the European Parliament and of the Council on European standardisation. Official Journal of the European Union.

European Union. (2017a). *New European Interoperability Framework*. Luxembourg.

Co-funded by the Erasmus+ Programme of the European Union

European Union. (2017b). *State of Play of Interoperability in Europe - Report 2016*. Luxembourg. Retrieved from https://ec.europa.eu/isa2/sites/isa/files/docs/publications/report_2016_rev9_single_pages.pdf

Hewlett Packard Enterprise. (2018). What is a Reference Architecture? Retrieved March 11, 2019, from https://www.hpe.com/emea_europe/en/what-is/reference-architecture.html

Openforum Europe. (2017). *ICT Standardisation in a Digital world*. South Croydon, UK.

Saekow, A., & Boonmee, C. (2009). A Pragmatic Approach to Interoperability Practical Implementation Support (IPIS) for e-Government Interoperability. *Electronic Journal of E-Government*.

Tallinn Declaration. (2017). *Tallinn Declaration on eGovernment at the ministerial meeting during Estonian Presidency of the Council of the EU on 6 October 2017*. Retrieved from http://ec.europa.eu/newsroom/document.cfm?doc_id=47559

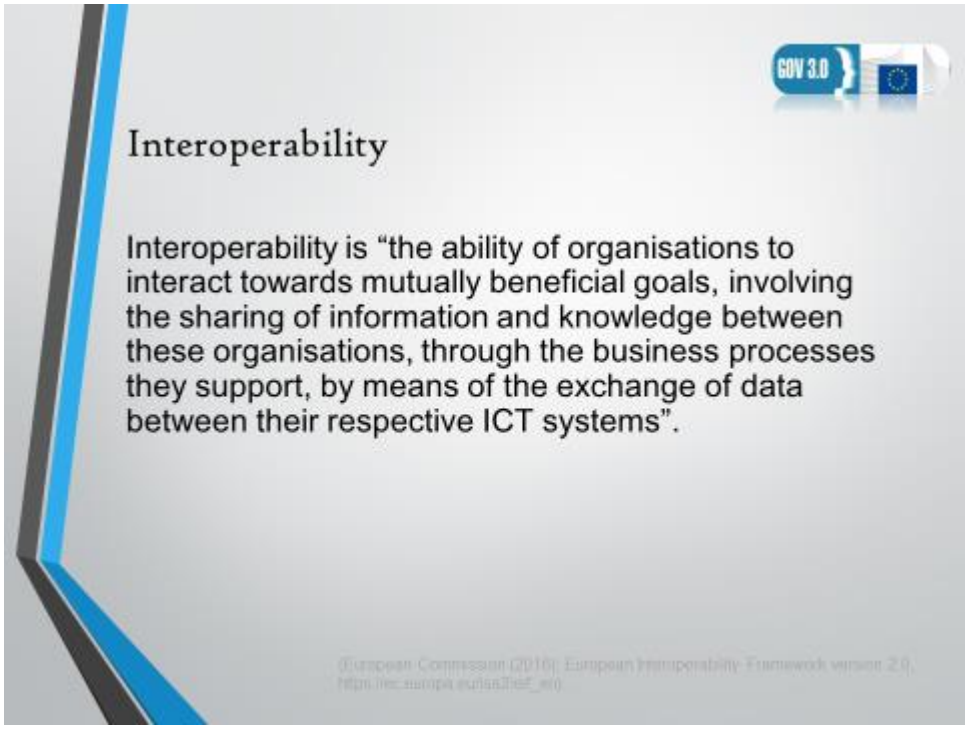
The Commission of The European Communities. (2003). *Linking up Europe: the importance of interoperability for egovernment services* (Commission Staff Working Paper).

Wimmer, M. A., Boneva, R., & di Giacomo, D. (2018). Interoperability Governance: A Definition and Insights from Case Studies in Europe. *19th Annual International Conference on Digital Government Research (Dg.o 2018)*. http://doi.org/10.1145/3209281.3209306

3.1.3.2 MOOC

Hello, I am Maria Wimmer. Professor of e-Government at the Institute for Information System Research at University Koblenz-Landau.

The topic of today's lecture is interoperability and standardization. With the increase of complexity of interactions, especially across country borders, the issue of effective cooperation becomes critical. To save money and time, companies and institutions have to work with each other as seamlessly as possible. This can be realized through interoperability and standardization.



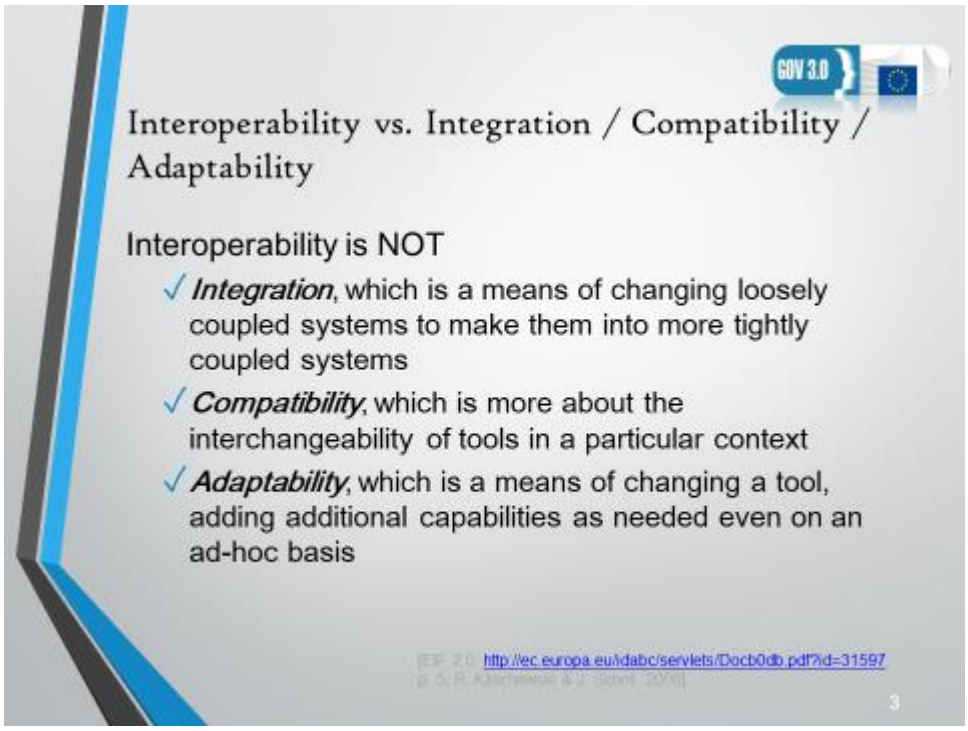
Interoperability can be defined in many ways. The simplest way could be: "The ability to exchange information".

A more comprehensive definition of Interoperability is provided by the European Commission.

Co-funded by the Erasmus+ Programme of the European Union

Interoperability is "the ability of organisations to interact towards mutually beneficial goals, involving the sharing of information and knowledge between the organisations, through the business processes they support and by means of the exchange of data between their ICT systems".

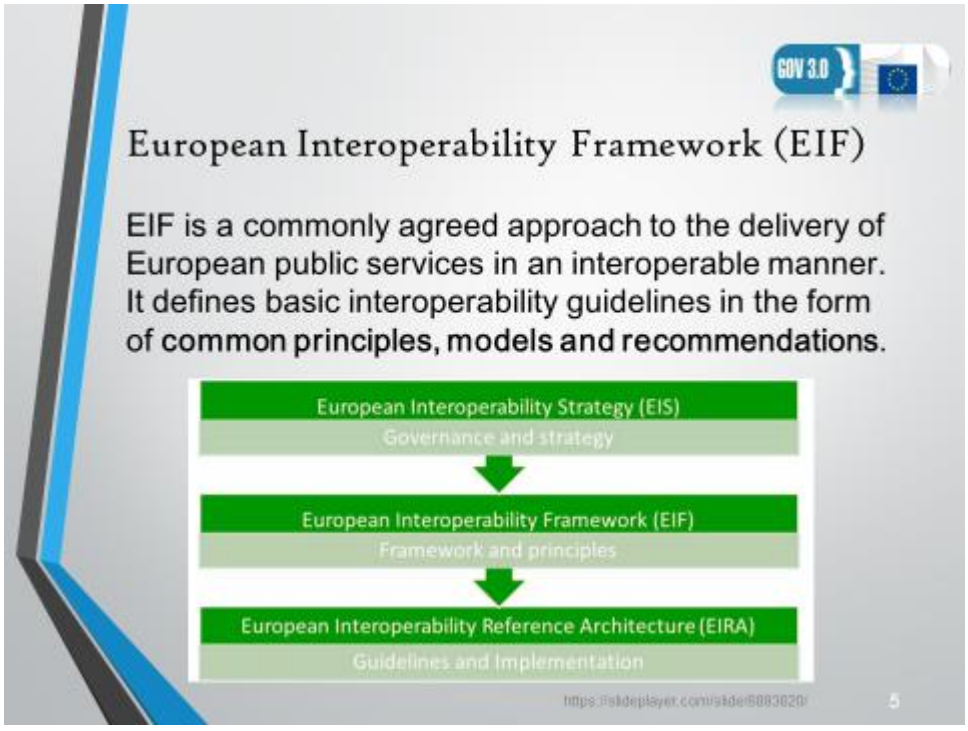
Interoperability is important because the effectiveness of Information Society determined by the ability of components to 'talk' to each other, or to interoperate. ICT applications will not reach their full potential unless they and their supporting infrastructures are fully interoperable.



It is necessary to distinguish Interoperability from some of the related concepts. Often interoperability gets confused with Integration (which means centralisation of different services and applications) / Compatibility (which is about using different tools in a particular context) / and Adaptability (which is about modifying the tools on an ad-hoc basis).

Co-funded by the Erasmus+ Programme of the European Union

Section 3.1.1 of European Interoperability Framework states that “Standards and specifications are fundamental to interoperability”. Standards are "technical specification approved by a recognized standardization body for repeated or continuous application". Depending on the body that developed the standard, there are international, European standards.

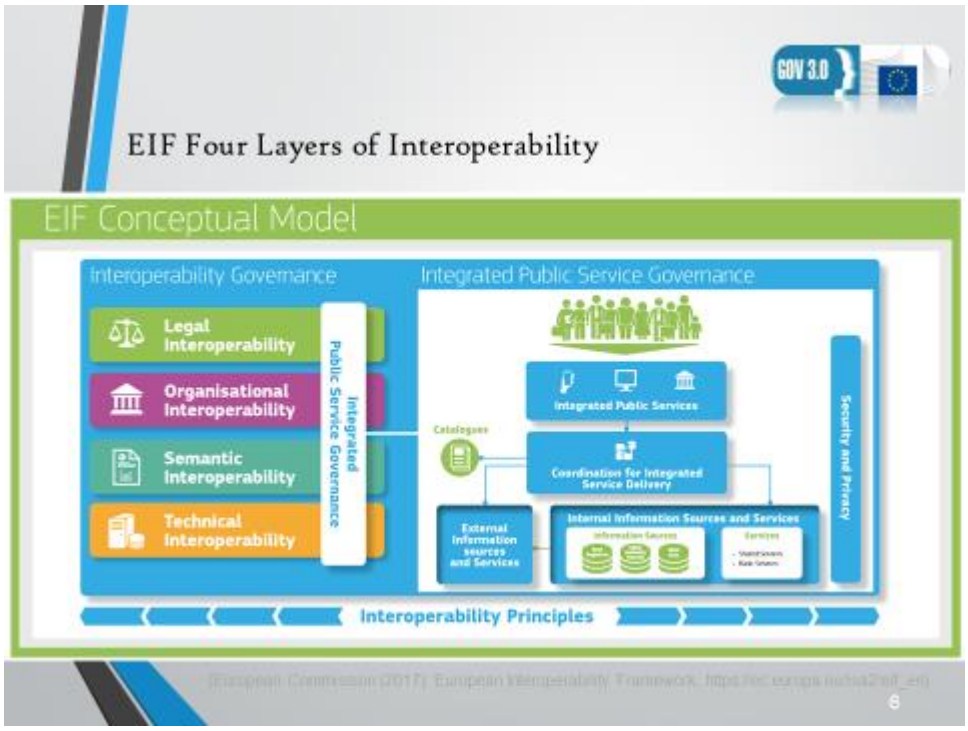


The absence of interoperability is a significant obstacle preventing the progress towards the creation of the Digital Single Market in Europe.

Co-funded by the Erasmus+ Programme of the European Union

The “eEurope Action Plan 2005” led to the creation of The European Interoperability Framework(EIF) which aims at promoting and supporting the delivery of European public services by fostering cross-border and cross-sectoral interoperability; guiding public administrations in their work to provide European public services to businesses and citizens; and finally complementing and tying together the various National Interoperability Frameworks at the European level.

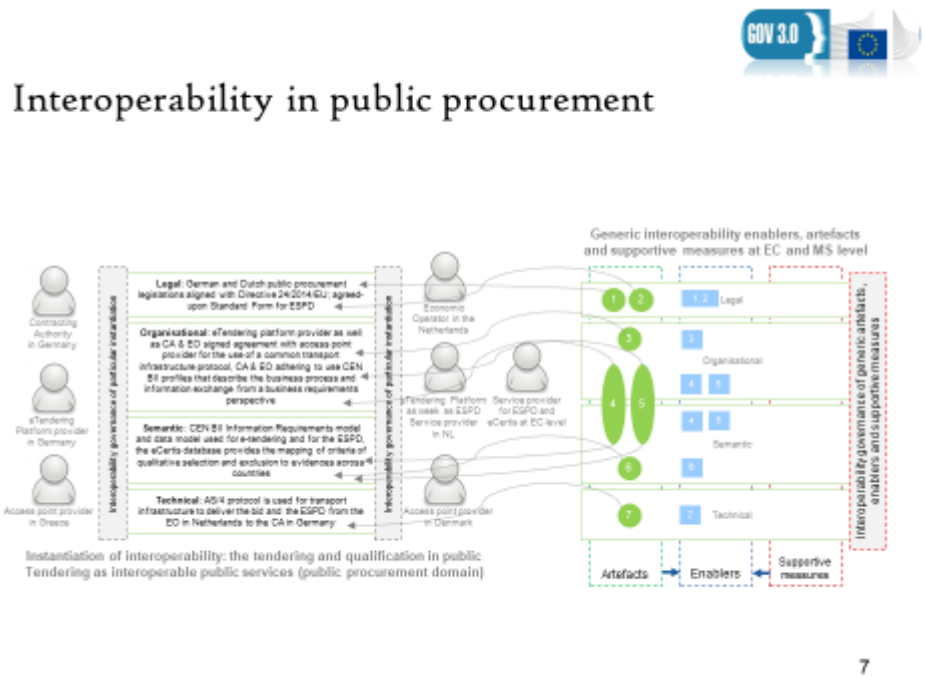
EIF defines framework and principles based on the European Interoperability Strategy, while European Interoperability Reference Architecture (EIRA) provides specific guidelines for the implementation of interoperability.



EIF describes four levels of interoperability, specifically “Legal”, “Organisational”, Semantic” and “Technical”. The levels of interoperability are important in the context of integrated public service governance.

EIRA plays an important role here as it describes how the interoperability solutions can be built on these layers. To achieve cross-border and cross-sectoral interoperability it is necessary to address each layer.

Co-funded by the Erasmus+ Programme of the European Union



7

>>Animated example of interoperability in procurement<<

1.

Here is an example of how interoperability works on different layers concerning the interoperability in public procurement in the European Union. First there are four layers: legal, organisational, semantic and technical.

They are supported by artefacts, supportive measures and enablers.

The whole four layers are managed through interoperability governance.

2.

So, there are various actors from different countries, involved in public procurement. Here you can see actors from Germany, the Netherlands, Denmark and Greece.

3.

Legal interoperability is the highest layer. Each public administration works within its own national legal framework. Sometimes, incompatibilities between legislation in different Member States make working together more complex or even impossible. In these cases, legal initiatives are necessary.

In this case German and Dutch public procurement legislations aligned with EU Directive 24/2014, concerning Standard Form for ESPD.

4.

The second layer of interoperability is concerned with how the organisations in different Member States, cooperate to achieve their mutually agreed goals. In practice, organisational interoperability implies integrating business processes and related data exchange.

In the procurement example, CA & EO adhere to the use of CEN BII profiles that describe the business process and information exchange from a business requirements perspective.

Some artefacts (in this case CEN BII) actually appear on more than one layer and are relevant for various aspects of interoperability.

5.

Co-funded by the Erasmus+ Programme of the European Union

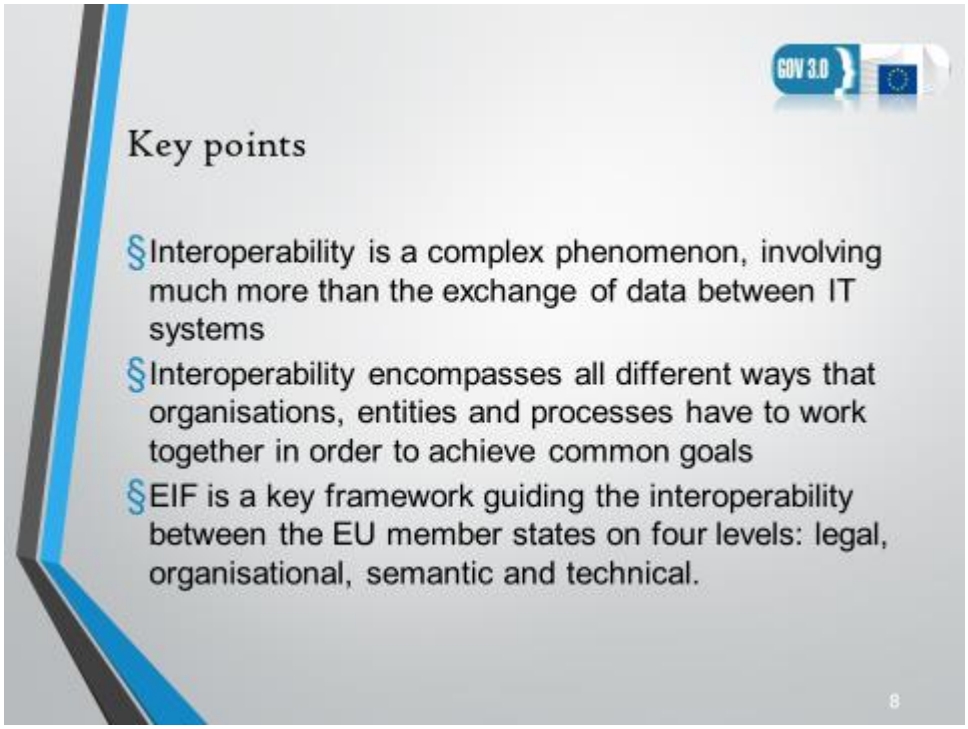
Semantic layer deals with the meaning and format of information processed by the organisations.

Here, CEN BII Information Requirements model and data model used for e-tendering and for the ESPD, along with the eCertis database provides the mapping of criteria of qualitative selection of procurement evidences across countries

6.

Finally, technical interoperability includes technical aspects such as interface specifications, interconnection services, data integration services, data presentation and exchange. The realization of interoperability on this layer is heavily dependent on common technical standards and specifications.

Here AS/4 protocol is used for transport infrastructure and delivering the bid and the ESPD between the actors across national borders.



Here is a quick recap of the presentation.

Interoperability is a complex phenomenon, which is not simply the exchange of the data between the different systems. It is about the effective work of the systems together with the aim of achieving common objectives. European Interoperability Framework, the main document on interoperability in the European Union, defines four levels of interoperability: technical, semantic, organizational and legal, while EIRA provides guidelines for the implementation of interoperability on each of these layers. The practical realisation of interoperability has been illustrated with the example in procurement domain.

Thank you for your attention!

Co-funded by the Erasmus+ Programme of the European Union

3.1.4 Module 4: Legal Implications of Data-driven Decision Making

Compiled by: Mag. Bettina Höchtl, Danube University Krems

3.1.4.1 Reader

Introduction

The course has two key aims, providing general insights into the GDPR and showing how the GDPR affects certain technology use, illustrated by three examples. The first project will shed light on certain legal aspects of Smart Governance, while the second one will deal with the field of data economy and smart contracts. The final example will focus autonomous systems.

Generally, the pursuit of data driven decision-making can have various reasons. To address legal questions that follow from the idea of data driven decision-making, there are of course more legal domains to take into account (such as constitutional aspects, procedural rights and copyright) than data protection, which this course focuses. With the aim to support potential in unfolding and to hinder hurdles from being a barrier, literature lists positive and risky factors of data driven decision-making.

Content

Data driven decision making: Potentials and Critiques

The concept of "**data driven decision-making**" entails different approaches, including data enriching the human's decision-making basis, the system already suggesting decisions or the system actually making decisions.

Reasons urging **the public administration to consider data driven decision-making are manifold**. Additional information providing insights policy makers did not have before is a clear potential. Besides the potential improvement of decisions, which McAffee and Brynjolfsson (2012) confirmed by stating, "*The evidence is clear, data driven decisions tend to be better decisions*", public administration should consider data driven decision-making because of the principle of outcome orientation, their obligation to produce measurable results based on a responsible use limited financial and personnel resources. According to the latter, data driven decision-making could free personnel from routine tasks. In addition to this possible enhancement of efficiency with the limited (personnel) resources at hand and the discovery of new correlations mentioned above, **potentials** of automated and data-driven decision making include tailoring public services to individual needs, especially in the areas of medicine and education (WP 29 2018). Additionally, potential benefits **from a citizen- and an economic perspective** are a potential rise in accountability, transparency, comprehensibility and citizen participation. In educational context, the concept of "engine of accountability" arose (Isaacs 2003). Especially information provision about implications to other policy domains and visualisations can strengthen clarity in understanding of citizens. This information could otherwise not be accessible for citizens. Companies can use data driven decision-making as a management tool as suggested by McAffee and Brynjolfsson (2012).

The WP 29[1] (2018) mentioned in their guidelines on automated decision-making application areas rang from healthcare to taxation, including finance, insurance, marketing and advertising. Moreover, there are other areas like education (Mandinach 2012), credit scores and the labour market. Exemplifying, the Austrian Labour market service plans to use an algorithm to predict the probable duration of unemployment of specific persons. This was criticised by the Ombudsman for perpetuating existing stereotypes and by politicians for lowering the chances of those unemployed persons, who are categorised in the worst category even further and for restricting support for this group, which is an assumption.[2] In other words, the perpetuation of existing stereotypes is the core argument of the Austrian Ombudsman criticising the Austrian

[1] This is a Board of experts, consisting mainly of members of data protection supervisory authorities of the member states. The European Data Protection Board endorsed the guidelines elaborated by the WP 29 that are of relevance in the context of the GDPR: https://edpb.europa.eu/news/news/2018/endorsement-gdpr-wp29-guidelines-edpb_en

[2] See the related discussion in a newspaper: Szigetvari, A. (2018), Leseanleitung zum AMS-Algorithmus, DerStandard https://derstandard.at/2000089720308/Leseanleitung-zum-AMS-Algorithmus or Volksanwaltschaft kritisiert AMS-Algorithmus (2019) https://derstandard.at/2000099270837/Volksanwaltschaft-kritisiert-AMS-Algorithmus-in-der-Krikik-der ; political criticism cf. https://derstandard.at/2000091228952/Wien-warnt-vor-Segmentierung-von-Arbeitslosen

Labour Market Service for their intended introduction of an algorithm to classify unemployed people. A potential perpetuation of existing stereotypes and a possible restriction of people to their preferences are challenges (WP 29 2018) like discrimination or bias in algorithms. The OECD praised the approach chosen by the Austrian Labour Market Service, but clearly expressed the dependence of this positive view on certain requirements, especially should the public be able to discuss and verify such models. A criticism pointed to by the OECD is the lack of independent studies dealing with the question how well algorithms work and whether they are really better than a categorisation through humans.[3]

General Data Protection Regulation: Basic Overview

The General Data Protection Regulation (GDPR) aims at the protection of natural persons with regard to the processing of personal data and on the free movement of such data. This dual objective occurs repeatedly. Recital 6 recognises that the technological development is a challenge for data protection. It mentions the increase of the exchange of personal data through companies and authorities and the publication of personal data through individuals. Then, the GDPR aims at contributing to economic and social progress. Recital 2 contains this goal and emphasizes strengthening the economies of the internal market and strengthening the well-being of natural persons. The third aspect is the enhancement of trust, security and control, highlighted by Recital 7: Trust and security is a basis for economic growth and natural persons should control their own data. This shows the dual purpose of strengthening the economies and protecting natural persons (especially visible in Recitals 2 and 7).

Scope, personal data and anonymous information

The crucial core concept is personal data, significantly defining the material scope of the GDPR. In principal, there is three different types of data, namely personal data, non-personal data and previously personal data. Personal data is clear, personal data is data that is related (or relatable) to an individual natural person (legally defined in Art 4 GDPR[4]). Non-personal data is something that has never been related to a person and previously personal data is data that used to be related or relatable to a person at some point, but is not anymore. Data that is not anymore relatable to a specific person is also called anonymous information. According to recital 26, anonymous information is information, which does not relate to an identified or identifiable natural person or personal data that was rendered anonymous in such a way that the data subject is no longer identifiable. According to the mere wording, Recital 26 covers both, information or data that has never been related to an identifiable or identified natural person (non-personal data) and previously personal data.

A fingerprint for example is personal data, even a special category of personal data (biometrical data). A fingerprint unambiguously relates to a person. In contrast to this, very small depictions of people at a station, where the people are not recognizable and just visible as shadows, is not personal data. This assessment changes with different circumstances. More knowledge about a specific person such as times of arrival and departure may lead to knowledge of the place and time of work of this person. This would be personal data. A smartphone can contain a lot of personal information. A software agent can potentially process many personal data such as data about saved apps or documents or information collected through sensors. This relates to an individual natural person and thus are personal data (Höchtl 2019). A breakfast and a newspaper is personal data when a specific natural person relates to these preferences. It might even be a specific category of personal data if a deduction of a specific political opinion of the type of newspaper is possible.

Just that the information concerns a group does not mean that it is not personal data. To determine if information about a group is personal data or not, the size of the group is what matters. You can have such a small group that even though you have information that appears to you as non-personal, in the end you again single someone out, ending up in the result

[3] Arbeitslose nach Chancen eingeteilt: OECD lobt AMS-Algorithmus - derstandard.at/2000096564832/teilt-Arbeitslose-nach-Chancen-ein-OECD-lobt-AMS-Algorithmus (2019) https://derstandard.at/2000096564832/teilt-Arbeitslose-nach-Chancen-ein-OECD-lobt-AMS-Algorithmus

[4] Art 4 nr. 1 GDPR provides that *"'personal data' means any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person;"*

Co-funded by the Erasmus+ Programme of the European Union

that this is again personal data. There is no real "recipe" or "objective number" that this group has to have in order to be big enough. This depends more on the concrete case and the circumstances of this case to decide whether a group is big enough or whether you have personal data at hand. Additionally, combining different datasets and relating this information to a person through the merger or combination may lead the data to being personal data as well.

In order to determine if anonymization has taken place, there are two theories that can be referred to, the Absolute (or "objective") Theory and the Relative (or "subjective") Theory.

The absolute theory is supported by recital 26 saying in order to determine if a natural person is identifiable, account should be taken of all the measures reasonably likely to be used either (and this is the most important aspect) by the controller or by another person. This stresses a focus on either the controller or someone else and takes account of all the means reasonably likely. The Relative Theory focuses more on the controller at hand, the actual person that actually decides on processing the data, including the means and purpose of the actual processing. The ECJ judged that a dynamic IP address is personal data for the operator of a website when he/she has legal means, which allow him to have the person identified through combination with additional information available for this person's internet service provider (ECJ C582/14, p. 49). This shows that is rather not solely one of the theories that will turn out as relevant in practice.

To sum it up, the GDPR provides rather general minimum standards, but no technical requirements how to anonymise a dataset in a specific case. Therefore, "*The question of whether data relates to a certain person is something that has to be answered for each specific data item on its own merits*" (WP 29, direct cit).

Art 3 GDPR lays the territorial scope pointing at two main aspects that are relevant for the applicability of the GDPR. These are first linked to the person at the controller's or processor's side and second to the data subject. More concretely, the territorial scope covers processing activities linked to (1) an establishment of a controller or a processor in the EU, regardless of whether the processing takes place in the EU or not or (2) the data subject being in the EU and being either offered goods and services or behaviourally monitored.

Key roles, linked rights and obligations

There are three main actors, the controller, the data subject and the processor. Art 4 nr. 7 GDPR defines the meaning of a controller stating, *"'controller' means the natural or legal person, public authority, agency or other body which, alone or jointly with others, determines the purposes and means of the processing of personal data; where the purposes and means of such processing are determined by Union or Member State law, the controller or the specific criteria for its nomination may be provided for by Union or Member State law".* Furthermore, Art 4 nr. 8 GDPR regulates, that *"'processor' means a natural or legal person, public authority, agency or other body which processes personal data on behalf of the controller;"* Since a processor does not need to be involved in every processing activity, the most important roles are the data subject and the controller. It is important to keep in mind that the data subject is the individual natural person the personal data can be related to, while the controller is the person, who decides about the means and purpose of processing.

The data subject's rights including access or erasure are regulated in Art 12-20 GDPR. Interestingly, among these there is one right, which includes aims of competition law (Kamlah 2016). This is the right to data portability, regulated by Art 20 GDPR[5], which aims at preventing the so-called "Lock-In-effect". Consumers would be "locked in" where they cannot easily change a service provider (cf. WP 29 2017). Data subjects have this right also when the contract with the controller is still valid (Forgó 2018).

The main responsibility of the controller is to demonstrate compliance with the data protection principles regulated in Art 5 GDPR. These include lawfulness, purpose limitation, data minimisation and storage limitation. Among the principles Art

[5] Art 20 GDPR says "*The data subject shall have the right to receive the personal data concerning him or her, which he or she has provided to a controller, in a structured, commonly used and machine-readable format and have the right to transmit those data to another controller without hindrance from the controller to which the personal data have been provided, where: (a) the processing is based on consent pursuant to point (a) of Article 6(1) or point (a) of Article 9(2) or on a contract pursuant to point (b) of Article 6(1); and (b) the processing is carried out by automated means.*"

Co-funded by the Erasmus+ Programme of the European Union

5 GDPR sets up, there are purpose limitation, data minimisation and storage limitation. This is all about judging to what extent a purpose justifies data use. In practice, judging what is necessary for which purpose must happen more nuanced. Generally, data use must be in line with the purpose the data was originally collected for, but there are certain exceptions. For example in the research field, the purpose does not have to be that specific, but can refer to a certain research project. Generally, the purpose has to be defined clearly, because otherwise, obtaining a legally valid consent will fail for a lack of informedness. Ano- or Pseudonimsation of data should be done as soon as possible with regard to the purpose. In case the anonymisation or pseudonymisation happens not immediately, there will be a need for a justification of this decision. Another principle is the principle of accuracy. This enables the data subject to correct data and measures are required to ensure verifying accuracy and up-to-date-ness not once, but repeatedly.

Art 6 GDPR provides the fundamental requirement of lawfulness for personal data processing, which needs to be met independent whether the processing is a data driven decision-making according to Art 22 GDPR or not. Art 22 GDPR solely adds further requirements to the basic ones including Art 5 and 6 GDPR. Informed consent of the data subject or a legally recognised reason why the processing is necessary can make the processing lawful. This could be the performance of a contract between the data subject and the controller, a legal obligation, vital interests of the data subject, tasks in the public interests and legitimate interests overriding the interests of the data subject in privacy of his/her data.

Decision and Profiling according to Art 22 GDPR

Art 22 GDPR provides that the data subject shall have the **right not to be subject to a decision with certain characteristics**. These characteristics refer to how the decision was made and to what follows from the decision. The decision has to be based solely on automated processing including profiling. Consequences following from the decision are required to be legal effects concerning the data subject or such effects that are similar to legal effects, the so-called “similarly significant effects”. According to Feiler and Forgo (2017), an example for a decision with legal effect is the termination of a contract while a data subject is being “similarly significantly affected” when the data subject is excluded of a job application solely based on an automated process.

There are **exceptions** that regulate when such an individual automated decision is legally admissible. First, if it is necessary for a contract between the data subject and the controller. Second, if Union or Member State law provide such an exception. Explicit consent is a third exception. In case of a contract or consent, special safeguard measures have to be implemented and at least the following rights for the data subject have to be granted: The data subject has the right to obtain human intervention on the part of the controller, the right to express his/her point of view and the right to contest the decision. Art 22 GDPR restricts decisions based on special categories of data to the cases of explicit consent or Union or Member State law setting out a reason of substantial public interest for the processing.

Art 4 GDPR defines **profiling** as any form of automated processing of personal data, consisting of the use of personal data to (1) evaluate certain personal aspects (2) relating to a natural person, in particular to (1a) analyse or predict aspects concerning that person’s (2a) performance at work, economic situation, health, personal preferences, interests, reliability, behaviour, location or movements.

This information about an individual or a group is assessed and categorized, which is the core aspect. Literature discusses to what extent a human must be involved in the processing in order to exclude the processing from the definition of Profiling according to Art 4 GDPR. It is relevant, what type of human involvement is subject matter of analysis. The definition does not imply, that if a human is somehow involved, it cannot be profiling, for according to the WP 29, human involvement does not necessarily take the activity out of the definition of profiling, because pretending human involvement without real influence will not suffice. According to the WP 29, the human supervisor needs to be compentent to change the decision in order to exclude the decision from being an automated individual decision according to Art 22 GDPR (WP 29 2018). The prevailing view in literature supports this (Bucher 2017 and Kamlah 2016). The main goal of Art 22 GDPR is restricting scoring and profiling to avoid humans being objects of a purely machine made decision (Forgó 2018a). GDPR does not restrict profiling itself according to Veil (2018). This view argues, GDPR does not regulate the mere creation of profiling, but the GDPR regulates profiling which affects humans through measures or decisions. Comparing profiling with automated individual decision making according to Art 22 GDPR, shows that if a person applies for a loan online for example (example

Co-funded by the Erasmus+ Programme of the European Union

from WP 29 2018), general profiling according to the WP 29 would be a credit score. If a human decides based on a purely automated produced profile, this is decision-making based on profiling. An automated decision-making including profiling is at hand if an algorithm decides and delivers this decision automatically to the receiver.

Selected impact of the GDPR

Data protection aspects within the research project SmartGov

The aims of the project Advanced Decision Support for Smart Governance are (1) to include existing data in the decision-making basis, for example demographical data or traffic data, then (2) to simulate potential results and (3) to select the best decision to be actually made. The public administration aims to base their decisions, such as in the area of optimizing waste management on active and passive e-participation through social media. Active e-participation being citizens addressing the public administration and answering to questions directly actively. Passive e-participation being the public administration analysing data that citizens share in social media, but not directly address to the public administration.

The underlying system is designed to crawl social media data such as from Facebook and Twitter, and collect them. After collection, the SmartGov system sends social media data to a processor for sentiment analysis. The outcome of this sentiment analysis are values indicating a positive or negative statement of a posting. These values range from -1 to +1 with -1 being very negative and +1 very positive. These values are fed into an expert system, which simulates different decision options (the so-called Fuzzy Cognitive Maps or FCM). A FCM depicts how certain concepts influence each other in reality. For example an increasing number of shops will have a positive influence on the amount of waste, resulting in an increase of the amount of waste. This will also have a positive influence on the duration of execution of the waste management, which will have a negative influence on the suitability of the route for waste management. Such scenarios could be simulated before the suitable scenario can be chosen to be realised.

Lawfulness according to Art 6 GDPR can be reached through **consent**. It can be discussed if a – publicly available - posting in social media already implies a permission to use the data. According to the French Supervisory authority, Permission to an organisation to process massive and repetitive data without informing the data subjects is not implied by posting data to social media networks (Deliberation 2011-203). The validity of this consent of course is dependent on the (1) legal capacity, (2) the informedness of the data subject and (3) country specific differences such as concerning the age limit for giving a valid consent, which according to Art 8 GDPR is 16. Austria and France have lowered this to 15 and Cyprus to 14 years of age.

Other than consent, there are also options for achieving lawfulness with regard to Art 6 GDPR. A second good option to take into account for the public administration in the SmartGov case is a legal obligation or a task carried out by the controller in the public interest. A legal basis has to meet certain requirements like the ones set up by Art 8 (2) EHRC. Especially this legal basis shall pursue the interests of national security, public safety, economic well-being of the country, prevention of disorder and crime, protection of health or morals or protection of the rights and freedoms of others. Two potential argumentation lines could be successful in the SmartGov case. These are, the public safety and economic well-being of the country. It is important to know that these purposes rather lead to the conclusion that public administrations should not extend the search to the whole social network. Further, my recommendation – and the recommendation of my colleagues and collaboration partners within the project's legal part, which this part of the lecture is based on – was to do a **data protection impact assessment** (DPIA). The WP 29 lists criteria that are decisive if a DPIA is necessary or not. Amongst others, the following are relevant for SmartGov: sensitive data or data of a highly personal nature is being processed like e.g. political opinions or location data that are relevant for SmartGov, data processing on a large scale, mining datasets and innovative use or applying new technological solutions like for example Internet of Things applications. (WP 29, 2017a, project D2.4.2)

Based on the guidelines of WP 29 and the work we did for SmartGov (WP 29, 2017a and project deliverable D2.4.2), the criteria for an acceptable DPIA include a description of the intended processing, the necessity, risk mitigation and a consultation with interested parties. A description of the intended processing requires mentioning the nature, scope, context, purposes, recording of personal data recipients, the storage period and explaining processing activities functionally. This should include the identification of assets on which personal data rely like people, hardware, software

Co-funded by the Erasmus+ Programme of the European Union

and network. After this description, the necessity and proportionality should be addressed and measures need to be defined for the proportionality and necessity of the processing. Lawfulness of the processing, an adequate processing, relevant processing and processing limited to the necessary data and a limited storage are some contents. The data protection officer's advice and views of data subjects should be asked for actively. Summarizing, data protection impact assessment is very important for a case like SmartGov.

Data protection aspects within the research project Data Market Austria

Our overall goal is to create a sustainable data-services ecosystem, where the data economy can thrive to develop its full potential. In other words, the Data Market Austria (DMA) aims at creating the business, legal, societal and technological foundations to provide a one-stop shop for data, where you can find data and get together with experts. The DMA especially targets start-ups with low resources who usually are not able to have a lot of effort put into the search of data or who are lacking the very basic legal knowledge already and who do not have huge technical infrastructure. The government is a potential actor on both sides, on the data market provider's side as well as on the data market customer's side. The **data market provider** (DMP) being the one that provides the data and the **data market customer** (DMC) being the one that "consumes" the data but is not a consumer according to consumer protection law. We decided to restrict the trade with data on the DMA in this early phase to business to business relations. The subject matter of transactions via the DMA is data. There is no legal definition of data. So it was decided to define it very broadly as "*digitally encoded characters or character strings, which can be processed directly automatically such as sensor data, audio-visual content or computer programmes*" to have a priori as little restriction as possible with regard to potential transaction objects at the DMA. There are four types of transactions relevant for the DMA (Rinnerbauer et al. 2017), which are (1) the data asset purchase (once a dataset is downloaded, it is permanently assigned to the buyer), (2) the data as a service (the DMC has no direct access to the data but he sends a query to the DMP and the DMP sends the results of the query back to the DMC), (3) the data streaming (a DMP grants access to a specific dataset for a specific timeframe or number of accesses to the DMC) and (4) data processing on behalf of a DMC (the DMC uses the DMP as processor, the case when the DMC sends his/her own dataset to the DMP and not just a query).

Smart Contracts were analysed with regard to their benefits and pitfalls of a use in the DMA. There are of course quite euphoric research visions. Some believe that there will be no legal disputes at all if you use smart contracts. Others have a more nuanced view and for instance consider another highly praised potential, the unforgeability, as an illusion (Buchleitner and Rabl 2017). The application of smart contracts is in any case somehow limited. You cannot depict the whole world in smart contracts, but the smart contract can only handle what is clearly determined. Other visions include a decrease of the necessity of legal services provided by the state, less transaction costs because of the lack of intermediaries, a guaranteed performance delivery and less ambiguities and uncertainties (Raskin 2017). From my point of view it is possible to have less transaction costs and it's also possible to have less ambiguities and uncertainties, but it's not possible to have a really 100% guaranteed performance delivery. Just think of the delivery of a painting, which the buyer should like. How can an algorithm judge if the buyer likes the painting? Judging creativity is hard for artificial intelligence. There are the limits and the boundaries of artificial intelligence. A third hope or vision is unforgeability as mentioned above. This relates to the blockchain, which is used as the technological fundament for smart contracts that are built upon the blockchain. It is very hard to forge a blockchain, but with a fork, if sufficiently many users or nodes act together to create another path in the blockchain, this could happen. One theoretically could change the blockchain, but from a certain position in the chain on, the computing power you would need is so high, that it's just not found reasonably likely that it would happen. (For more detailed technical information on how the blockchain works see Olnes et al. 2017)

The requirements elicitation within the project revealed that the start-ups especially are very legally uncertain e.g. concerning the meaning of anonymization and general core aspects of data economical acting. An application of smart contracts should ideally increase the efficiency and support the DMA's actors. A model licensing contract should facilitate contract design and the related negotiation process including a proof of who initiated which clauses of the final contract, which might be of importance in case of a dispute. This is how a technical documentation can result in a legal advantage of smart contracting. This can facilitate interpretation of a contract in case of a dispute, for example in Austria, there is a

Co-funded by the Erasmus+ Programme of the European Union

regulation of civil law saying that if a clause is unclear, it will be interpreted negatively for the party that brought it in. If one can technically proof who brought a clause in, then this may facilitate interpretation.

A downside of smart contracts is the loss of flexibility. Code lines as Cuccuru (2017) says are not able to render grey areas. Everything is either one or zero, which is why only measurable variables and clearly defined terms can be automated in a smart contract. So, if the life cycle of a contract as a whole is predetermined, the flexibility offered by a contract law is lacking. As Sklaroff (2018) puts it, "*the flexibility of semantic contracts is a feature, not a bug*". So if something happens that was not thought before when coding the lines for the smart contract, you cannot technically at least – legally of course ex post in court –react to this circumstance.

In requirements elicitation revealed legal uncertainty as a big issue. Therefore, we created data protection guidelines that should guide a data market provider in practice when first thinking about taking part, participating in the DMA, there may turn up a lot of questions such as "Do I fall under the scope of the GDPR?" The DMP should rather assume he does, because Art 3 GDPR focuses on the controller's establishment being in the EU or the data subject being in the EU and the data processing being in connection with the offer of services and goods or the monitoring of behaviour of the data subject. This is a very broad territorial scope. Other questions that might turn up include the assessment of what constitutes personal data ("What does relation to a person mean?" "What is relevant for this?"). Along questions like these, within the project, we drafted guidelines for DMPs (Höchtl et al. 2018). If you wonder whether your concrete dataset is personal data, there is no one fits all solution, but it is rather recommendable for a DMP to ask herself whether she thinks it is realistic that her DMC will use the data to identify humans. And if a DMP questions this, she should take into account all means that will reasonably be used, either by the DMC or by another person, namely independent of whether these means are legal or illegal (Feiler and Forgó 2017). Questions like "Does he have the resources?" I mean the time, money, technical equipment for example – are relevant. If a DMP is not sure, she should rather assume, it is personal data that she is dealing with.

Summarizing, data protection principles demand for measures that limit the economic use of data. There are insecurities when it comes to the concrete technical measures that lead to compliance with the GDPR and the potential of the DMA as a platform lies in standardisation and increase of legal certainty through (1) standard contractual clauses and (2) technical documentation of negotiations.

Data protection aspects of autonomous systems

National and international stakeholders that are dealing with autonomous systems right now show the relevance of examining autonomous systems from a legal perspective. To name just a few, there is the European Parliament, which enacted a resolution expressing recommendations to the Commission on civil law rules on robotics (EP 2017). There is the principles for an AI strategy formulated by the German government and the initiatives of the Austrian government. These include the decision protocol of the council of ministers of 28 November 2018, where it says artificial intelligence will be a topic of high priority and the initiative of the (Austrian) Federal Ministry for Transport, Innovation and Technology, who founded an Advisory Board of experts called (Austrian) Council for Robotics and Artificial Intelligence. This Council has written a whitepaper called "Design Austria's future with robotics and AI positively", dated November 2018. (Höchtl 2019 with further references)

Besides these national and international stakeholders, there are consulting agencies dealing with autonomous systems. To mention just one of them, I want to point at Gartner's Hype Cycle for Emerging Technologies 2018 including "flying autonomous vehicles", "artificial general intelligence" and "virtual assistance". These all are related to autonomous systems. According to Gartner, the plateau of these topics will be reached in more than 10 years concerning flying autonomous vehicles and artificial general intelligence and in 2-5 years concerning virtual assistance.

While research on AI is not a young research field, there is no universally agreed definition. Research on AI has been conducted at least since 1955, when John McCarthy wrote a proposal naming artificial intelligence. Some approaches to define AI compare AI to human intelligence, but there arise difficulties, because neuroscience has many open questions concerning the functioning of our brain. Comparing something, which we want to explain to something that is characterized by open questions, is a bit difficult. (Höchtl 2019 with further references)

Co-funded by the Erasmus+ Programme of the European Union

Often, super intelligence or artificial general intelligence is distinguished from weak AI. Weak AI means that there are certain tasks an AI programme can do, but it is not better than humans are. In contrast to this, super intelligence means that this programme is better than a human is and will beat a human in every task in every area that you can think of. (Höchtl 2019 with further references)

As one example for a definition of AI may serve the one by Kaplan/Haenlein (2019), who define AI as "*a system's ability to interpret external data correctly, to learn from such data and to use those learnings to achieve specific goals and tasks through flexible adaptation*". This definition contains three aspects, the interpretation of external data, the learning from the data and achieving specific goals. This is what can be deduced from many definitions in literature. It is often somehow about a perception, about learning and about actions. (Höchtl 2019 with further references)

Even if a group of experts from ethical perspective on the European level raised ethical concerns that speak against attaching autonomy to a system at all, researchers suggested criteria to decide whether a system should be regarded as an "autonomous" one or not. According to Wiebe (2002) it is the goal orientation, the autonomy, the ability to learn and the ability to react. For the European Parliament (2017), deciding and implementing its decisions without external control is relevant. To give you an example for an application of an autonomous system, we could think of software agents or bots. In line with Vulkan's definition of a software agent or a bot, which is "*a program that acts independently on behalf of its user*" (Vulkan 1999), this can be considered as autonomous system. If an autonomous system is acting autonomously in the user's interest, this requires knowing the user's preferences. And this makes the link to data protection law.

Data a user provides to a software agent or a bot actively is of course personal data that the bot processes. But there is also additional data the bot can potentially collect, which is maybe less consciously transferred to this bot. There was a categorisation of data developed in the context of autonomous driving by Klink-Straub/Straub 2018, which can be transferred to the data a software agent could process. Data about the device itself like a smartphone or a notebook (such as the IP-address, the serial number, brand, etc.) could already allow conclusions concerning location, financial background and even the user's values. Information linked to the use like typing, personalised aspects, background picture, etc., could allow conclusions concerning the user's mood and preferences, potentially various personal data are processed. (Höchtl 2019 with further references)

A controller is – according to Art 4 GDPR - defined as the one deciding on the purpose and means of processing and we know factual and not legally admissible power to decide is relevant. If autonomy is characterised by making decisions and implementing them without external control (EP 2017), will the AI be seen as the controller if it will be autonomously deciding on its own? (Höchtl 2019 with further references)

There are some different views in literature, ranging from the opinion of using AI like a tool (Rabl 2017) to assigning limited legal capacity to AI (Specht/Herold 2018). In law, responsibility tends to be related to control. Consequently, an essential question is whether the AI controls itself or someone else controls it. The legal solution depends on the answer to this question. Possible solutions range from the AI being the controller to the user being the controller and thus being subject to the controller's obligations. (Höchtl 2019 with further references)

As outlined in Höchtl 2019, software agents or bots may process many kinds of personal data. There is a lack of standards for implementation in order to comply with the GDPR, e.g. with regard to erasure or data portability. (Höchtl 2019 with further references)

Conclusion

As a summary, first, potentially a bot processes personal data and the data subject provides this more or less by intention. Second, it should be examined legally how to put together the imagination of a controller being the one who decides and a system deciding without external control. Thirdly, there is a need for standards for implementation. As I said this concerns mainly the erasure from interconnected systems and technical details on how to grant data portability in case more than one data subject is involved. I see a need for guidelines with regard to how to balance these interests of the different data subjects. (Höchtl 2019 with further references)

Co-funded by the Erasmus+ Programme of the European Union

References

Buchleitner, C. und Rabl, T., Blockchain und Smart Contracts: Revolution oder alter Wein im digitalen Schlauch?, ecolex 2017.
Buchner in Kühling/Buchner, DS-GVO 2017, Art 22 mn 15
Cuccuru, P. (2017), Beyond bitcoin: an early overview on smart contracts, International Journal of Law and Information Technology, 2017, 25, 179-195.
EP (2017), European Parliament resolution of 16 February 2017 with recommendations to the Commission on Civil Law Rules on Robotics (2015/2103(INL))
Feiler, L. and Forgó, N. (2017), EU-DSGVO EU-Datenschutz-Grundverordnung Kurzkommentar, Verlag Österreich, Wien, Art 22 mn 3-4; Art 4 mn 3 Recital 26.
Forgó, N. (2018a), DSGVO, Dateneigentum und autonomes Fahren: eine Beziehungsgeschichte, ZVR-Verkehrsrechtstag 2018, ZVR 2018/240, 455.
Forgó, N. in Forgó, N. and Zöchling-Jud, B. (2018), Das Vertragsrecht des ABGB auf dem Prüfstand: Überlegungen im digitalen Zeitalter, Manz, Wien, 112.
Höchtl, B. (2019). Datenschutzrechtliche Implikationen autonomer Systeme. Jusletter IT, 21. Februar 2019
Höchtl, B., Homar, P., Appl, C., Hittmair, G., Heidenreich, K., Huber, A., Lampoltshammer, T. (2018), Final Report on Legal, Social and Cultural Aspects (Part I) (non-public deliverable)
Isaacs, M. L. (2003), Data-Driven Decision Making: The Engine of Accountability, Professional School Counseling, Vol. 6, No. 4, Special Issue: Carreer Development and the changing workplace, 288-295.
Kamlah, W. in Plath, K.-U. (ed.) (2016) BDSG/DSGVO Kommentar zum BDSG und zur DSGVO sowie den Datenschutzbestimmungen von TMG und TKG, ottoschmidt, Köln, Art 20 mn 9; Art 22 DSGVO mn 6 and § 6a BDSG, mn 11-13.
Kaplan, A. and Haenlein, M. (2019), Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence, Business Horizons, Vol. 62, Issue 1, January-February 2019, 15-25.
Mandinach, E. B. (2012), A Perfect Time for Data Use: Using Data-Driven Decision Making to Inform Practice, Educational Psychologist Vol. 47, Issue 2, 71-85.
Mc Afee, A. and Brynjolfsson, E. (2012), Big Data: The Management Revolution, Harvard Business Review, 3-9.
Olnes, S., Ubacht, J., Janssen, M. (2017), Blockchain in government: Benefits and implications of distributed ledger technology for information sharing, Government Information Quarterly 34 (2017) 355-364.
Rabl, T. (2017), The Rise of the Machines – Outsmarting the ABGB and everything else?, ecolex 2017, 611.
Raskin, M. (2017), The Law and Legality of Smart Contracts, 1 GEO. L. TECH. TEV. 305 (2017).
Rinnerbauer, B., Homar, P.; Appl, C.; Parycek, P.; Hittmair, G.; Heidenreich, K.; Huber, A. (2017). Data Market Austria - First Report on Legal, Social and Cultural Aspects (Part I) (publicly available)
Sklaroff, J. (2018), Smart Contracts and the Cost of Inflexibility, University of Pennsylvania Law School Penn Law: Legal Scholarship Repository Prize Winning Papers.
Specht/Herold (2018), Roboter als Vertragspartner? Gedanken zu Vertragsabschlüssen unter Einbeziehung automatisiert und autonom agierender Systeme, MMR 2018, 40.
Veil, W. in Gierschmann, S., Schlender, K., Stentzel, R., Veil, W., Kommentar Datenschutz-Grundverordnung, 2018, Bundesanzeiger Verlag, Köln, Art 22, mn 4
Vulkan (1999), The Economic Journal 109 (February), USA, F 67-F90 (F86).
Wiebe, A. (2002), Die elektronische Willenserklärung, J.C.B. Mohr (Paul Siebeck), Tübingen.
WP 29 (2017), Guidelines on the right to data portability, 5.
WP 29 (2017a), Guidelines on Data Protection Impact Assessment (DPIA) and determining whether processing is „likely to result in a high risk" for the purposes of Regulation 2016/679
WP 29 (2018), Guidelines on automated decision-making, 5.

Co-funded by the Erasmus+ Programme of the European Union

3.1.4.2 MOOC

Hello, my name is Bettina Höchtl. I have been working as a member of the scientific staff at Danube University Krems for five years now. I have a legal background and my research interest is particularly the legal framework on data protection.

This MOOC shall first give you insights into the concept of personal data and enable you to name some factors that are relevant when determining if a dataset is a personal one or not. Additionally, you should become aware of legal issues of the use of social media data for decision-making and of data protection questions raised by the use of autonomous systems.

We increasingly produce and store data. The General Data Protection Regulation recognizes data as a possible driver for economy. At the same time, the data requires protection in order to strengthen the individual natural person. The GDPR pursues both goals.

It is important to know, that the special protection provided by the GDPR refers to personal data only. On the one hand, there is personal data, which has a clear relation to an individual natural person – which means to a human – such as my name together with my date of birth. Nevertheless, to determine whether data is personal data is not always that easy.

The definition of personal data encompasses data about persons who are identified and data about persons who are "identifiable". The second case can be challenging. Especially since it is not entirely clear, what the decisive factors are when determining whether data is personal data or not. Literature provides two theories to solve this question, namely the Relative Theory and the Absolute Theory. The Absolute Theory focuses on the question whether someone ("in the world") can link the data in question to an individual human. In contrast, the Relative Theory focuses on the concrete controller and the question if he is able to link the data to a person. A judgement of the European Court of Justice combines these two theories somehow. The European Court of Justice, exclusively in charge of interpreting EU-law, ruled that a dynamic IP-address is personal data for an operator of a website if he has legal means to link the data to the person together with the data available for the internet service provider of this.

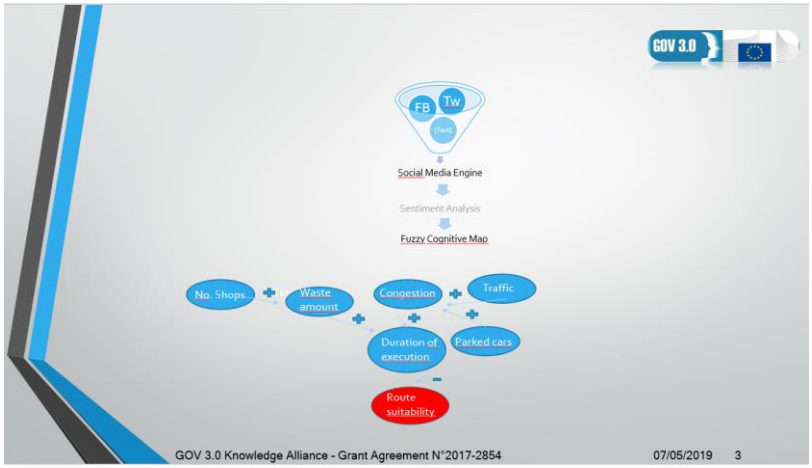
The Recitals provide information about some aspects the EU-legislator was considering when enacting the GDPR. Recital 26 says in order to determine if a natural person is identifiable, account should be taken of all the measures reasonably likely to be used either (and this is the most important aspect now) by the controller or by another person.

Here, you see four pictures. The first one depicts a fingerprint. Do you think this depicts personal data? (Pause) yes, it is biometrical data and for this reason a special category of personal data, because your fingerprint is unambiguously connected to you. The second picture shows the Central Station in New York. It shows very small depictions of people. They are not recognizable, they are visible as shadows and from this perspective, I would not say that this contains personal data. This assessment changes with different circumstances. If we know about one specific person, that this person arrives at the station at a specific point of time and leaves the station at a specified point of time, then you will be able to deduce from this information the place and time of work of this person. This would be personal data. The third picture shows a

Co-funded by the Erasmus+ Programme of the European Union

smartphone with some applications. A smartphone can contain a lot of personal information, for example, apps that you have saved, the documents that you have saved or the information collected through the sensors. This relates to you as an individual natural person and thus are personal data. Do you think the fourth picture, which shows a breakfast and a newspaper contains personal data? The question is whether a specific natural person is related to this data, whether you know about his or her preferences. It might be personal data if you know what type of newspaper this is and it might even be a specific category of personal data if you can deduce a specific political opinion of the type of newspaper.

Goals like increasing efficiency, facilitating processes and enabling each other to make use of innovative technology with strong safety and security measures characterize digital network society. Driven by these intentions, both public administration and economy thrive for an "optimized user experience" and want to facilitate communication. Addressing these developments, some of my research deals with a legal examination of (often technological) suggestions on how to make interactions between different players more efficient, innovative or simply easier.



SmartGov is such a suggestion. This research project, called Advanced decision support for Smart Governance combines a well-established, expert-based simulation tool (called Fuzzy Cognitive Maps) with a new type of input. This input tries to capture the citizen's perception of an issue making use of social media data.

Please remember the first part, where we have been emphasizing how to distinguish personal data from non-personal data and think about the nature of social media data. Do you think a regional government can include social media postings that they deem useful in their tool? This leads us to some core principles of data protection.

The principle of Fairness and Transparency appears through numerous rights to information for the data subject, which is the person, who relates to the personal data. The second crucial role is the one of the controller. Controller is the person deciding about the means and purposes of processing. This highlights the importance of the purpose. The principle of Purpose Limitation addresses the purpose. This points out that the purpose of the processing plays a big role in the legal decision if certain processing operation is lawful or not. As a principle, the data subject must have a sufficiently clear imagination of the purpose, but there are exemptions to this principle.

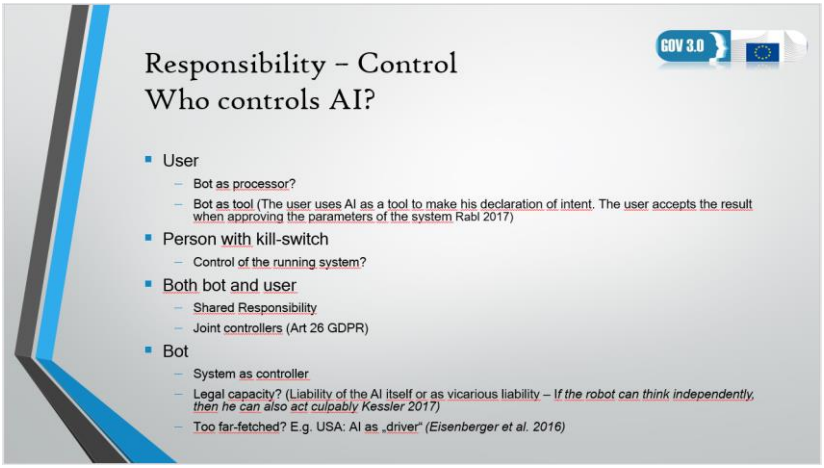
Data Minimisation and Storage Limitation underline the overall aim of data protection law, in a nutshell, controllers are obliged to process data to the amount necessary and not to simply keep data. The design of the principles is of course more nuanced, but this should give you just a first insight.

Where social media postings were published to the public, which means basically that everyone who can access the social network can access the postings, some people might think, these postings can be used by everyone for whatever. There are ongoing discussions in legal science, e.g. about the meaning of data made publically available and about the consequences of this. It would counteract the principle of purpose limitation if a social media user's consent can go so far as to include use by everyone for every purpose. No, it is not that easy. Posting content on social media leads to the options for lawful data processing provided by Art 6 GDPR and the question if and how these are applicable. Informed consent of

Co-funded by the Erasmus+ Programme of the European Union

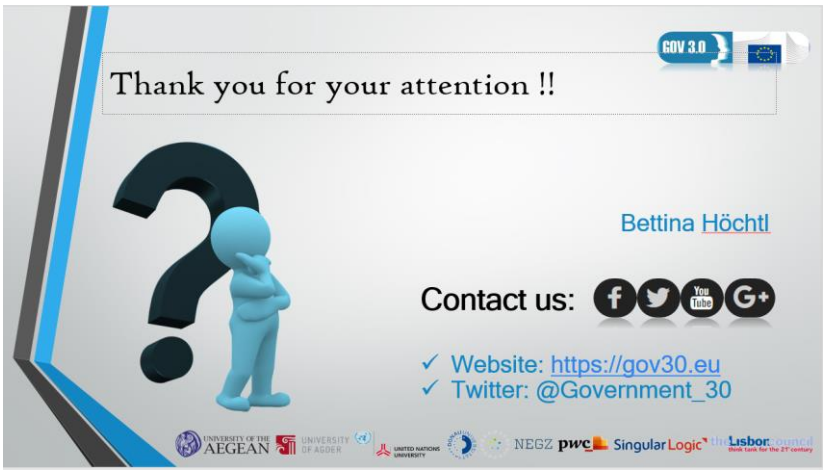
the data subject or a legally recognised reason why the processing is necessary can make the processing lawful. This could be the performance of a contract between the data subject and the controller, a legal obligation, vital interests of the data subject, tasks in the public interests and legitimate interests overriding the interests of the data subject in privacy of his/her data.

We have shortly shed light on the inclusion of social media in decision-making. Let us now draw attention to a different case, using autonomous agents for contract management.



Researchers have examined artificial intelligence for about 70 years; there are controversial views on the potentials and challenges related to these intelligent programmes. Application areas range from public administration to companies.

Part of the legal discussion addresses granting legal personhood to software agents, liability and data protection aspects. Against that background, the autonomous systems are defined as systems that alter their goals and that decide without external control and knowing that a controller is the one deciding on purpose and means of processing, I have raised the question if an autonomous system could in future take the role of a controller (Höchtl 2019). At least, it is obvious, that if an independent decision is a characteristic of this type of system, it does not fit together to assign no responsibility to the controlling programme. To put it different, categorizing a system as "autonomous" and at the same time treating it as a pure "tool" seems not justified. A pre-requirement for assigning liability to the system itself or to the system and the user jointly, is to assign some sort of legal capacity to this system. Regardless of whatever solution will be found, it is necessary to examine this question further from a legal point of view. (Höchtl 2019)



Thank you for your attention. Questions?

Co-funded by the Erasmus+ Programme of the European Union

3.2 Course 2: Digital Government II

3.2.1 Module 5: Datafication/Big Data Analytics

Compiled by: Francesco Mureddo, Lisbon Council (Belgium)

3.2.1.1 Reader

Introduction

Datafication, according to Mayer-Schönberger and Cukier (2013), is the transformation of social action into online quantified data, thus allowing for real-time tracking and predictive analysis. To put it simple it is about taking a previously invisible process or activity and turning it into data that can be monitored, tracked, analyzed and optimized.

With datafication any aspect of people's life can be turned into data: new technologies have made it possible to monitor, record and analyze everything around us as quantifiable data. A lot of our daily activity is now automatically monitored.

Nowadays, everybody is connected to the internet at least with a smartphone. Every time we connect to a social network such as Twitter, Facebook or LinkedIn, every time we make shopping online, a check-in on a plane, a theater or a cinema, we create data, an immense amount of data, hence the name big data.

The prediction is that by 2030 we will have over 100 trillion connected sensors, and in 2035 we will interact with a connected device every 18 seconds.

Contents

Big Data can be defined as massive and complex data sets that become so large, so rapidly, that are impossible to process using conventional methods. They may be analyzed computationally to reveal patterns, trends, and associations, especially relating to human behaviour and interactions. Business and government agencies dig into exponentially growing piles of metadata collected from social media, cell phones, cars, credit cards, sensors, photographs, videos, transactions, etc.

The characteristics of big data can be summarize with the 5Vs: Volume, Velocity, Variety, Veracity and Value:

- Volume is the quantity of generated and stored data
- Velocity is the speed at which the data is generated, collected and analyzed
- Variety is the type and nature of the data
- Veracity is the quality or the accuracy of the captured data
- Value is the worth of the extracted data and it is the most important aspect of big data. The real value comes from the insights that are generated from analyzing the big data.

Big data analytics is the complex process of examining large and varied data sets or big data to uncover information including hidden patterns, unknown correlations, market trends customer preferences and citizens' opinions that can help organizations and governments make better decisions. It is a form of advanced analytics, which involves complex applications with elements such as predictive models, statistical algorithms and what-if analysis powered by high performance analytics systems. With the ability to analyze big data, governments can monitor and optimize their budget allocation, to ensure costs savings and rendering their services faster, more efficient, transparent and user-oriented, also giving citizens a more proactive role in government.

Concerning the use of big data technologies in the policy cycle, according to Maciejewski (2017), big data supports better policy development and execution “by strengthening the information input for evidence-based decision-making and provides more immediate feedback on policy and its impacts”. According to Schintler and Kulkarni (2014), big data has great potential as a resource for helping to inform different points in the policy analysis process “from problem conceptualization to ongoing evaluation of existing policies, and even empowering and engaging citizens and stakeholders in the process”.

Big data can promptly identify emerging problems or even predict them reducing the costs of solving them. It can be useful also in the improvement of policies, getting immediate feedback, through collected data from social media, by citizens and stakeholders.

In short, big data tools and technologies present interesting opportunities to address some key challenges of data based policy making:

- Making sense of thousand opinions from citizens
- Identify cheaper and real-time proxies for official statistics
- Anticipate detection of problems, before they become intractable
- Uncover causal relationship behind policy problems
- Anticipate or monitor in real time the impact of policies
- Identify key stakeholders to be involved in or target by specific policies
- Generate a fruitful involvement of citizens in the policy making activity

Big Data in governance and policy making benefits apply to a wide variety of subjects

- Health Care: making care more preventive and personalized by relying on a home-based continuous monitoring, thereby reducing hospitalization costs while increasing quality. Detection of infectious disease outbreaks and epidemic development.
- Education: by collecting all the data on students' performances, it would be possible to design more effective approaches. The collection of these data is made possible thanks to massive web deployment of educational activities. Moreover, data can be used to update and upgrade prescribed literature for a variety of fields which are witnessing rapid development.
- Urban Planning: huge high fidelity geographical datasets describing people and places are generated from administrative systems, cell phone networks, or other similar sources.
- Transport: based on the analysis and visualization of road network data, so as to implement congestions pricing systems and reduce traffic.
- Energy: analysis and clarification of the energy pattern use through data analytics and smart meters, which can be useful for the adoption of energy saving policies avoiding blackouts.
- Environment: the use of ubiquitous data collection through sensors networks in order to improve environmental modeling and manage carbon footprint.
- Financial Risk: integrated analysis of contracts in order to find relations and dependencies among financial institutions in order to assess the financial systemic risk.
- Homeland Security: the analysis of conversations in social media networks, as well as the analysis of financial transactions carried out by alleged terrorists, which can be used for homeland security.

And furthermore:

- Assessment of computer security by the mean of the logged information analysis, i.e. security information and event management.
- Better track of food and pharmaceutical production and distribution chain.
- Collect data on water and sewer usage in order to reduce water consumption by detecting leaks.
- Use of sensors, GPS, cameras and communication systems for crisis detection, management and response.

The predictive power of the data can be applied to policy making in various applications:

- Human behaviour and social events can be predicted for example based on mobile phones, which can be used as sensors, as they can quantify human movements in order to explain changes in patterns. It is also possible to predict voting outcomes based on twitter activity.

Co-funded by the Erasmus+ Programme of the European Union

- Public health: with tools such as Google Flu Trends, which is based on the prevalence of Google queries for flu-like symptoms, it is possible to detect epidemic outburst. However knowledge about some limits of these kind of tools is significant. As pointed out by Lazer et al. (2014), in the end the prevalence of flu in the 2011/2012 and 2012/2013 seasons was overestimated by more than 50%. So, accurate analysis of the data is important, because data can be misleading.
- Global food security: in thirty years human population will reach around 9 billion individuals. The world food production will have to increase by 60% by increasing the agricultural production and fighting water scarcity. FAO is launching an online data portal which will enhance planners' and decision makers' capacity to estimate agricultural production potential and variability under different climate and resources scenarios.
- Environmental analysis: various agencies and institutions are creating tools and services for scientists, researchers and policy makers in order to share and analyze environmental and geospatial data in order to make sustainability decisions.
- Crisis management and anticipation: big data can be used for crisis management and anticipation by building up crisis observatories, i.e. laboratories devoted to collecting and processing enormous volumes of data on both natural systems and human techno-socio-economic systems, in order to gain early warnings of impending events.
- Global development: one example is Global Pulse, a big data based innovation program fostered by UN Secretary-General and aimed at harnessing today's new world of digital data and real-time analytics in order to foster international development, protect the world's most vulnerable populations, and strengthen resilience to global shocks.
- Intelligence and Security: about national security there are programs developed to detect cyber espionage activities in military computer networks. One other example is a program that recognize as anomalous individual actions with comparison to a background of routine network activity. There is also in act a research on data that can be used by first responders to tackle with natural disasters and terrorists attacks, by law enforcement to deal with border security concerns, or to detect explosives and cyber threats.
-

Conclusion

Big data implies also various challenges for the governments, such as complexity, storage, security and privacy but also the need of new technologies and human skills. Finding competent and advanced data scientists in data mining and analysis is often a difficult task.

Storage is becoming a strategic asset as the spread of structured and unstructured information drives concerns about backup, recovery and archiving in government. Small budgets, the constantly growing government information and the switch to digital information make it hard for government agencies to rightsize their traditional big data storage. Many agencies are rethinking the role of traditional storage and deploying a cost-efficient and combined approach of tape for archival storage, disks for often requested records, and cloud storage for big data information.

One other big challenge for governments is in matter of legality and security while dealing with big data. There is a very fine line between collecting and using big data for predictive analysis and ensuring citizens' privacy. According to Stefan Strauß (2015), together with its supportive relationship with surveillance, big data can reinforce a number of related threats, such as profiling, social sorting and digital discrimination. For instance, users of privacy tools such as Tor might become classified as terrorists by the NSA surveillance software "xkeyscore". Moreover, quoting Mayer-Schönberger and Cukier (2013), a more extreme example of the danger of over-reliance in the predictive power of big data is that if big data could predict that an individual will commit a crime before it happens, people could be punished for their propensity to commit a crime. This raises concerns about the ethical considerations of the role of free will versus the dictatorship of data.

Regarding privacy, a concrete risk is unintended data breach, which can have serious consequences, because the larger is the concentration of personal data, the more attractive is a database to criminals.

References

Apiumhub, The Concept Of Datafication; Definition & Examples, August 2017 medium.com

Gang-Hoon Kim et al., Big Data Applications in the Government Sector: A Comparative Analysis among Leading Countries, March 2014 researchgate.net

Maruti Techlabs, Top 10 sectors making use of Big Data analytics, July 2017 towardsdatascience.com

Viktor Mayer-schönberger and kenneth Cukier, Big Data: A Revolution That Will Transform How We Live, Work, and Think, 2013

MIT Technology Review Insights, Big Data, Bigger Responsibility, May 2015 www.technologyreview.com

Adelaide O'Brien, The Impact of Big Data on Government, October 2012 ironmountain.com

David Osimo et al., Towards Policy-making 2.0 - International Roadmap and case studies on ICT for Governance and Policy Modelling, 2015

Margaret Rouse, Contributors: Mark Labbe, Lisa Martinek and Craig Stedman, September 2018. searchbusinessanalytics.techtarget.com

Sagar Sanghvi, Datafication – An Era of Big Data, April 2016 promptcloud.com

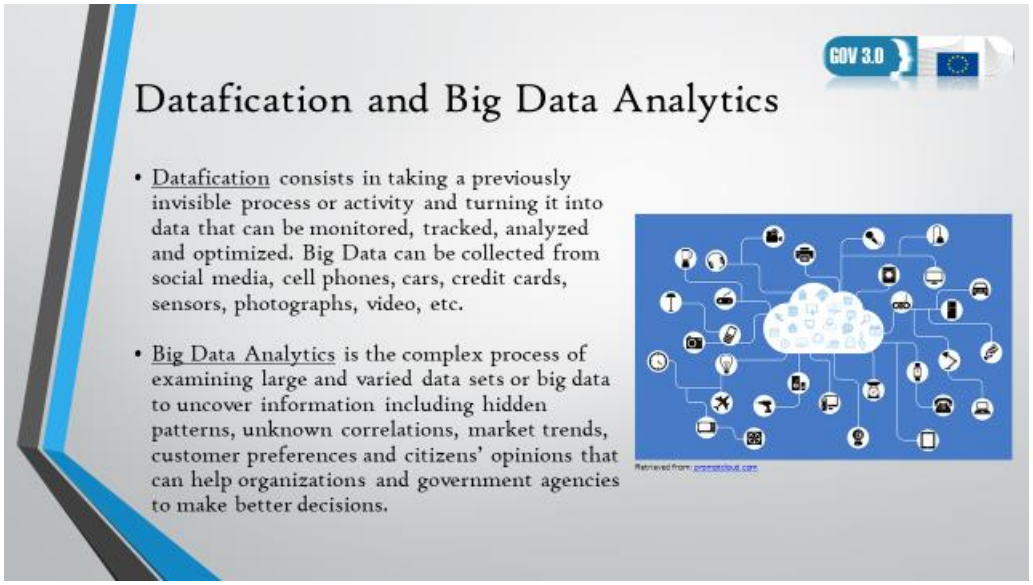
Stefan Strauß, Datafication and the Seductive Power of Uncertainty —A Critical Exploration of Big Data Enthusiasm, December 2015 www.researchgate.net

World Economic Forum, Big Data, Big Impact: New Possibilities for International Development, January 2012 weforum.org

3.2.1.2 MOOC

Hello I am Francesco Mureddu

In this presentation I am going to talk about datafication and big data analytics and how they can improve (governance and policy making).

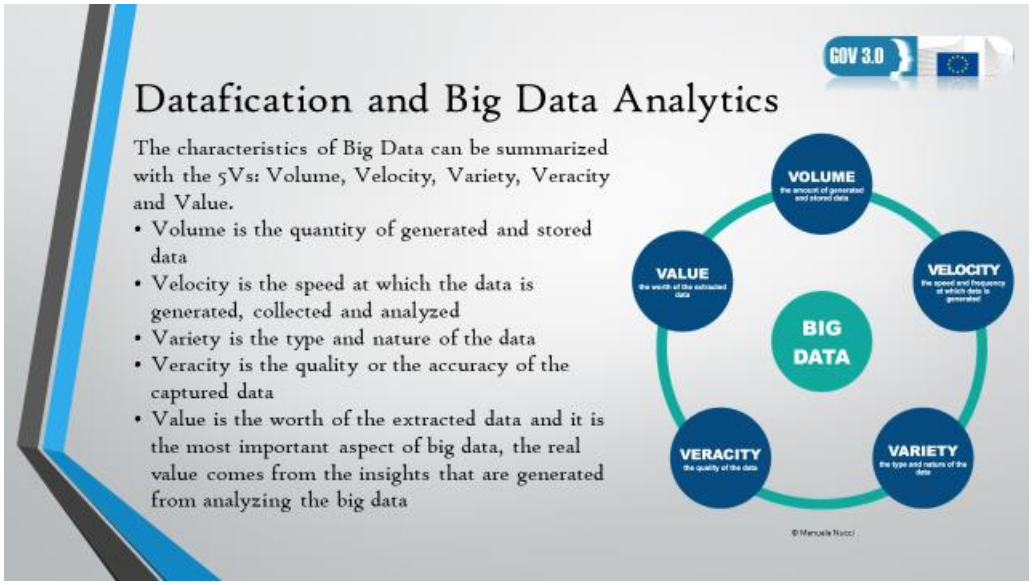


Datafication is "the transformation of social action into online quantified data thus allowing for real-time tracking and predictive analysis"

Co-funded by the Erasmus+ Programme of the European Union

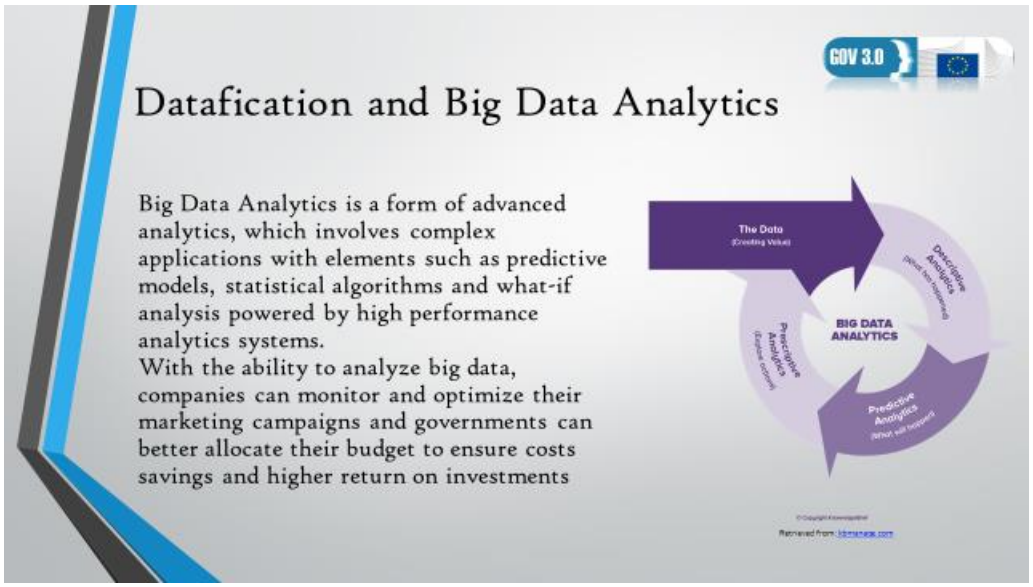
Nowadays we are all connected to the internet via smartphones, social networks such as Twitter or Facebook, cars, credit cards, e-shops, videos and many more. All these actions can be transformed into data, which can be observed, tracked, analyzed and optimized. A big part of our daily activity is now monitored. The amount of data generated is huge, hence called big data. All the data can be analyzed to reveal patterns, trends and association, especially related to human behaviour and interactions.

The characteristics of big data can be summarized with the famous 5 Vs: volume, which is the quantity of generated and stored data; velocity, which is the speed at which the data are generated, collected and analyzed; variety is the type and nature of the data; veracity is the quality or the accuracy of the data and finally we have value, which is the worth of the extracted data and it is the most important aspect of data, the real value comes from the insight generated from analyzing the big data.



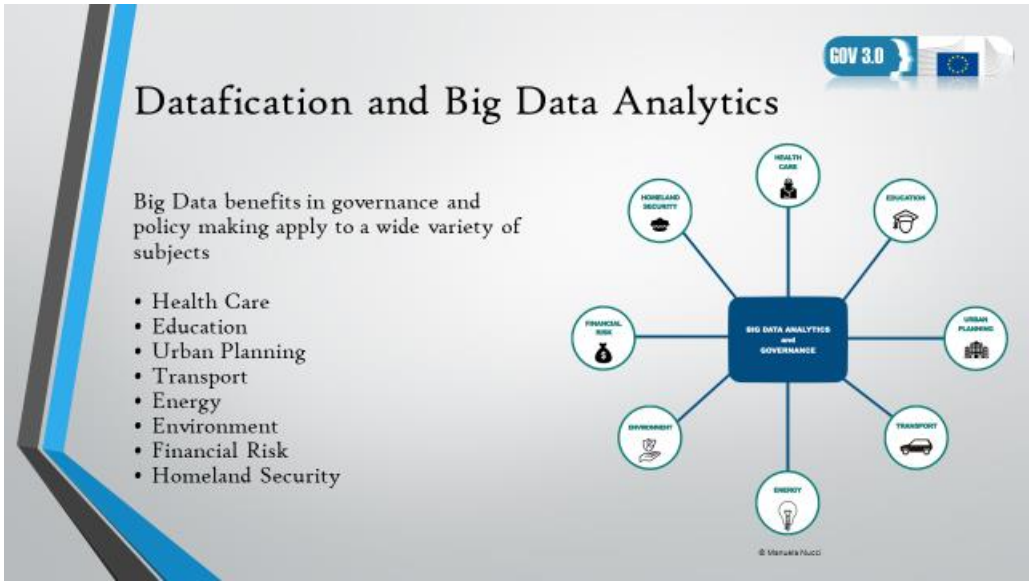
Big data analytics is the complex process of examining data sets to uncover information, market trends, castumer preferences and citizens' opinions, etc. With the ability to analyze big data, governments can monitor and optimize their budget allocation to ensure costs savings and rendering faster, more efficient, transparent and user-oriented services, also giving citizens a more proactive role in policy making.

Co-funded by the Erasmus+ Programme of the European Union



With big data governments can identify emerging problems and even predict them, reducing the costs of solving them.

Policy making can be improved in many ways thanks to data analysis and the sectors that can see benefits are several.



In healthcare for example is now possible to reduce hospitalization costs while increasing quality and giving more preventive and personalized care. With tools such as Google Flu Trends, which is based on the prevalence of Google queries for flu-like symptoms, it is also possible to detect infectious disease outbreaks.

Concerning education, by collecting data on students' performances it is possible to design more effective approaches.

Transportation instead can be improved by analyzing road network data, so as to implement congestions pricing systems and reduce traffic.

The analysis of big data can be applied to urban planning as well. It is in fact possible to retrieve huge amount of information from high fidelity geographical data sets generated from administrative systems, cell phone networks or other similar sources.

Co-funded by the Erasmus+ Programme of the European Union

Data analytics can be used to analyze energy use patterns in order to adopt energy saving policies. It is also possible to use data collection through sensors in order to improve environmental modelling and to efficiently manage the carbon footprint.

The analysis of conversations on social media or financial transactions carried out by alleged terrorists can be used for homeland security.

We can also avoid financial risks analyzing contracts in order to find relations and dependencies among financial institutions.

The predictive power of the data can be applied to policy making and to several others applications, such as assessment of computer security via, for example, security information and event management.

Another relevant application is a more efficient track of food and pharmaceuticals production and distribution chain. It is also possible to collect data on water and sewer usage to reduce water consumption. Moreover, the use of sensors and GPS, cameras and communication systems allows to detect and properly manage crisis situations.

Based on mobile phone activity we can predict human behaviour; it is possible for example predict voting outcomes based on Twitter activity or explain changes in patterns by quantifying human movements, using mobile phones as sensors.

One crucial matter is global food security. Food production must be increased because in thirty years the human population will reach around 9 billions individuals. For this reason FAO is launching an online data portal, which will enhance planners' and decision makers' capacity to estimate agricultural production potential and variability under different climate and resources scenarios.

Various agencies are creating tools and services for scientists, researchers and policy makers in order to share and analyze data aimed to make sustainability decisions regarding the environment.

By building up crisis observatories, such as laboratories devoted to collecting and processing data on both natural systems and human techno-socio-economic systems, is possible to manage crisis with anticipation.

An interesting example of the use of big data in global development comes from UN Secretary-General. It is an innovative program called Global Pulse, which aims at channelling today's digital analysis to foster international development, protect the world's most vulnerable populations and strengthen resilience to global shocks.

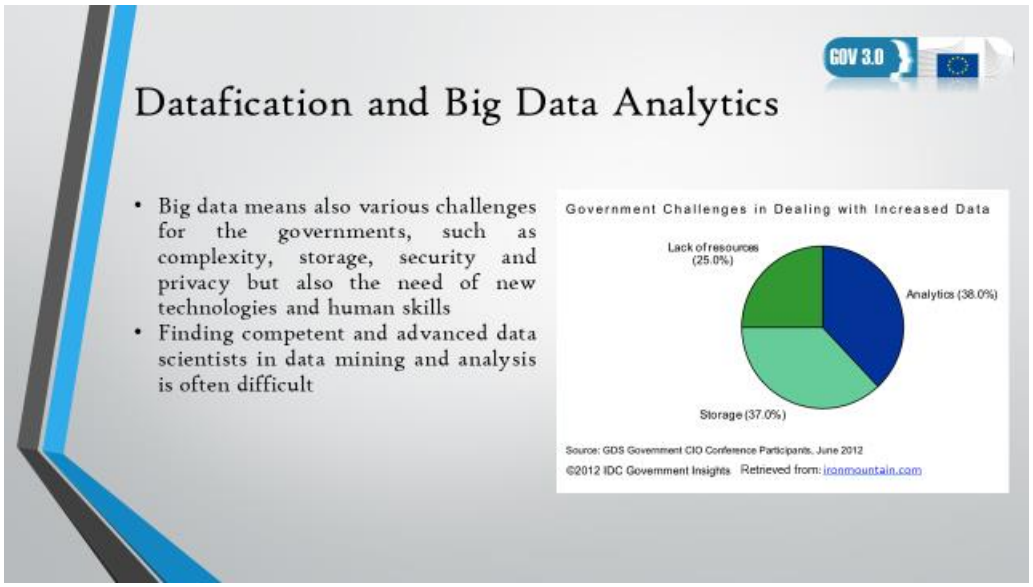
Regarding intelligence and security there are programs developed to detect cyber espionage, others focused on recognizing anomalous individual actions based on comparison with a background of routine network activity.

Big data can be used by first responders to manage natural disasters and terrorist attacks, or by law enforcement to deal with border security concerns or to detect explosives and cyber threats.

Big innovations bring also some challenges for the governments, mostly regarding complexity, storage, security and privacy, but also the need of new technologies and human skills. Data mining and analysis need highly skilled data scientists.

Many agencies are rethinking the role of traditional storage and deploying a cost-efficient and combined approach of tape for archival storage, disks for often requested records, and cloud storage for big data information.

Co-funded by the Erasmus+ Programme of the European Union



One big challenge concerns legality and security while dealing with data. There is a very thin line between collecting and using big data for predictive analysis and ensuring citizens' privacy. Big data, together with surveillance can reinforce a number of related threats, such as profiling, social sorting and digital discrimination. One can risk to be classified by NSA as a terrorist just for using privacy tools such as Tor.

Regarding privacy an other risk is unintended data breach that can have serious consequences such as blackmail, identity theft and many more.

Thank you for your attention!

Co-funded by the Erasmus+ Programme of the European Union

3.2.2 Module 6: Open Government Data

Compiled by: Lőrinc Thurnay, MSc Danube University Krems (Austria)

3.2.2.1 Reader

Introduction

This reader introduces Open Government Data—what Open Government Data is, how does it relate to similar concepts, what are its main objectives, benefits and pitfalls. We discuss the quality of Open Government Data—an issue concerning both data users and releasing organizations—as well as other concerns throughout the Open Data Lifecycle. Finally, we introduce Open Data Portals, and as inspirational examples, some Open Government Data use cases.

Content

What is Open Data and Open Government Data

Open Data (OD) has several definitions. From a technical point of view Dietrich (2012) defines Open Data as „freely accessible data on the Internet, reusable under open licenses, provided in appropriate machine-readable formats". If we approach Open Data from the perspective of a potential user, Open Data might be defined as "accessible public data that people, companies, and organizations can use to launch new ventures, analyze patterns and trends, make data-driven decisions, and solve complex problems" (Gurin 2014).
Another approach to understand what Open Data is is to look at a list of criteria that make data Open Data. Charalabidis et al. (2018) propose the following critera (explanations by the author of these notes):

- Data must be primary—data should be published by the source, or close to the source, as opposed to data published by someone who modified, reinterpreted the data;
- Complete—completion in terms of content and format; the data is described to cover a certain topic, that should be fully covered, with no records missing (or at least not without explanation);
- Timely—Data should be published as soon as realistically possible, i.e. not only archives, but current data.
- Machine processable—Digital provision of data does not necessarily mean that data is machine processable as intended if the format in which data is stored does not match with how given data could logically be interpreted and processed. E.g.: a spreadsheet typically contains data that may be bases for calculations. In this case, providing a spreadsheet as a digital image file *does* contain the information, but calculations cannot be performed on them.
- Available online—If users can only access data in offline manners (e.g.: picking up on a storage device in person), data cannot be fully considered as Open Data. Very large volumes of data that are not practical to transmit over the Internet might be exceptions.
- Accessible in a non-discriminatory way—data should be accessible to everyone under the same conditions;
- Accessible in non-proprietary format—data might be provided free of charge and with permissive licenses, but if it can only be used with software that is not free of charge or does not ship with permissive licenses, it cannot be considered as Open Data fully.
- Non-restrictive licenses—Freely using, sharing, adapting should generally be allowed for data to be considered open[1].
- No (or minimal) costs—Open Data should be free of charge. Exception might be in case the provision of data to an individual user incurs significant costs to the provider, e.g.: in case of very large volumes of data.
- As accurate as possible—similarly to completeness, data should contain what it promises to contain, as accurately as can be reasonably expected.

Open Government Data is Open Data released by governmental (or other public) organizations, typically mandated by laws such as national Freedom of Information Acts (FoIA). Freedom of Information Acts, providing the public right to access public data based on requests have been implemented since its original inclusion of the Universal Declaration of Human Rights (Vijayakumar and Vijayakumar, 2004), however these do not satisfy the criteria of OD, because public data is not provided automatically and not necessarily in a timely manner, and obviously lacking the digital perspective. President Obama's memo on Transparency and Open Government (2009) and the following Open Government Data Act first laid out and mandated Open Data as we know it in the US, with the European Union following suit with its Public Sector Information (PSI) Directive (2013).

[1] See Creative Commons to learn more from non-restrictive licenses: creativecommons.org

Linked Data means that sctructured and machine-readable data is published in a way that allows for an easy linkage between different data sets originating potentially from different sources. Linked Data allows for semantic querying: structured information is provided to explain the context and the nature of data records, that facilitates linkage between records of the same nature between different sources, and clears the context (semantic meaning) of certain records.

Big Data has several definitions, depending on the approach. For our purposes, Big Data data that is too big to be handled in conventional methods (e.g. in a spreadsheet), instead has to be handled with targeted solutions and extra value can be realized bexause of its volume. It is typically private (not open) data, collected in a passive manner, for example Facebook's databases, or a large online retailer's sales records. In general, while we examine Open Data in terms of availability, we examine Big Data in terms of size.

Objectives and Benefits

There are three main reasons behind Open Data initiatives, and why organizations—public or private— might open up datasets that they manage in the previously discussed manners. Open Data 1) brings about transparency and accountability; it 2) promotes innovation and improved efficiency and 3) encourages engagement and participation.
Transparency and accountability resulting from an organization opening up their datasets means that Open Data users will have a better understanding of the organization's operation and decision making mechanisms. Based on data, citizens may reflect on the operation of these organizations. In case of a governmental organization, this means improved openness of the government. One of the arguments for Open Government Data is that data is created or collected with public resources, about the public, therefore should belong to the public. Secondary benefits of the transparency and accountability objective of OD is potentially increased trust in the publishing organization (if published data proves the prudent operation of the organization) and improved public image.

The business value of data in our age is widely known and discussed (see e.g.: Vertesi and Dourish, 2011). An organization opening up datasets that may freely be accessed by the public (e.g. data that by being opened does not hinder the organization itself) opens the door for new *innovation* in the economy based on these data, as well as potential *increased efficiency* either in the economy or even directly related to the publishing organization. For example, based on an opened up dataset a startup might build a tool that helps people understanding the contents of the data in questions, and thus helping them make better data-driven decisions that have direct or indirect positive effects on the economy. Related to this, the reuse of data (i.e. not having to collect or create the same data that has already been collected by another organization) frees up resources in the economy that can be used in productive ways.

Open Data encourages *engagement and participation* of the public. Everyone in the public having free access to the same data might form public discourse. It gives a powerful resource in the hands of journalists and investigator, both professional and citizens. OD potentially leads to co-creation, when new services, products, and enriched data is created, outside of the publishing organization—increased value of a direct or indirect cooperation.

Innovation and engagement combined can lead to improvement of Open Data quality, which potentially further strengthen OD benefits (as discussed later). Transparency and public engagement characteristics of OD may lead to improved policy making in the public sector, if fitting Open Government institutional measures are introduced.

Quality of Open Data

Quality of Open Data is one of the most important factors that concern the usability and actual value of OD. Data with poor quality require more interpreting and pre-processing effort to use, and may, partially or completely, render data unfit for usage. Quality issues are common with OD for several reasons ranging from lack of preparation, resources, attention, lack of testing or direct re-usage by the publishing organization.

Quality issues concern Open Data in different ways:

- The data itself, both in terms of content and format. Such quality issues may occur regarding accuracy, standards (i.e. geographic information is described in a non-standard way, e.g.: custom created country codes instead of the ISO 3166-1 standard), consistency (e.g.: "City" value is "New York" in one row, "NYC" in another), completion, timeliness, uniqueness (duplicate records serving no intentional purpose), amongst others.

Co-funded by the Erasmus+ Programme of the European Union

- Metadata—it is the description of the data at hand to help users understand and work with the data. Common issues include non-existing or incomplete metadata (e.g.: if we just have a file "data.xlsx" with no explanation, we might not be able to identify it is the data we are looking for), understandability (linguistic issues with the descriptions), accuracy, lack of (contact) details about the publisher (making it impossible to contact them for feedback or clarification), missing publishing data, missing licensing information, etc.
- Data quality issue regarding linkability.
- For example, the reader might have encountered the issue of downloading a CSV (Comma-Separated Values) file from the internet, upon opening it with their default editor, Microsoft Excel, the data records appear concatenated in one long cell, instead of separate columns, as intended. This is often because the file is using non-standard CSV format, for example using ";" semicolons as separators instead of "," commas, as the file type's name would also suggest, and their software does not handle non-standard formats automatically[2].

The Five Star Rating of Open Data

Sir Tim Berners-Lee, the inventor of the World Wide Web, has created the five star rating of Open Data, rating the value and usefulness of OD3.

Data gets *one star* if it is uploaded to the Internet in any format, with an open license. One can look, store, share and manually transcribe to later edit such data. Lots of data are published that would qualify for one star—the publication process is simple, the publisher just has to press save, or scan a document, and upload it to the Internet.

Data gets *two stars* if it fits the previous requirements, and in addition is in a machine-readable format. As mentioned earlier, having a scanned spreadsheet from a paper in an image file is not machine-readable, one cannot perform the intended calculations on it, therefore to qualify for two stars, one has to publish data in a structured format. For example, in case of spreadsheets, in Microsoft's legacy proprietary Excel file format, XLS. On two-star datasets user can, in addition to the previous, perform calculations, visualize, aggregate, and export data into other formats.

Your data gets *three stars* if it meets the two-star requirements, but instead of any machine-readable formats, it is provided in non-proprietary formats. Excel files would not qualify, because they are a proprietary format owned by Microsoft. CSV, on the other hand, is a non-proprietary format, so CSV files would get three stars.

Data gets *four stars* if it is published in accordance with the RDF standard. RDF stands for Resource Description Framework; it is a *Linked Data* standard allowing data interchange on the Web, facilitating linkability between data sets. The principle of RDF linking is similar to clickable links as we know them from our Internet browser, with the addition that the nature of the linkage is also specified. For example, while the Wikipedia article of Edgar Allan Poe has a clickable link to the article about the city of Baltimore, the relation between the two articles is only explained in English free text, easily understandable by humans, but not by the computer. RDF includes the nature of the linkage in a machine-readable format as part of the link, in this case, specifying that "Edgar Allan Poe" (subject) has a "birthplace" linkage to "Baltimore" (object). Linkage information are called "predicates", and subject-predicate-object combinations describing a linkage are referred to as "triplets". If data are published in an RDF compatible format, they qualify for four stars.

To get a *five star* rating, data does not only have to comply with RDF, it must have its record already linked to (open) definitions and schemas. So, based on the previous example, it is not enough to describe the relationship between two entities; one must also link to a standardized, openly accessible reference to these entities. For example, DBpedia is like a machine-readable Wikipedia, linking to "Edgar Allan Poe", "hasBirthplace" and "Baltimore" in DBpedia using the standard schema described by schema.org would fulfill five star criteria.

Lifecycle

[2] To address this particluare issues, see support.office.com/en-gb/article/import-or-export-text-txt-or-csv-files-5250ac4c-663c-47ce-937b-339e391393ba

[3] See 5stardata.info/en/

Co-funded by the Erasmus+ Programme of the European Union

When studying the "life" of Open Data, one can identify several phases with distinct characteristics, stakeholders, opportunities, challenges, limitations. Several such categorizations exist (see for examples: Boley and Chang, 2007; Harrison, et al., 2012; Heimstädt, Saunderson, and Heath, 2014, as identified by Charalabidis et al., 2018).

For our purposes, we will discuss the following phases of the Open Data lifecycle: collection or creation, preparation, publishing, usage, collaboration and feedback.

Collection or creation of OD refer to the processes in which primary data to be opened up is collected, or created, by the publishing organization. For example, in case of governmental administrations collect and create a plethora of data in their normal operation—registries, inventories, accounts, budgets, statistics, censuses, archives, and so on, and therefore methodologies used for the collection or creation also cover a wide range. While data collection or creation would often happen regardless of whether the resulting datasets is to be opened up, the collection or creation phase should be studied as an integral phase of the OD lifecycle.

Ideally, the collection or creation of data that is to be opened up already happens with consideration to the requirements of OD. For example, since OD should be published adhering to relevant industry standards, therefore—unless it is specifically impractical or impossible—data should be collected or created in these standards. With this, publishers save costs and reduce the chance of quality issues by eliminating the need of a subsequent conversion from custom formats to standard formats. Unfortunately, this is commonly not the case, as roles and responsibilities of data collection or creation and data publishing often lay at different units in an organization, with limited degrees of cooperation and authority to influence each other's processes.

Even if data collection or creation happens with OD in mind (and especially if it does not), *preparation* of data to be opened up is needed. There are several reasons for this. First, internal usage of data might have different practical needs than the (assumed or real) needs of the public. Then, data might contain sensitive information in terms of privacy, security, or competition, which should be filtered, obfuscated, anonymized, or aggregated before release. If it has not happened before, appropriate formats, structures and standards should be applied, opportunities to semantic enrichment and linkability should be considered and taken advantage of. Very important, that metadata describing the data must be prepared with consideration to the quality issues discussed earlier, and an appropriate license must be applied. The identification what data sets could be and should be published itself is a challenging task requiring a broad overview of the operational, legal, technical structure, as well as the data repositories of an organization, and also the public's needs.

Once properly prepared, Open Data can be *published*. Organizations may elect to use different platforms to release their data to the public (e.g.: their websites, or open data portals), or in case of governmental organizations, the platform may be mandated by law. Publishing on Open Data portals is practical, and often mandated for governmental agencies, as this gives users a central point where they can find a big range of data sets from several organizations, in a standard, searchable, filterable way. OD may also be published via web application programming intefaces (APIs), which is increasedly mandated (Europa.eu, 2018). APIs, unlike graphical user interfaces (GUIs) such as websites, are designed to interface between application and application, and therefore publishing OD over APIs allows for further automation of OD integration into software solutions.

Organizations might want to promote the publication of their data sets to increase visibility and reach of their data, thus further enabling the potential benefits of OD. Organizations may be reluctant to publish data because of costs involved, organizational risks, pushback against necessary changes in organizational structure and processes, or lack of understanding of the objectives and potential benefits of Open Data.

The *usage* of Open Data is of course the most prominent phase of the OD lifecycle. Once the data goes outside the perimeter of the publishing organization, it starts to live its own life in the hand of users with different use cases, needs, and goals. OD is used by journalists, NGOs, citizens, educators, academia, and governmental agencies, with widely ranging potentials benefits, as introduced earlier. Publishing organizations should always keep in mind that the data that they open up will finally be used, and should aim to enable users to achieve maximum benefits of OD at every step of the OD lifecycle.

Co-funded by the Erasmus+ Programme of the European Union

Collaboration between users of Open Data is a beneficial phenomenon that requires some sort of collaboration platform. Collaboration platforms can be online ones, such as forums or groups, where users can discuss data sets, comment on records, share creations that were built on OD, or collaborate directly on OD-enabled projects. Offline collaboration platforms, coding clubs, camps, conferences, and so on also exist, creating an even stronger OD community, and encouraging bringing about benefits of OD focused on local or regional issues.

Finally, *feedback* from users of OD and the OD community to publishing organizations is the phase that makes the OD lifecycle a cycle. By using OD, people will have comments, suggestions, complaints about the contents, quality, metadata, publishing methods and processes and other aspects of OD. By receiving, analyzing and reacting on feedback, changes based on the actual requirements of OD constituents can be introduced to future releases of OD, further increasing the potential value of public data.

Data Portals

Open Data portals are the most typical sources where users might find OD to be used. OD portals can host regional, national, or international OD, may host industry sector-specific data. Organizations that publish a large number of data sets might decide maintain their own, organizational OD portals.
In Europe, the European Data Portal[4] aggregates data sets from national data portals of European countries, creating a single, standardized, point of access for European OD, with advanced search and filtering capabilities. In the United States, data.gov hosts OD from sources all over the American public administration. Typical for OD portals, both portals categorize datasets by typical concerns of public administration, such as agriculture, energy, regional issues, transport, economy and finance, international issues, justice, environment, education, health, population and society, and science and technology, allowing users to browse and discover data sets by their interests.

Open Data Portals are often implemented utilizing the CKAN software. CKAN, an open source data management system and de facto OD portal standard comes with a standard set of APIs, enabling interaction between data portals and the creation of software solutions that hook into the functionality of Open Data portals—offering enhanced search functionality, data analysis, automatic data-based services, and others.

Use Cases

Open Data is a resource, free to use for everyone. Possibilities and use cases are many and come in a wide range: from high school students finding source information for the home works, through investigative journalists uncovering government corruption, to large industrial entities creating integrated, automated, mission critical OD-based decision making systems. Here I bring two real life examples, to give an illustration as to what OD is used for, and as a source of inspiration.
Riigiraha[5] is a visualization tool built by the Estonian Ministry of Finance, using Open Data about spending of central government, local governments and that of social security funds. The tool's aim is to make the government sector´s financial activities more transparent and understandable by showing historic and continuously updated, current figures, charts and illustrations on government spending. Its "Where does my money go?" section lets users enter their monthly income figures and their municipality, and illustrates with figures and numbers, exactly what part and amount of their income taxes payed is spent on what purpose—expenses of fire departments, foreign diplomatic missions, railroad infrastructure, etc. This increases government transparency and potentially reinforces taxpayers in the feeling that their taxes are payed for good reason, are put to good use, and make them a valuable contributor to their societies.

openlaws[6] is an Austrian company providing a legal information networking project for legal professionals to find, work and collaborate on legal information. Reportedly, they base almost all of their operation and turnaround on Open Data from several European countries. They use OD as a source of their products—data as a service (DaaS) portals and mobile application for legal professionals—but also for the optimization of their internal processes.

[4] See: europeandataportal.eu

[5] See: riigiraha.fin.ee

[6] See: openlaws.com

Co-funded by the Erasmus+ Programme of the European Union

The European Data Portal, in addition to their data repositories, collected and published a database of Open Data use cases[7] where one can find volumes other use cases by location, sector, keyword or type, to get further inspiration, or to get in touch with people and organizations who have experience and know-how with regards to the use of Open Data in practice.

Conclusion

Open Government Data is a valuable resource from economic, democratic, societal and academic perspectives. It has the potential to bring about innovation, optimal economic performance, government transparency and increased trust, as well as increased public participation. The value and potentials of OGD diminishes by a number of organizational, technical and political factors, such as data or metadata quality, lack of willingness or resources to publish, or follow through with necessary organizational changes. Ideally, however, Open Governmental Data is readily accessible for anyone, including the reader of this reader, whether they are professionals with in depth knowledge of data analysis, or curious students or citizens wanting to discover these open, public resources.

References

Boley, H., and E. Chang. "Digital Ecosystems: Principles and Semantics." In *2007 Inaugural IEEE-IES Digital EcoSystems and Technologies Conference*, 398–403, 2007. https://doi.org/10.1109/DEST.2007.372005.

Charalabidis, Yannis, Anneke Zuiderwijk, Charalampos Alexopoulos, Marijn Janssen, Thomas Lampoltshammer, and Enrico Ferro. *The World of Open Data: Concepts, Methods, Tools and Experiences*. Public Administration and Information Technology. Springer International Publishing, 2018. https://www.springer.com/us/book/9783319908496.

Dietrich, D., et al.: Open data handbook documentation, p. 11 (2012)

Europa.eu. "Proposal for a Revision of the Public Sector Information (PSI) Directive." Text. Digital Single Market - European Commission, April 25, 2018. https://ec.europa.eu/digital-single-market/en/proposal-revision-public-sector-information-psi-directive.

Gurin, Joel. Open Data Now: The Secret to Hot Startups, Smart Investing, Savvy Marketing, and Fast Innovation. 1 edition. New York: McGraw-Hill Education, 2014.

Harrison, Teresa M., Theresa A. Pardo, and Meghan Cook. "Creating Open Government Ecosystems: A Research and Development Agenda." *Future Internet* 4, no. 4 (December 2012): 900–928. https://doi.org/10.3390/fi4040900.

Heimstädt, Maximilian, Fredric Saunderson, and Tom Heath. "From Toddler to Teen: Growth of an Open Data Ecosystem." *JeDEM - EJournal of EDemocracy and Open Government* 6, no. 2 (November 4, 2014): 123–35. https://doi.org/10.29379/jedem.v6i2.330.

Obama, Barack. "Transparency and Open Government." whitehouse.gov, January 21, 2009. https://obamawhitehouse.archives.gov/the-press-office/transparency-and-open-government.

Vertesi, Janet, and Paul Dourish. "The Value of Data: Considering the Context of Production in Data Economies." In *Proceedings of the ACM 2011 Conference on Computer Supported Cooperative Work*, 533–542. CSCW '11. New York, NY, USA: ACM, 2011. https://doi.org/10.1145/1958824.1958906.

Vijayakumar, Manju, and J. K. Vijayakumar. "Right to Information and Freedom of Expression." In *Information, Communication, Library and Community Development*, edited by S. Gopalakrishnan and B. Ramesh Babu. B R Publishing, 2004. http://eprints.rclis.org/7222/.

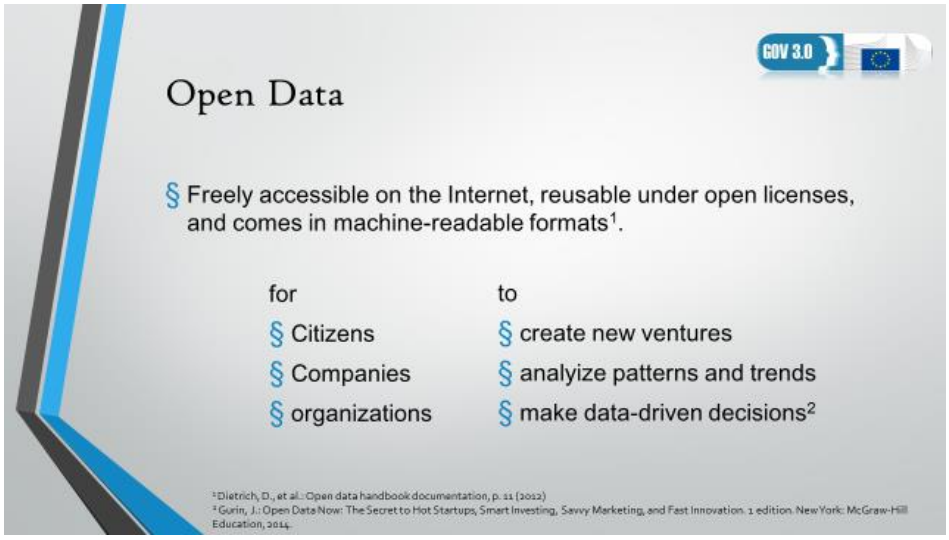
Zuiderwijk, Anneke, Marijn Janssen, and Chris Davis. "Innovation with Open Data: Essential Elements of Open Data Ecosystems." *Information Polity* 19, no. 1,2 (January 1, 2014): 17–33. https://doi.org/10.3233/IP-140329.

[7] See: europeandataportal.eu/en/using-data/use-cases

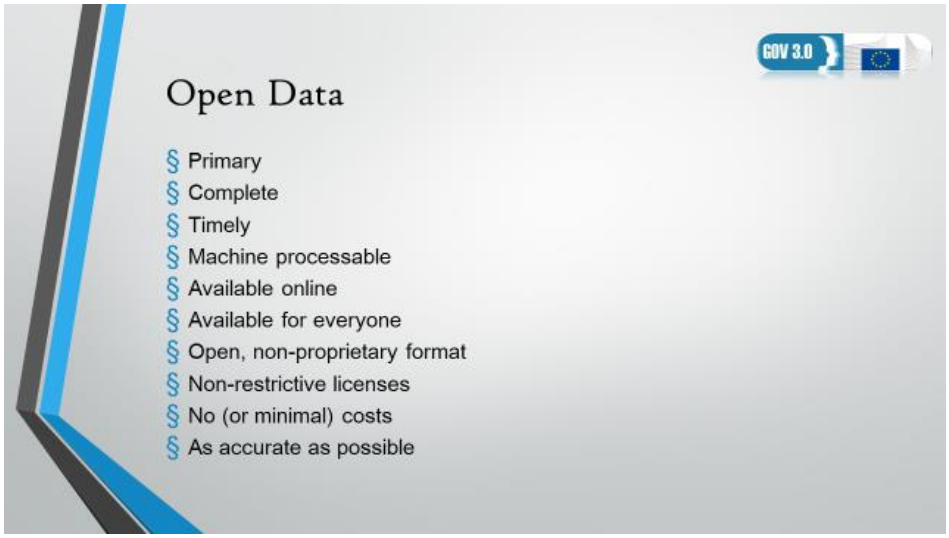
Co-funded by the Erasmus+ Programme of the European Union

3.2.2.2 MOOC

Hi, my name is Lőrinc Thurnay. Today I am going to talk about Open Government Data, what Open Government Data is, what are the potential benefits and pitfalls of Open Government Data, and how it can be used.



So, what is Open Data?

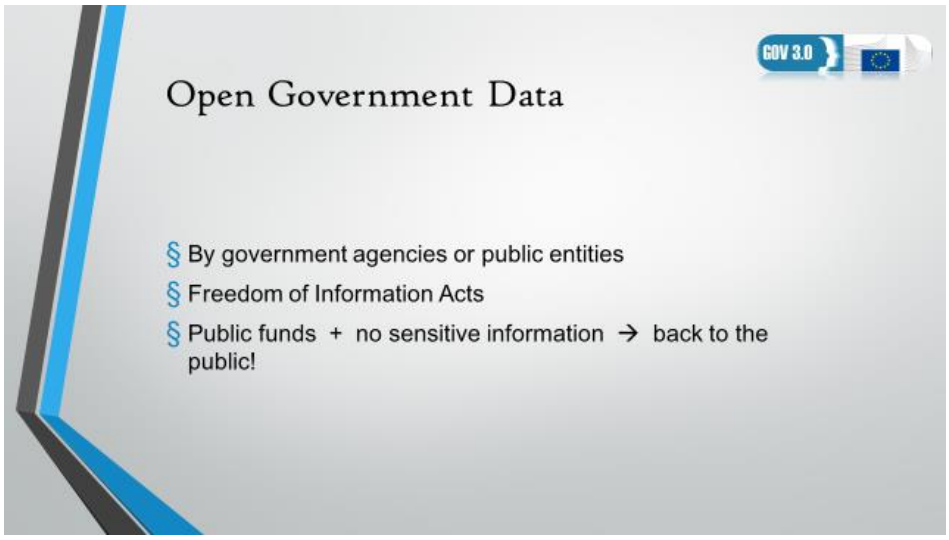


Technically speaking, Open Data is data that is freely accessible on the Internet, reusable under open licenses, and comes in machine-readable formats. Open Data is meant for citizens, companies and organizations to create new ventures, analyze patterns and trends and make data-driven decisions. Ideally, Open Data is:

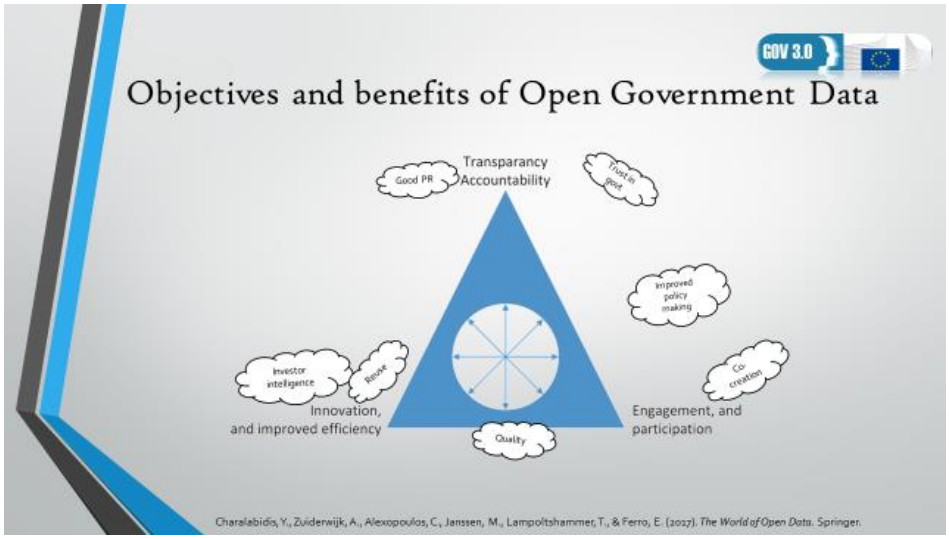
- Primary – which means it comes straight from the source,
- Complete – includes everything it says it would include, nothing missing,
- Timely – which means data is released as soon as possible, so users can use current data,
- Machine processable,
- Available online – so, having to go to City Hall in person to request data is not Open Data!,
- Available for everyone,
- In open, non-proprietary format – you should be able to work with Open Data using open software,
- Non-restrictive licenses,

Co-funded by the Erasmus+ Programme of the European Union

- At no (or minimal) costs,
- And as accurate as possible.



Open Government Data is Open Data that is published by Government Agencies, or other entities with public funding. In many jurisdictions, governments are mandated to publish Open Data by law, typically by national Freedom of Information Acts. If data is created with public funds, and does not contain sensitive information, why not release it back to the public?



There are three main objectives of Open Government Data. Let's go through these, and see what the benefits they bring about are.

The first objective is to *increase transparency and accountability of government*. By releasing data collected and used by an organization, citizens can better understand how an agency operates, and how their data-driven decision making mechanisms work. Open Government Data gives a powerful tool into the hand of citizens, journalists and organizations to hold government accountable. For instance, an investigating journalist might download Open Data on public procurement, and cross-referencing it with the Company Register build a data analysis tool to help him uncover corruption.

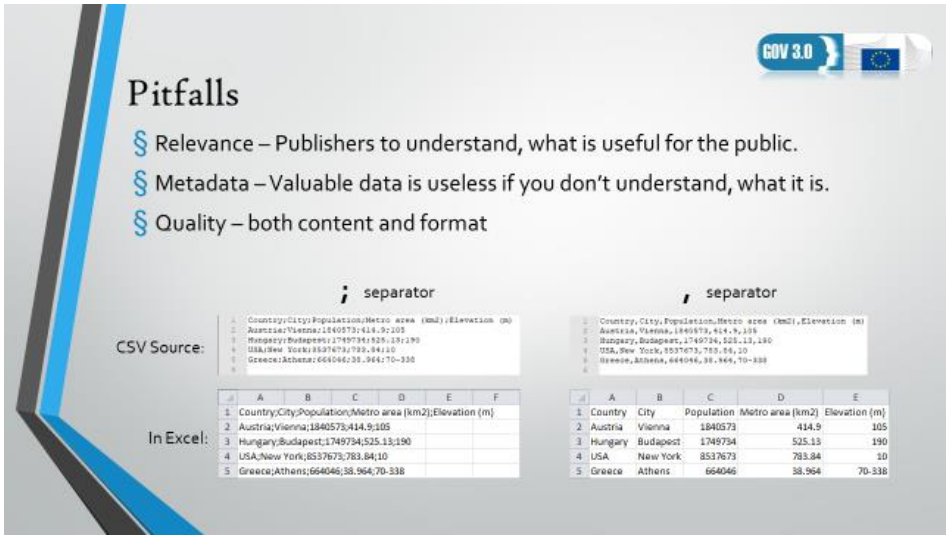
The second objective of Open Government Data is to promote *innovation and improved efficiency*. It is becoming common knowledge that data are valuable resources. More meaningful data open the door for new innovation and increased efficiency in the economy in general and directly related to the publishing organization. For example, a startup may build a tool that helps people understand the contents of certain Open Data, and thus encouraging them to make better data-driven business decisions. Open Data available for everyone also eliminates the need for different organizations to produce

Co-funded by the Erasmus+ Programme of the European Union

the same data independently from each other, reducing duplicate efforts in the economy, freeing up resources to perform more valuable activities.

The third objective of Open Government Data is to *encourage public engagement and participation*. When Open Government Data reaches—in one way or another, directly or indirectly—a wide audience, it can form public discourse. Collaboration between people with different skills and backgrounds can potentially lead to co-creation: resulting in new Open Data-driven services and products. Open Government Data—with appropriate institutional measures—can allow citizens to engage the government in policy making, which strengthens the democratic institutions of the whole country. In essence, Open Government Data enables people to take part in democratic processes in a better informed way.

So, we see that Open Government Data carries tremendous potential value. However, realizing this value is often made difficult by different pitfalls. Let's take a look at a few typical pitfalls when it comes to releasing and using Open Government Data.



For Open Government Data to bring about real value, it has to be relevant and useful for its users. If an organization publishes data that only makes sense in the context of the organization's internal processes, the public will not have much use of it. Publishing organizations have to understand and identify, which data sets are useful for the public.

It is very important, that data sets are described properly—in other words, that they have appropriate metadata. Descriptions help users understand what the data they are dealing with contains, in what format, language, range, precision, geographic or temporal relevance… and so on. Without a proper description, it is not only difficult to find the dataset you are looking for, it is also difficult to use it. For example, if you have an Excel file with the name "table 1", with a bunch of numbers in it, it *might* be the data you are looking for, but without proper headers and descriptions, you won't know which numbers mean what.

One of the common issues with Open Data is quality. Obviously, not only the descriptions of data have to be of good quality, but also the data itself. On one hand, the content of the data should be of high quality – it should be as accurate as possible, complete, with nothing missing, but also unique, with no duplicates. On the other hand, the format of the data it is presented in should also be of high quality. It is advisable to use appropriate standards wherever possible (for example: using ISO standard country codes, instead inconsistent, self-assigned ones), to be consistent in naming (as, for example using NYC in one row and New York City in another makes it look like the two are different entities), to use correct character encoding, so special characters show up on all modern systems correctly, and so on. If either of these qualities is missing, the data is going to be more cumbersome to use, or the decisions that one makes based on the data will not reflect reality adequately.

Let's take a look at a relevant data quality example, that you may have already had first-hand experience with. You might have encountered the issue of downloading some data in CSV (Comma-Separated Values) format from the internet. When

Co-funded by the Erasmus+ Programme of the European Union

you opened it with your default editor, Microsoft Excel, the data records appeared in an unstructured way, all in one column, instead of nice spreadsheet. This happens because of a *quality* issue: the file is using a non-standard CSV format, for example using *semicolons* as the separator character, instead of *commas*. Excel expects separator characters to be *commas*, since commas are the standard, so it cannot display your data correctly – not without changing specific settings, anyway.

If you are looking to try your hands with Open Government Data, you can start by visiting relevant Open Data Portals. Typically, Open Data Portals focus on national, regional or international Open Data, but you might find industry specific Data Portals, too. In Europe, the European Data Portal aggregates data from national data portals of EU member states, making it a single, easy-to-use point-of-access for European Open Government Data, with advanced search and filtering capabilities. You can check it out at europeandataportal.eu, or the main American Open Data portal at data.gov. Typically, Open Government Data portals categorize datasets by typical concerns of public administration, such as agriculture, energy, transport, and so on, allowing users to browse and discover data sets by their interests.

The European Data Portal, in addition to all the available Open Data, collected and published a database of Open Data use cases, browsable by location, sector, or keyword, for you to find inspiration to get started with Open Government Data. You can find this database at this link on the screen[8].

To summarize: Open Government Data is a valuable resource from economic, democratic, societal and academic perspectives. It can enable innovation, optimal economic performance, increased trust and transparency of government, and also increased public participation. Open Governmental Data is readily accessible for anyone, including you, whether you are professional with in depth knowledge of data analysis, or a curious student or citizen wanting to discover these open, public resources.

[8] See: europeandataportal.eu/en/using-data/use-cases

Co-funded by the Erasmus+ Programme of the European Union

Thank you very much for watching. Good-bye!

Co-funded by the Erasmus+ Programme of the European Union

3.3 Course 3: Disruptive Technologies in the Public Sphere – Digital Government III

3.3.1 Module 7: Smart City Government/IoT

Compiled by: Prof. Leif Flak, University of Agder (Norway)

3.3.1.1 Reader

Introduction

The smart city phenomenon emerged in the late 1990ies and has gained substantial attention after the turn of the century both among practitioners and researcher. The key motivation behind the focus on smart cities is addressing challenges related to the increasing urbanization worldwide. Already in 2008, 3,3 billion people lived in urban areas and it is estimated that by 2030 the number will reach 5 billion. The increase in population density is expected to challenge life quality in the urban areas in a number of ways, including energy consumption, transportation, pollution levels, waste management, public service provision and participation in democratic processes To meet these challenges, urban areas need to become "smarter" in order to maintain a status as an attractive area to live, work and study.

Content

Key components with emphasis on technology

The conceptual framework of Nam and Pardo (2011) suggests that smart city development can be viewed as the interplay between technology factors, institutional factors, and human factors.

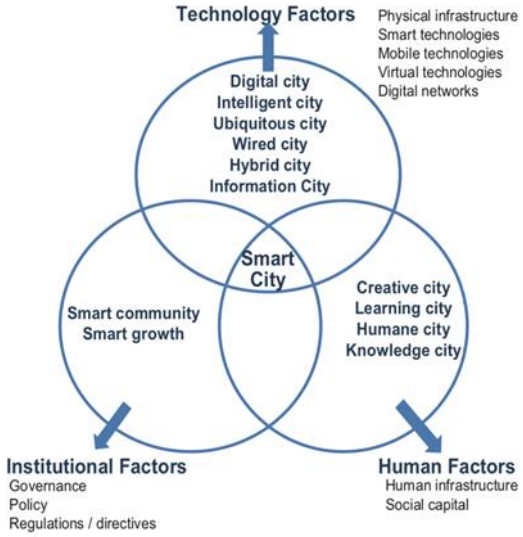


Figure 6: Foundational components of Smart City (Nam & Pardo, 2011)

Although a number of technologies are necessary in smart city development, it is generally agreed that smart city development is highly data driven. Phenomena like IoT (Internet of Things), Big data and Data analytics are often seen as key technological enablers of development (Hashem et al, 2016). IoT refers to the increasing number of Internet connected sensors that can be used for various measurements, e.g. energy consumption, traffic, maintenance needs, personal health monitoring and so on. Sensors need to be connected to the Internet to be useful. Connectivity indicates that networks and infrastructure are important factors in smart city development. Connected sensors generate huge amounts of data – often referred to as "Big data". Big data provides the foundation for data analytics – in simple terms computerized analysis of large amounts of data. Data analytics are predominantly used for predictions but also as a basis for automation in several areas as suggested by Hashem et al. (2016) below.

Table 1: Smart City applications (Hashem et al., 2016)

Application	Specific Use	IoT	Possible Communication Technologies	Advantages	Limitations
Smart Healthcare	Health monitoring,	Sensors, smart wearable devices	Bluetooth and ZigBee	—Early diagnose the disease	—Lack of precision
Smart Transportation	Efficient route management	Smart Cars, Cameras, RFID cards	RFID, 3G, and 4G	—Automatic traffic management —Efficient route management —Less congestion	—Network disconnectivity can cause serious accidents
Smart Governance	To make smart policies with the aim of managing the citizens	Smartphones, cameras, sensors	WiFi, LTE, LTE-A, WiMax, Bluetooth, LoRaWAN,	—Awareness in terms of citizens needs —Clear policy	—Collection and analysis of data seem difficult task
Smart Grid	To manage the power supply	Smart meters and Smart readers	WiFi, Zigbee, Z-Wave	—Efficient power supply —Future needs estimation	—Costly —Hard to manage

Vidiasova, et.al. (2017) found a number of factors and perspectives in the literature on smart cities. These are summarized in the table below.

Table 2: Perspectives on smart city literature (Vidiasova et al., 2017)

Table 1. Summary of Perspectives on the literature review about smart cities

Relevant Factors and Perspectives	Contributors
"stakeholders relations", "information technologies" and "e-government"	Hall et al., 2000 [5] Lombardi, Giordano, Farouh, & Yousef, 2012 [29] Chourabi et al., 2012 [4] Gil-Garcia & Aldama-Nalda, 2013 [6]
"knowledge-intensiveness" and "information intensiveness"	Kourtit and Nijkamp, 2012 [17] Nam & Pardo, 2011 [7]
"innovation and entrepreneurship"	Hollands, 2008 [2]; Paskaleva, 2011 [8]; Zygiaris, 2013 [9]
"city planning"	Batty, 2013 [12]; Anthopoulos & Vakali, 2012 [11]
"citizen-participation"	Gil-Garcia, Zhang, & Puron-Cid, 2016 [15]; Granier & Hiroko Kudo, 2016 [16]
"governance"	Meijer & Bolívar, 2016 [13]; Pereira, Macadar, & Testa, 2016 [14]
"open government and open data"	T. M. Harrison et al., 2012 [31]; Kuk & Davies, 2011 [32]
"environmental sustainability"	Pardo & Gil-Garcia et al., 2015 [1]
"social and cultural pluralism"	Priano & Guerra, 2014 [24]
"education and training"	Lazaroiu & Roscia, 2012 [25]
"health services"	Carli, Dotoli, Pellegrino, & Ranieri, 2013 [26]
"social security and protection"	Afonso, dos Santos Brito, do Nascimento, Garcia, & Álvaro, 2015 [27]
"economic planning and organization"	Perboli, De Marco, Perfetti, & Marone, 2014 [28]
"data analytics and big data"	Aguilar, 2016 [19]; Hashem et al., 2016 [20]

Defining Smart City

A plethora of definitions on smart cities have emerged. Nam and Pardo (2011) and Chourabi et al. (2012) have provided overviews of some of the existing definitions to illustrate the variety of existing definitions. The variety of definitions inevitably leads to conceptual confusion and hinders cumulative research. To address this, Ojo, Curry, and Janowski (2014) summarized existing definitions (table below).

Table 3: Elements of smart city definitions (Ojo et al., 2014)

No	Description	Reference
Nature	*Is a* (1) forward-looking City in the areas of economy, people, governance, mobility, environment and lifestyle; (2) form of urban innovation; and (3) Intellectual Capital Profile of a City	Giffinger et al. 2007), (Nam, Taewoo; Pardo, 2011), (Zygiaris, 2012)
Essence	*Means to* (1) Information access, bridging digital divide, lifelong learning, social inclusion and economic development; sustainable economic growth and urban development, higher quality of life; and wise management of natural resources; (2) innovative socio-technical and socio-economic growth of a city	(Hollands, 2008) , (Vasseur & Dunkels, 2010), (Zygiaris, 2012)
Approach	*Involves* (1) investments in human and social capital; (2) investment in traditional (transport) & modern (ICT) communication infrastructure; (3) promoting participatory governance and engagement of citizens; (4) technological, organizational and policy innovation	(Caragliu et al., 2009), (Nam, Taewoo; Pardo, 2011)

Co-funded by the Erasmus+ Programme of the European Union

Smart city governance

"…is a form of smart governance, enabling and allocating decision-making rights to stakeholders (in particular citizens) to participate in effective and efficient decision-making processes to improve the quality of life in cities" (Pereira et.al., 2019, p 30)

Outcomes and measurements

Outcomes of smart city initiatives can be both positive and also somewhat negative. The bullet lists below suggests some commonly mentioned positive outcomes and concerns.

Positive Improvements in e.g.

- Transportation
- Services
- Energy consumption
- Water and waste management
- Cost effectiveness
- Participation

Concerns

- Privacy and security
- Technology outpaces policy and law
- Decision makers do not understand the smart city potential
- More equality or just better for the rich?

Conclusion

It is interesting to note that several smart city benchmark initiatives have emerged. These range from taking a very technical approach to extensive and comprehensive assessments such as these:

https://www.ieseinsight.com/doc.aspx?id=2124&ar=&idi=2&idioma=2

https://www.smartcitygovt.com

Different rankings apply different assessment criteria and consequently different cities come out on top. The variety in assessments can be seen as an indication of an immature field where key indicators are still being discussed. See below for examples of how cities rank differently according to different criteria.

Co-funded by the Erasmus+ Programme of the European Union

The Top 20 Global City Performance by Index, 2017

	Mobility	Health	Safety	Productivity
1	Singapore	Singapore	Singapore	Singapore
2	San Francisco	Seoul	New York	London
3	London	London	Chicago	Chicago
4	New York	Tokyo	Seoul	San Francisco
5	Barcelona	Berlin	Dubai	Berlin
6	Berlin	New York	Tokyo	New York
7	Chicago	San Francisco	London	Barcelona
8	Portland	Melbourne	San Francisco	Melbourne
9	Tokyo	Barcelona	Rio de Janeiro	Seoul
10	Melbourne	Chicago	Nice	Dubai
11	San Diego	Portland	San Diego	San Diego
12	Seoul	Dubai	Melbourne	Nice
13	Nice	Nice	Bhubaneswar	Portland
14	Dubai	San Diego	Barcelona	Tokyo
15	Mexico City	Wuxi	Berlin	Wuxi
16	Wuxi	Mexico City	Portland	Mexico City
17	Rio de Janeiro	Yinchuan	Mexico City	Rio de Janeiro
18	Yinchuan	Hangzhou	Wuxi	Yinchuan
19	Hangzhou	Rio de Janeiro	Yinchuan	Hangzhou
20	Bhubaneswar	Bhubaneswar	Hangzhou	Bhubaneswar

Source: Juniper Research

Figure 7: [Top 20 global city performance by index 2017]

Co-funded by the Erasmus+ Programme of the European Union

Figure 8: Cities in motion index 2018

References

Anthopoulos L. (2015) Understanding the Smart City Domain: A Literature Review. In: Rodríguez-Bolívar M. (eds) Transforming City Governments for Successful Smart Cities. Public Administration and Information Technology, vol 8. Springer, Cham

Eden strategy institute (2018). Top 50 Smart City governments. Online: https://static1.squarespace.com/static/5b3c517fec4eb767a04e73ff/t/5b513c57aa4a99f62d168e60/1532050650562/Eden-OXD_Top+50+Smart+City+Governments.pdf

Gil-Garcia, J. R., Pardo, T. A., & Nam, T. (2015). What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization. Information Polity 20 (1): 61–87.

Co-funded by the Erasmus+ Programme of the European Union

Hashem, I.A.T., Chang, V., Anuar, N.B., Adewole, K., Yaqoob, I., Gani, A., Ahmed, E. and Chiroma, H. (2016). The role of big data in smart city. International Journal of Information Management,Volume 36, Issue 5,Pages 748-758.

Meijer, A., & Bolívar, M. P. R. (2016). Governing the smart city: a review of the literature on smart urban governance. International Review of Administrative Sciences 82(2): 392–408.

Nam, T. and Pardo, T.A. (2011). Conceptualizing smart city with dimensions of technology, people, and institutions. In Proceedings of the 12th Annual International Digital Government Research Conference: Digital Government Innovation in Challenging Times (dg.o '11). ACM, New York, NY, USA, 282-291.

Ojo, A., Curry, E. & Janowski, T. (2014). Designing Next Generation Smart City Initiatives - Harnessing Findings And Lessons From A Study Of Ten Smart City Programs. ECIS 2014 Proceedings - 22nd European Conference on Information Systems.

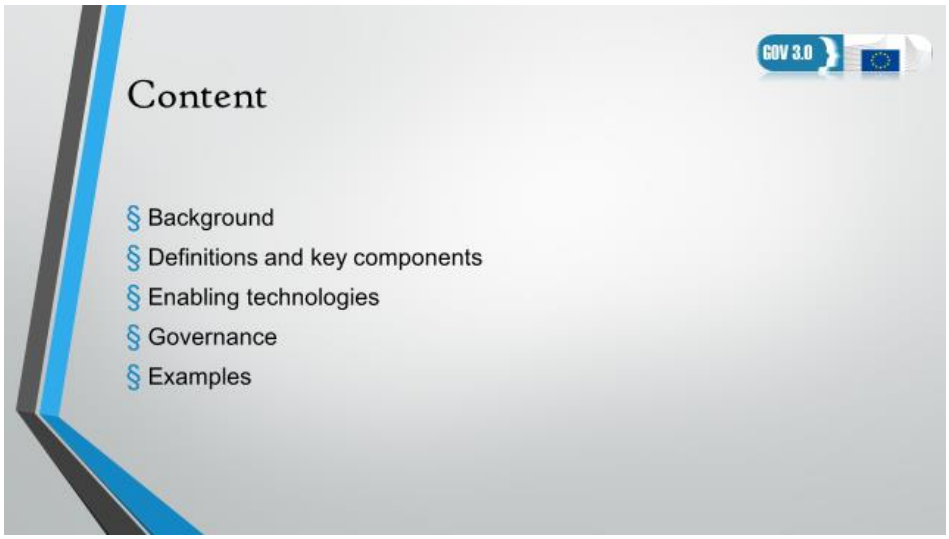
Pereira, G., Parycek, P., Falco, E. & Kleinhans, R. (2018). Smart governance in the context of smart cities: A literature review. Information Polity. 23. 1-20. 10.3233/IP-170067.

Vidiasova, L., Kachurina, P. and Cronemberger, F. (2017). Smart Cities Prospects from the Results of the World Practice Expert Benchmarking, Procedia Computer Science, Volume 119.

3.3.1.2 MOOC

Hello, my name is Leif Skiftenes Flak. I work for the University of Agder where I am heading the newly established Centre for Digital Transformation - CeDiT. CeDiT is a social science research center that brings together scientists from different disciplines to study the impact of digitalization on society. Before working with CeDiT, I have close to 20 years of experience with research in the area of electronic government – eGovernment for short. This presentation is about Smart cities, which in some ways can be seen as a continuation of eGovernment at the local level.

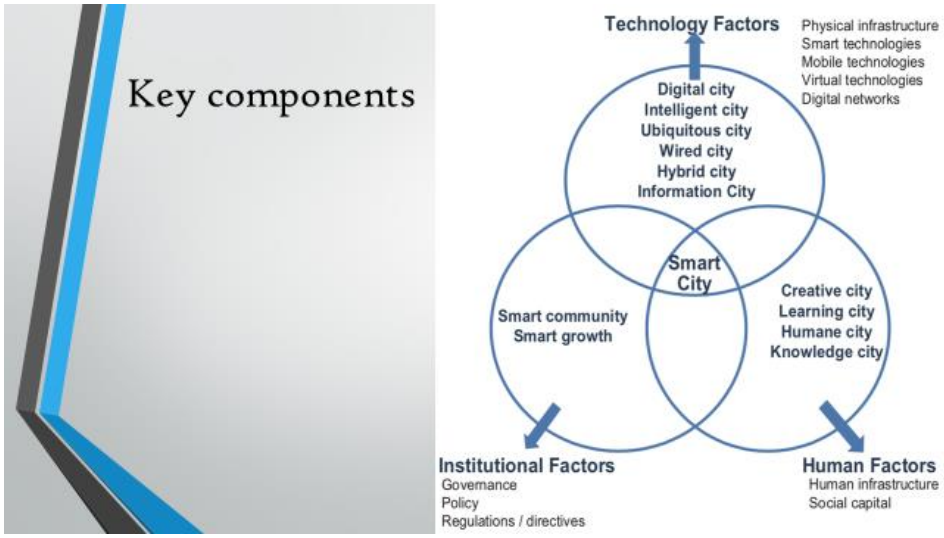
In this video, I will outline the basic concepts of smart cities. The **learning objective** is that after having watched this video, you should understand the smart city phenomenon and be able to describe it to others.



In order for you to understand smart cities, you need to understand what led us to focus on smart cities in the first place. Then it makes sense to outline the key components of smart cities that we can start to develop a shared understanding. Smart cities are highly data and technology driven and we will touch upon some key technologies used in smart city initiatives. As smart cities in some ways challenge existing ideas about governance we also need to talk about governance. Finally, I´ll show a few examples to of existing smart cities.

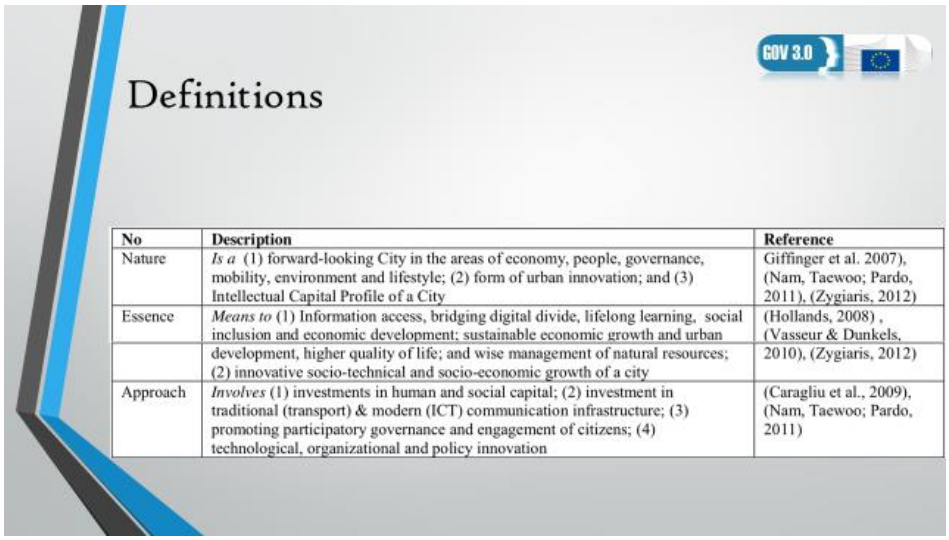
Co-funded by the Erasmus+ Programme of the European Union

Background. 2008 marked the year when more than 50 percent of all people, 3.3 billion, lived in urban areas. By 2030 this number is expected to increase to 5 billion. As more and more people live in cities – and cities expand to sizes we have never before encountered, maintaining the cities as attractive places to live, work and study is becoming challenging. Increasing population density brings about challenges related to e.g. energy consumption, waste management, traffic, air quality – just to mention some of the key issues. In short, the problems of population density is seen as so severe that new ways of thinking about city development is necessary in order to maintain quality of life in the cities. In practice, some emerging technologies enabled us to do exactly that.



Key components. Smart cities are often understood as the intersection of institutional, human and technology factors. This simply means that technology is becoming much more influential on how we organize cities and how we as humans act and interact than in the past. We see that advancements in technology are influencing city policies and regulations. It is becoming commonplace that cities, even medium to smaller cities, develop smart city strategies or action plans to ingrain technology as a foundation for city attractiveness. This has far reaching consequences and challenges existing ideas about how we govern our cities. This is an issue in itself and we will get back to that shortly. Further, it is important to understand that the key driver for smart city development is to improve conditions in the daily lives of us as citizens, workers, students, etc. I think it is fair to say that new technology gave rise to new policies and plans that should eventually improve human conditions in a number of areas.

Co-funded by the Erasmus+ Programme of the European Union



No	Description	Reference
Nature	*Is a* (1) forward-looking City in the areas of economy, people, governance, mobility, environment and lifestyle; (2) form of urban innovation; and (3) Intellectual Capital Profile of a City	Giffinger et al. 2007), (Nam, Taewoo; Pardo, 2011), (Zygiaris, 2012)
Essence	*Means to* (1) Information access, bridging digital divide, lifelong learning, social inclusion and economic development; sustainable economic growth and urban	(Hollands, 2008) , (Vasseur & Dunkels,
	development, higher quality of life; and wise management of natural resources; (2) innovative socio-technical and socio-economic growth of a city	2010), (Zygiaris, 2012)
Approach	*Involves* (1) investments in human and social capital; (2) investment in traditional (transport) & modern (ICT) communication infrastructure; (3) promoting participatory governance and engagement of citizens; (4) technological, organizational and policy innovation	(Caragliu et al., 2009), (Nam, Taewoo; Pardo, 2011)

Definitions. To add precision, you can see definitions of the nature, essence and approaches to smart cities on your screen.

Enabling technologies. Technology is at the heart of smart city initiatives and data is the very core. The ability to generate, analyze and use data to automate, streamline or sometimes invent entirely new services is central in smart cities. To be able to do this we need a number of technologies. In this video, I´ll focus a few of the key technologies that enable smart cities.

The first is **Internet of things – IoT**. IoT refers to the use of sensors in increasingly more of the things we use or come in contact with in our daily lives. Sensors measure various properties of objects. But sensors alone is not IoT. However, when sensors are connected to the Internet, they are key enablers of what we call the Internet of things as they transmit the properties of objects. Today we put sensors in e.g. watches, cell phones, trash cans, cars, roads, bridges, tunnels, water pipes and so on. All these sensors generate massive amounts of data – and Internet traffic.

The amount of Internet traffic generated by IoT, leads us over to another key enabling technology, namely **5G**. 5G is the next generation mobile communication technology that will provide sufficient bandwidth for wireless transmission of sensor data. Further, 5G has other properties that will benefit smart cities. We can connect more devices to a 5G network than previous generations and delays in communications are dramatically reduced.

But having data and sufficient communication technology is not sufficient. We also need technology that can make sense of large data sets. Making sense of large sets of unstructured data is exactly the strength of **Artificial Intelligence – AI**. Recent advances in micro-processors and machine learning algorithms has made AI extremely capable and is by many

Co-funded by the Erasmus+ Programme of the European Union

considered to be one of the most influential technologies over the next years. AI and various data analytics approaches are necessary for smart cities to make sensible use of all the data they have at their disposal.

The 3 mentioned technologies, or technological trends, are of course not the only ones with relevance for smart cities but they are among the most important.

I mentioned the importance of **governance** earlier. Let´s talk briefly about governance. Developing a smart city means thinking differently about city development. It requires leaders to distance themselves from traditional government ideas that city development is managed and carried out by government officials alone. With smart cities, governments need to put in place mechanisms that attracts businesses to develop solutions that generate data that can be used to improve life in the city or smart ways of utilizing the data. Further, they need to encourage citizens to share data and to contribute actively in the development of the city. Developing a smart city is dependent on an ecosystem of stakeholders working together for the common good.

I hope you are beginning to get a grasp of the essence of smart cities. Smart cities have the potential of substantial improvements in public participation, private and public services and in reducing the carbon footprint of cities. However, some warn about dangers of smart cities. Dangers are typically, loss of privacy and increased digital divide. The latter refers to the danger of smart cities leading to increased in-equality as smart cities may favor the wealthy over the less privileged.

I round off the video with a couple of examples of currently advanced smart cities.

Co-funded by the Erasmus+ Programme of the European Union

London topped the 2018 ranking of smart cities conducted by xx. The city scored high on leadership and has developed several strategies to make London an inclusive city by protecting the interests of vulnerable groups. Further, London also established the “Smart London Board” comprised of industry experts and though leaders to assist in planning and realization of the vision.

Singapore came in second in the same ranking. Their approach has been quite different from London in that Singapore has been somewhat less people centric and more service and competence oriented. Singapore has a holistic approach to smart city development and emphasizes industry incentives for tech innovation and a number of talent developments and training programs.

I hope you now have a general understanding of the phenomenon of smart cities and wish all the best in exploring the theme further.

Co-funded by the Erasmus+ Programme of the European Union

3.3.2 Module 8: Machine Learning and Data Mining

Compiled by: Prof. Yannis Charalabidis, University of the Aegean (Greece)

3.3.2.1 Reader

Introduction: Data Science

Data science is an interdisciplinary field aiming to turn data into real value. Data may be structured or unstructured, big or small, static or streaming. Value may be provided in the form of predictions, automated decisions, models learned from data, or any type of data visualization delivering insights. Data science includes data extraction, data preparation, data exploration, data transformation, storage and retrieval, computing infrastructures, various types of mining and learning, presentation of explanations and predictions, and the exploitation of results taking into account ethical, social, legal, and business aspects.

Data Science deals with both structured and unstructured data. It is a field that includes everything that is associated with the cleansing, preparation and final analysis of data. Data science combines the programming, logical reasoning, mathematics and statistics. It captures data in the most ingenious ways and encourages the ability of looking at things with a different perspective. Likewise, it also cleanses, prepares and aligns the data. To put it more simply, data science is an umbrella of several techniques that are used for extracting the information and the insights of data. Data scientists are responsible for creating the data products and several other databased applications that deal with data in such a way that conventional systems are unable to do.

The National Consortium for Data Science, an industry and academic partnership established at UNC, Chapel Hill in 2013, defines data science as “the systematic study of digital data using scientific techniques of observation, theory development, systematic analysis, hypothesis testing, and rigorous validation.” A key purpose of data science is to use data to describe, explain, and predict natural and social phenomena by:

- Creating knowledge about the properties of large and dynamic data sets;
- Developing methods to share, manage, and analyze digital data; and
- Optimizing data processes for factors such as accuracy, latency, and cost.

Data Science is not only a synthetic concept to unify statistics, data analysis and their related methods, but also comprises its results. Data Science intends to analyze and understand actual phenomena with "data". In other words, the aim of data science is to reveal the features or the hidden structure of complicated natural, human and social phenomena with data from a different point of view from the established or traditional theory and method. This point of view implies multidimensional, dynamic and flexible ways of thinking.

Data Science consists of three phases:

- design for data,
- collection of data and
- analysis on data.

It is important that the three phases are treated with the concept of unification based on the fundamental philosophy of science explained below. In these phases the methods which are fitted for the object and are valid, must be studied with a good perspective.

Data Mining

Data mining is simply the process of garnering information from huge databases that was previously incomprehensible and unknown and then using that information to make relevant business decisions. To put it more simply, data mining is a set of various methods that are used in the process of knowledge discovery for distinguishing the relationships and patterns that were previously unknown. We can therefore term data mining as a confluence of various other fields like artificial intelligence, data room virtual base management, pattern recognition, visualization of data, machine learning, statistical studies and so on. The primary goal of the process of data mining is to extract information from various sets of data in an attempt to transform it in proper and understandable structures for eventual use. Data mining is thus a process which is used by data scientists and machine learning enthusiasts to convert large sets of data into something more usable.

Machine Learning

Machine learning is kind of artificial intelligence that is responsible for providing computers the ability to learn about newer data sets without being programmed via an explicit source. It focuses primarily on the development of several computer programs that can transform if and when exposed to newer sets of data. Machine learning and data mining follow the relatively same process. But of them might not be the same. Machine learning follows the method of data analysis which is responsible for automating the model building in an analytical way. It uses algorithms that iteratively gain knowledge from data and in this process; it lets computers find the apparently hidden insights without any help from an external program. In order to gain the best results from data mining, complex algorithms are paired with the right processes and tools.

Machine learning is concerned with the question of how to construct computer programs that automatically improve with experience. The difference between data mining and machine learning is equivocal. The field of machine learning emerged from within Artificial Intelligence (AI) with techniques such as neural networks. Here, we use the term machine learning to refer to algorithms that give computers the capability to learn without being explicitly programmed ("learning from experience"). To learn and adapt, a model is built from input data (rather than using fixed routines). The evolving model is used to make data-driven predictions or decisions.

ML consists an important technology for processing Big Data. "Big Data Machine Learning" has been used widely in the fields of both public and private sector. ML has flourished in the '90s and was first used in the field of Statistical Science, while there were made attempts to learn a computer how to play games. In this period of time, ML algorithms were designed for a variety of purposes, such as speech recognition, but also for providing data-driven answers to vexing questions. According to Chui K. T. et al., 2017, there are four types of ML: Un-supervised learning (unlabeled training data), which commonly applied algorithms for supervised learning are Decision Trees, Support Vector Machines (SVM), Naive Bayes, Neural Networks and Maximum Entropy (ME), Supervised Learning (labeled training data in type), Semi – supervised Learning (few labeled and many unlabeled data in type) and Reinforcement Learning – a totally different type and its main goal it to learn how to control data. ML's field is organized around three primary research objectives, Task – Oriented Studies, Cognitive Simulation and Theoretical Analysis. Literature provides a huge amount of ML models and few examples among all are "classification and regression trees", "neural network" (Multilayer Perceptor), "Bayesian Neural network", "support vector Regression", "K- nearest neighbor model "(KNN) and "Gaussian Processes". There are many techniques in literature, which can be used for the development of an ML model. Petter Jeffcock captures four of them:

- Regression – These algorithms are being used for numeric predictions
- Classification – Enables the membership detection among a known class
- Clustering – Logical Grouping of mass of data
- Anomaly Detection – Identification of rare/ different items among a dataset considering the data majority

The continuous advance of ML is crucial in many fields such as cybersecurity and scientific discovery as well as in multiple business domains. ML is used for information extraction from a raw of data and it can be used for a variety of purposes (e.g. prediction, understanding). When it comes to government, ML algorithms can help in the identification of significant factors and yet not defined interrelations and as such can be used to decrease the complexity of societal phenomena that are related with policy problems.

Data Science vs Data Mining vs Machine Learning

As we mentioned earlier, data scientists are responsible for coming up with data centric products and applications that handle data in a way which conventional systems cannot. The process of data science is much more focused on the technical abilities of handling any type of data. Unlike data mining and data machine learning it is responsible for assessing the impact of data in a specific product or organization.

While data science focuses on the science of data, data mining is concerned with the process. It deals with the process of discovering newer patterns in big data sets. It might be apparently similar to machine learning, because it categorizes algorithms. However, unlike machine learning, algorithms are only a part of data mining. In machine learning algorithms

are used for gaining knowledge from data sets. However, in data mining algorithms are only combined that too as the part of a process. Unlike machine learning it does not completely focus on algorithms.

Their roots are very different: data mining emerged from the database community, and machine learning emerged from the Artificial Intelligence (AI) community, both quite disconnected from the statistics community. Despite the different roots, the three (sub)disciplines are definitely overlapping.

Machine Learning and Data Mining Benefits for Public Sector

Regarding the main benefits of using DM and ML in the public sector, the DM and ML systems are efficient, accurate, with high performance, and usable to different domains, especially for solving classification problems. Table 1 summarizes the benefits of the adoption of ML, analyzed in specific topics related to government services, pinpointing at the research, where these benefits are cited.

Table 4: Machine Learning and Data Mining Benefits for Public Sector

TOPIC	DETAILS
Efficiency	The pervasiveness of the digital information age further leads to the generation of big data as well as big government data, at a faster rate, thus making manual data analysis and interpretation impossible. ML & DM does not only automate the analysis of big government data but also can provide data-driven answers to vexing questions and even can help in the creation of new theories.
Accuracy	The results of ML & DM systems, irrespective of the used techniques, are more accurate since ML & DM can process big government data and no intervention from either knowledge engineers or domain experts is needed.
Performance	ML & DM consists an easiest and fastest way for automated classification to analyse data when compared to manual process which would consume a significant amount of time and effort by reducing the cost and the complexity of alternative processes.
Flexibility	ML & DM efforts are majorly devoted to different domains especially to the more influencing applications to the society such as healthcare, energy crisis, education, food security, overfishing, environmental pollution, migration crisis, urbanization, and water security.
Multi-dimensional	ML & DM has capabilities to handle multi-dimensional and multi-variety data in dynamic or uncertain environments.
Team – Based & Mixed-Initiative Learning	New ML & DM methods are capable of working collaboratively with humans to jointly analyse complex data sets might bring together the abilities of machines to tease out subtle statistical regularities from massive data sets with the abilities of humans to draw on diverse background knowledge to generate plausible explanations and suggest new hypotheses.
Data Benefits/ Usefulness of Data	Although a huge amount of government data is already open and online, in many cases, societies, currently, have not the mechanisms, or laws or even cultures to benefit from them. An ML & DM system can be beneficial concerning their utilization and exploitation
Continuous Improvement	ML & DM systems have the capability of the continuous “self-improvement” by using historical data.

Machine Learning and Data Mining Obstacles for Public Sector

In the utilization of ML in government there are also limitations which are primarily imposed by the nature of the data analyzed and may lead to misleading results. Both the development of a ML model and the data processing may cost a significant amount of time, considering that, for the former, there are no specific techniques to be followed, while in many

Co-funded by the Erasmus+ Programme of the European Union

cases a variety of techniques have to be tested and, for the latter, the amount of data may be tremendous. Table 2 summarizes the challenges using ML in government services.

Table 5: Machine Learning and Data Mining Obstacles for Public Sector

TOPIC	DETAILS
Privacy & Ethical Issues	In many cases (e.g. healthcare) the collection of personal data, the ownership of personal data and the benefits of their processing leads to privacy and ethical issues
Various ML & DM Techniques	In many cases, based on which action to be taken and when to be taken, various ML & DM techniques are needed to be tried for the extraction of better results.
Availability of Data	In many cases there can be found difficulties of gaining regulatory approval of accessing data (for instance in healthcare), or even lack of data (geographical data) in order for a ML & DM system to be properly trained for quality results.
Quality and Quantity of Data	Lack of data (geographical data) or even accessed data may not be representative and in cases of predictions barriers can be found decreasing the quality and quantity of the ML & DM system
Unstructured Data	Unstructured data are a major challenge in the usage of machine learning if we think of the different regional languages.
Interpretation of results	Interpretation of results is also a major challenge to determine the effectiveness of ML & DM algorithms. Although a ML & DM algorithm can extract results correctly their interpretation may not be proper
Information Overload	The computational power in combination with big data is less efficient since machine learning processes should be capable of removing and neglecting data in order to enjoy a finite and reasonable computation time.
Heterogeneity of Data	ML & DM is sensitive to heterogeneity in the data, such as different vocabularies and different writing styles.

Machine Learning and Data Mining Application for Public Sector

Several works have been found in literature, exploring or proposing technologies, including ML techniques, for analyzing automatically the data due to their structure and their sheer volume for improving the relations among citizens and governments. Various ML models are, also, being used in order to classify data from social media platforms, such as Facebook and Twitter, into predefined categories. As Sakai and Hirokawa mentioned, ML techniques can be used as support vector machine (SVM) and word feature selection (SVM + FS) in order to analyze citizens' reports, for instance danger detection signs reports even by using social media reports or even for real danger detections – reports. The previous techniques could achieve higher performance in detecting danger signs compared to humans considering, also, that judgment from humans has a low rate of agreement. Also, a promising usage of ML on the same field can be detected for political purposes or for evaluation of politicians' truthfulness. Tourism industry through forecasting visitor arrivals (demand indicator) can be served as a tourism reference for the public sector. Using ML techniques, including more detailed data (such as road/air transport, accommodation, and art), can be beneficial for economic development. In New Zealand, ML models are being used in livestock industries for the predictions of livestock estimation with biosecurity, broad applications in disease risk modelling policy and planning, while Wilbanks, J.T. & Topol, E.J. and Kwok Tai Chui et al. revealed that worldwide great efforts are being made in the field of healthcare, water pollution and air pollution.

Table 6: Machine Learning and Data Mining Application for Public Sector

Project Title	Scope
PADGETS	Design, develop and deploy a prototype tool- set to allow pol- icy makers to graphically create web applications, deployed in Web 2.0 media.
EU Community	Combination of social media interactions, qualified contributors, document curation, visual analysis plus online and offline trust- building tools for the provision of better policy options to decision makers.

Co-funded by the Erasmus+ Programme of the European Union

NOMAD	Introduction of new dimensions into the experience of policy making by providing decision-makers with fully automated solutions for content search, selection acquisition, categorization and visualization that work in a collaborative form in the policy-making arena.
MANYLAWS	Seamless and inclusive access to legal information across EU and improve the efficacy of decision making in legislative procedures operated by governmental organizations.
READ	Implementation of a Virtual Re- search Environment where archivists, humanities scholars, computer scientists and volunteers can boost research, innovation, development and usage of cutting edge technology for the automated recognition ,transcription, indexing and enrichment of handwritten archival documents.
SIMPATICO	SIMPATICO's "learning by doing" approach will use this information and match it with user pro- files to continuously adapt and improve interactions with the public services. All the collected information on public services and procedures will be made available within Citizenpedia, a collective knowledge database released as a new public domain re- source.
MOBiNET	Development, deployment and operation of the technical and organisational foundations of an open, multi-vendor platform for Europe-wide mobility services)
Pericles	PERICLES aims to address the challenge of ensuring that digital content remains accessible in an environment that is subject to continual change.
EURECA	EURECA aims to build soft- ware solutions to improve interoperability among existing data systems,such as clinical trials and electronic health record systems..
INFRALERT	Development of an expert-based information system to support and auto- mate infrastructure management from measurement to maintenance.
X5GON	Solution helping users/students find what they need not just in OER repositories, but across all open educational re- sources on the web.
STREAM-LINE	Addresses the competitive ad- vantage needs of European online mediabusinesses(EOMB) by delivering fast re-active analytics suitable in solving a wide array of problems, including ad- dressing customer retention, personalised recommendation, and more broadly targeted services.
MATILDA	Design and implementation of a holistic 5G end-to-end services operational frame- work tackling the lifecycle of design, development and orchestration of 5G-ready applications and 5G network ser- vices over programmable infrastructure, following a unified programmability model and a set of control abstractions
BIG DATA EUROPE	BDE aims to build an extensive stakeholder network spread within relevant communities from across the different SC domains; cover the whole process of data us- age within each, from data collection,processing, storage and visualization to the development of data services.
HOB- BIT	HOBBIT aims at abolishing the barriers in the adoption and deployment of Big Linked Data by European companies, by means of open bench- marking reports that allow them to assess the fit- ness of existing solutions for their purposes
COM- PARE	Integration of state-of-the-art strategies, tools, technologies and methods for collecting, processing and analysing sequence-based pathogen data in combination with associated (clinical,epidemiological and other) data, for the generation of actionable information to relevant authorities and other users in the human health, animal health and food safety domains.
MAN- TIS	Development of a Cyber Physical System based on Pro- active Maintenance Service Platform Architecture enabling Collaborative Maintenance Ecosystems.
SWAMI	Provision of an improved and comprehensiverepresentation of the neutral atmosphere from the sur-face to 1500 km altitude.

Conclusion

ML and DM can be used to analyze Big Data, including government's data, or even to generate new knowledge, while classification problems can be met. Despite the different available approaches for solving classification problems, the main approach is Data Mining including ML techniques due to the capabilities that these can provide. From the conducted analysis, it is revealed that ML is a method used in order to devise complex systems and, by using statistical techniques, it consists a powerful tool which can predict or support governments' decision makers. Among the most cited perks of DM and ML usage in government is accuracy, efficiency, scalability and flexibility.

However, the benefits that both DM and ML can provide to governments are possible limited because of the nature of data and the human intervention needed for the interpretation of results, which may lead to misleading results For the integration of different datasets categories, DM in combination with ML can create new ways to solve complex problems

Co-funded by the Erasmus+ Programme of the European Union

(sarcastic remarks) by combining, also, deep learning techniques with a neural network to avoid possible difficulties concerning computing power and time issues. Despite the barriers concerned by the nature of data, ML is proven to be a promising technology and the public sector cannot be excluded estimating, also, all the potential benefits provided by the ML. The same, of course, applies to the DM, since DM techniques are required and preceded ML techniques for the analysis of Data. Detailed datasets (such as crime and health statistics) consist extremely useful information for decision makers and can be extracted through the combination of DM and ML. ML models' effectiveness can be improved by using and testing a variety of techniques and there are also many available free tools implemented for that reason. Furthermore, as Alexandra Terlyga & Igor Balk mentioned that governments can use ML clustering techniques to set goals to their units, based on different indicators (e.g., clustering high-level educational institutions by overall spending (Profit and Loss Statement), can lead governments on setting proper expectations. Our study, also, revealed that a variety of applications in different domains is being implemented with all governmental organizations participating as pilots. Although a large part of the applications executed only as pilots, it is clear enough that many governments not only consider on improving their existing services, but actions are conducted towards decision making through the use of DM and ML. Analysis of these projects, also identified the need for collaboration with private sector organizations. One of the aspects to which further attention is required should be the challenges of Big Data and furthermore of Big Governmental Data, such as the data's heterogeneity and the integration of datasets from different domains. Similar efforts already exist and can lead governments to more accurate results for data-driven decision making. Another crucial issue lies behind the legal frame which should be created to define the use of these data for the common good, overcoming the limitations of the usage of datasets which include sensitive information, imposed by the recent EC regulation for the protection of individuals privacy.

References

Provost, F., & Fawcett, T. (2013). Data science and its relationship to big data and data-driven decision making. *Big data*, *1*(1), 51-59.

Van der Aalst, W. (2016). Data science in action. In *Process Mining* (pp. 3-23). Springer, Berlin, Heidelberg.

Sammut, C., & Webb, G. I. (2017). *Encyclopedia of machine learning and data mining*. Springer Publishing Company, Incorporated.

Wang, J., Hu, X., & Zhu, D. (2008). Data mining in public administration. In *Handbook of Research on Public Information Technology* (pp. 556-567). IGI Global.

Sebastiani, F. (2002). Machine learning in automated text categorization. ACM computing surveys (CSUR), 34(1), 1-47.

Moldagulova, A., & Sulaiman, R. B. (2017, May). Using KNN algorithm for classification of textual documents. In Information Technology (ICIT), 2017 8th International Conference on (pp. 665-671). IEEE.

Mitchell, T. M. (2006). The discipline of machine learning (Vol. 9). Pittsburgh, PA: Carnegie Mellon University, School of Computer Science, Machine Learning Department.

Grimmer, J. (2015). We are all social scientists now: how big data, machine learning, and causal inference work together. PS: Political Science & Politics, 48(1), 80-83.

Patil, A. P., Doshi, D., Dalsaniya, D., & Rashmi, B. S. (2017, September). Applying Machine Learning Techniques for Sentiment Analysis in the Case Study of Indian Politics. In International Symposium on Signal Processing and Intelligent Recognition Systems (pp. 351-358). Springer, Cham. https://doi.org/10.1007/978-3-319-67934-1_31

Marasco, D. E., & Kontokosta, C. E. (2016). Applications of machine learning methods to identifying and predicting building retrofit opportunities. Energy and Buildings, 128, 431-441. https://doi.org/10.1016/j.enbuild.2016.06.092

Dolicanin, C., Kajan, E., Randjelovic, D.: Handbook of Research on Democratic Strategies and Citizen-Centered E-Government Services, pp. 231–249. IGI Global, Hersey (2014)
https://www.researchgate.net/profile/Nuno_Garcia/publication/290950006_E
health_Current_status_and_future_trends/links/56c45c2308aea564e304a9ea.pdf

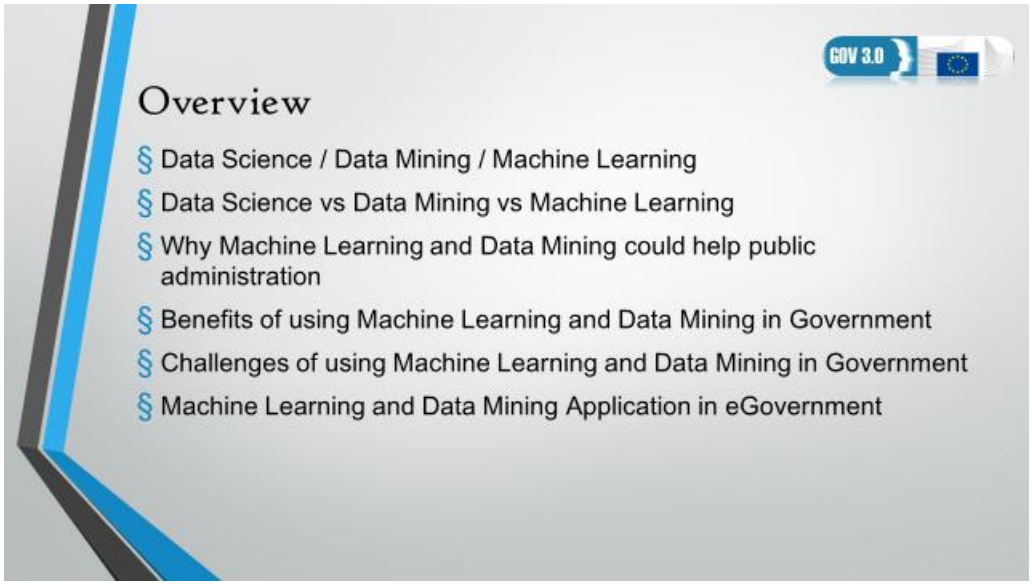
Goodman, B., & Flaxman, S. (2016). European Union regulations on algorithmic decision-making and a" right to explanation". arXiv preprint arXiv:1606.08813.

Eshleman, R., & Yang, H. (2014, December). " Hey# 311, Come Clean My Street!": A Spatio-temporal Sentiment Analysis of Twitter Data and 311 Civil Complaints. In Big Data and Cloud Computing (BdCloud), 2014 IEEE Fourth International Conference on (pp. 477-484). IEEE. https://doi.org/10.1109/BDCloud.2014.106

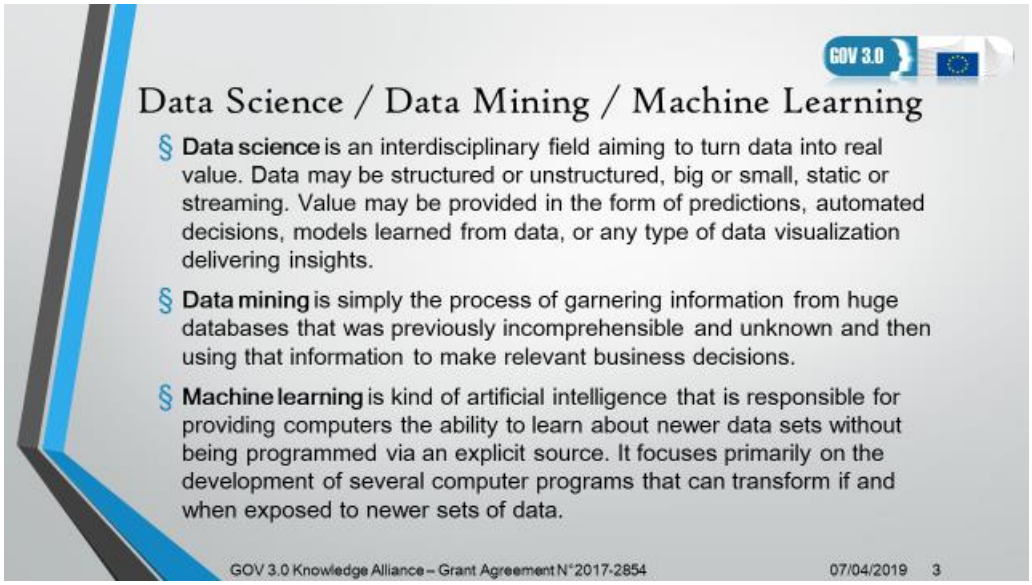
Netten, N., van den Braak, S., Choenni, S., & van Someren, M. (2016, March). A Big Data Approach to Support Information Distribution in Crisis Response. In Proceedings of the 9th International Conference on Theory and Practice of Electronic Governance (pp. 266-275). ACM. https://doi.org/10.1145/2910019.2910033

3.3.2.2 MOOC

Hello, I'm Yannis Charalabidis, an associate professor in ICT & eGovernment at the University of the Aegean. In this presentation, I will tell you about Machine Learning and Data Mining and how it can affect public administration.

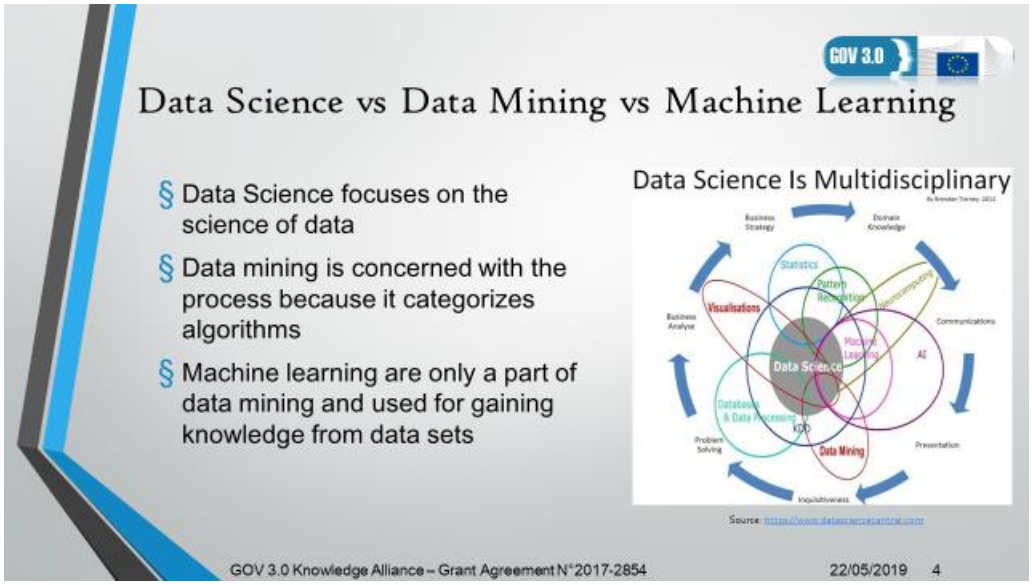


In particular, data mining is simply the process of garnering information from huge databases that was previously incomprehensible and unknown and then using that information to make relevant business decisions. On the other hand, machine learning is kind of artificial intelligence that is responsible for providing computers the ability to learn about newer data sets without being programmed via an explicit source. However, machine learning is one technique that can be used for data mining, but it's not the only one. Both machine learning and data mining are used to the process of data science for assessing the impact of data in a specific product or organization.

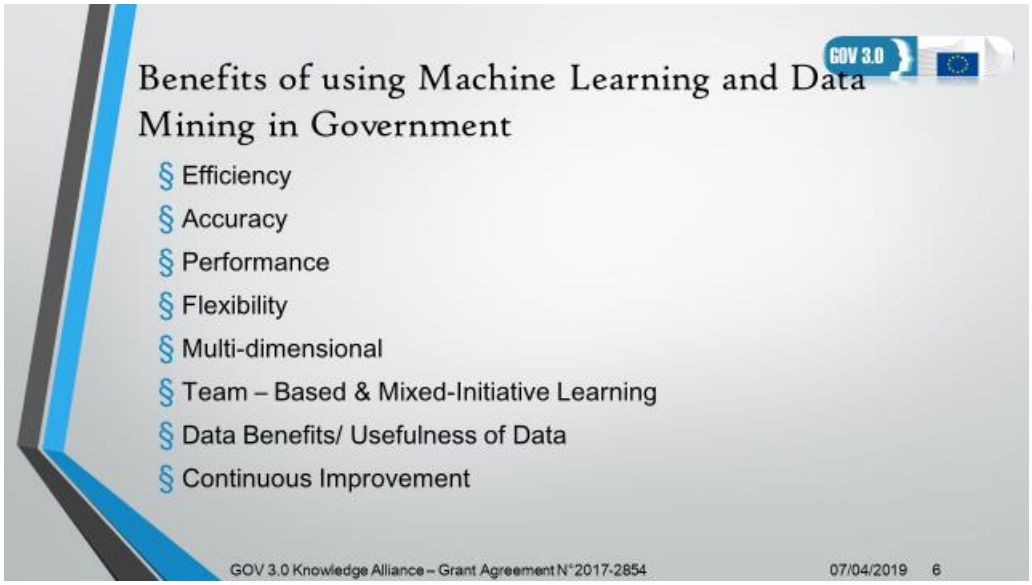


Co-funded by the Erasmus+ Programme of the European Union

Generally, Data science is an interdisciplinary field aiming to turn data into real value. Data may be structured or unstructured, big or small, static or streaming. Value may be provided in the form of predictions, automated decisions, models learned from data, or any type of data visualization delivering insights. Data science includes data extraction, data preparation, data exploration, data transformation, storage and retrieval, computing infrastructures, various types of mining and learning, presentation of explanations and predictions, and the exploitation of results taking into account ethical, social, legal, and business aspects.

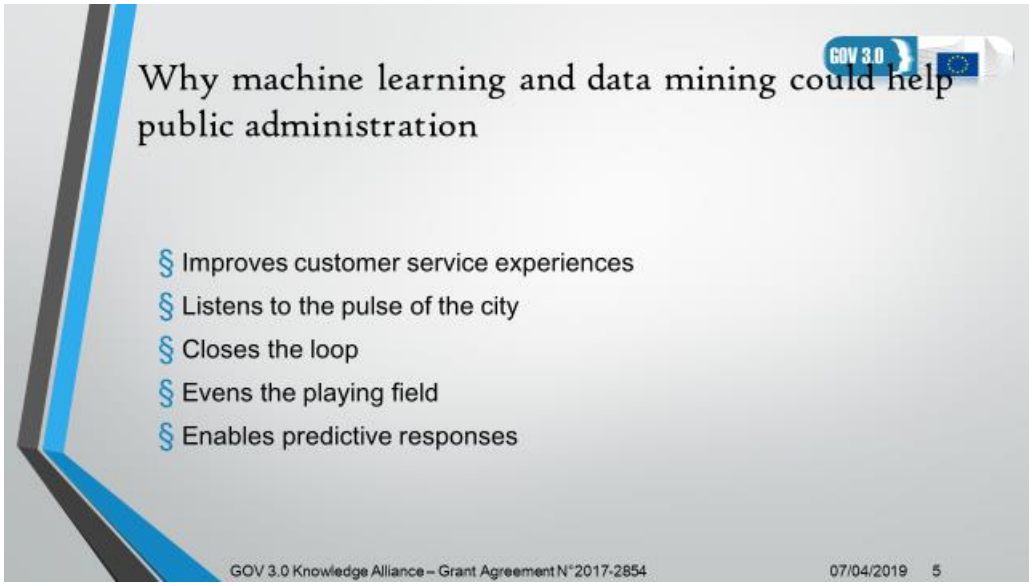


Data mining (DM) can be defined as "the analysis of (often large) data sets to find unsuspected relationships and to summarize the data in novel ways that are both understandable and useful to the data owner". The input data are typically given as a table and the output may be rules, clusters, tree structures, graphs, equations, patterns, etc. Clearly, data mining builds on statistics, databases, and algorithms. Compared to statistics, the focus is on scalability and practical applications. Unlike, machine learning (ML), as we mentioned before, is kind of artificial intelligence which uses complex algorithms that iteratively gain knowledge from data and it lets computers find the apparently hidden insights without any help from an external program. In order to gain the best results from data mining, complex algorithms (machine learning) are paired with the right processes and tools.



Co-funded by the Erasmus+ Programme of the European Union

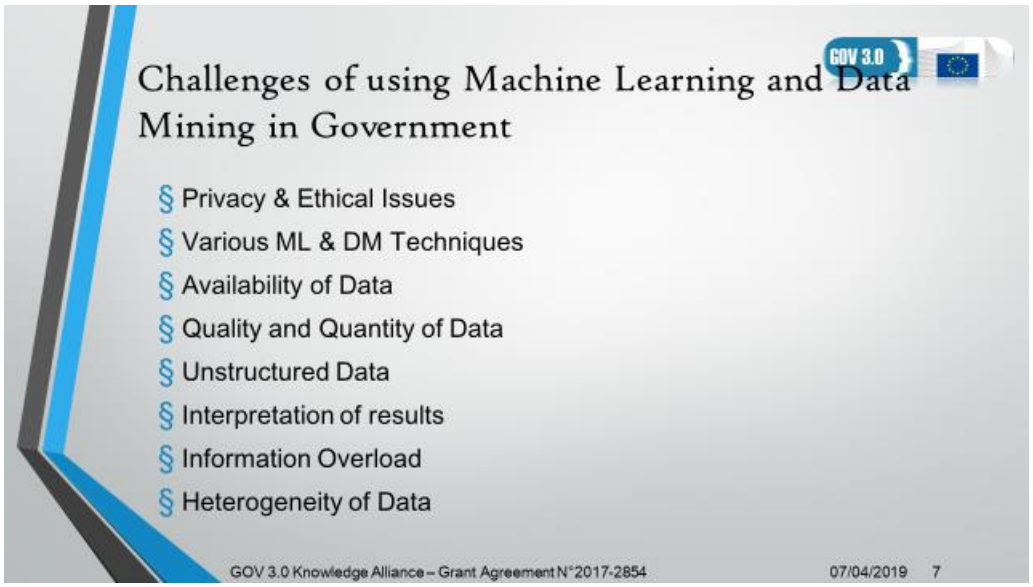
Regarding the main benefits of using ML & DM in the public sector, the ML & DM systems are efficient, accurate, with high performance, and usable to different domains, especially for solving classification problems. The quality of the provision of governments to the citizens can be improved by high accuracy in governmental documents. Furthermore, ML & DM & DM consists an easier and faster way for automated classification for data analysis, by reducing the cost and the complexity of alternative processes, compared to manual processes which consume a significant amount of effort and time. In addition, efforts are majorly devoted to different domains, especially to the domains where the influence is higher to society such as education, migration, energy, urbanization, and healthcare. This is also related with another positive aspect of ML & DM & DM, i.e. scalability, as reusability of ML & DM & DM models is considered very high.



Sentiment Analysis (SA) using ML & DM & DM is a technique capable of enhancing the interactivity, and thus the relationship between governments and citizens. SA has the ability to eliminate possible criticalities among the two parts (government and citizens) leading the first on taking the right decisions and actions. Considering social media, SA allows governmental organizations to identify and understand citizens' needs while enabling citizens on affecting either the service delivery or the implementation of any new service or allows them to identify new innovations for services that already exist. Table on notes summarizes the benefits of the adoption of ML & DM & DM, analyzed in specific topics related to government services, pinpointing at the research, where these benefits are cited.

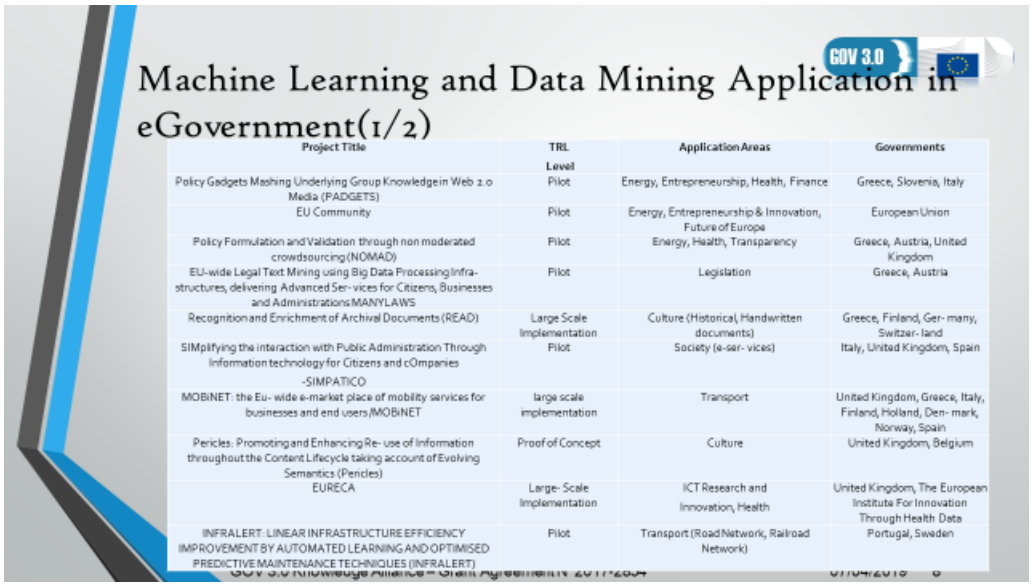
In the utilization of ML & DM in government there are also limitations which are primarily imposed by the nature of the data analyzed and may lead to misleading results. Both the development of a ML & DM model and the data processing may cost a significant amount of time, considering that, for the former, there are no specific techniques to be followed, while in many cases a variety of techniques have to be tested and, for the latter, the amount of data may be tremendous. Table on notes summarizes the challenges using ML & DM in government services.

Co-funded by the Erasmus+ Programme of the European Union



The grand challenges that ML & DM usage in government are related with the quality and quantity of data. If we also considered the existence of different regional languages, heterogeneity and unstructured data raises the complexity of ML & DM tasks. Two contradictive challenges occur; the one is lacking relevant data for processing, whereas in some cases too much data is produced leading to information overload problems. Data sets may include sensitive data (e.g. health records) whose acquisition and processing is prohibited by third parties without proper permission. Although by removing sensitive data from datasets will solve the legal issues, no one can ensure proper predictions from the ML & DM model without these types of data (e.g., postal code can reveal racial information and loan defaulting).

With regard to legal, ethical barriers, we identified difficulties of gaining regulatory approval of accessing data (for instance, in healthcare or geographical data) or even when limited access is permitted, data may not be representative or incomplete. Unstructured data consist a major challenge in the usage of ML & DM (e.g. if we think of the different regional languages) and in combination with the limited computational power and the Big Data, the efficiency loss may be unavoidable.



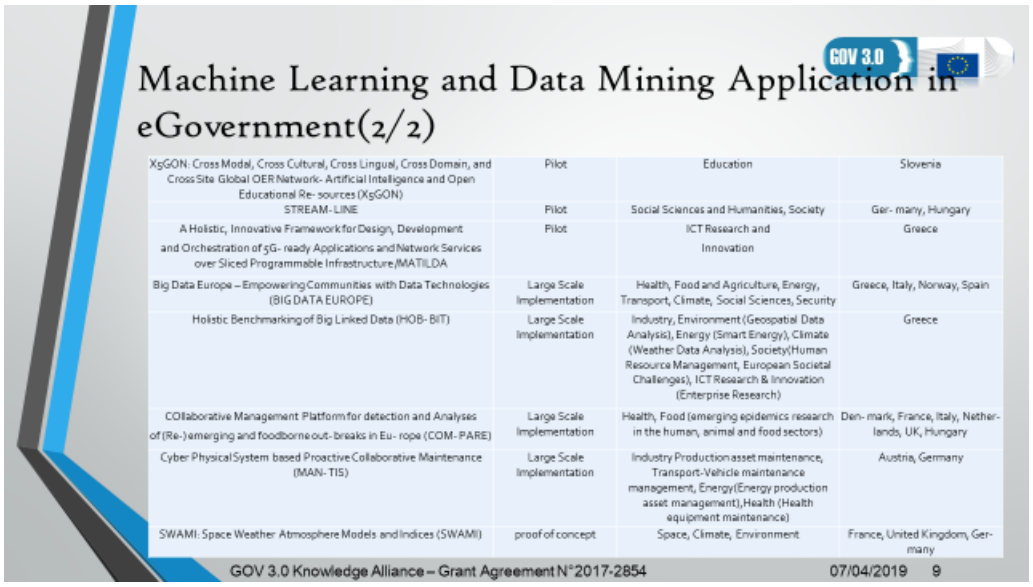
Project Title	TRL Level	Application Areas	Governments
Policy Gadgets Mashing Underlying Group Knowledge in Web 2.0 Media (PADGETS)	Pilot	Energy, Entrepreneurship, Health, Finance	Greece, Slovenia, Italy
EU Community	Pilot	Energy, Entrepreneurship & Innovation, Future of Europe	European Union
Policy Formulation and Validation through non moderated crowdsourcing (NOMAD)	Pilot	Energy, Health, Transparency	Greece, Austria, United Kingdom
EU-wide Legal Text Mining using Big Data Processing Infra-structures, delivering Advanced Ser- vices for Citizens, Businesses and Administrations MANYLAWS	Pilot	Legislation	Greece, Austria
Recognition and Enrichment of Archival Documents (READ)	Large Scale Implementation	Culture (Historical, Handwritten documents)	Greece, Finland, Ger- many, Switzer- land
SIMplifying the interaction with Public Administration Through Information technology for Citizens and cOmpanies -SIMPATICO	Pilot	Society (e-ser- vices)	Italy, United Kingdom, Spain
MOBINET: the Eu- wide e-market place of mobility services for businesses and end users/MOBiNET	large scale implementation	Transport	United Kingdom, Greece, Italy, Finland, Holland, Den- mark, Norway, Spain
Pericles: Promoting and Enhancing Re- use of Information throughout the Content Lifecycle taking account of Evolving Semantics (Pericles)	Proof of Concept	Culture	United Kingdom, Belgium
EURECA	Large- Scale Implementation	ICT Research and Innovation, Health	United Kingdom, The European Institute For Innovation Through Health Data
INFRALERT: LINEAR INFRASTRUCTURE EFFICIENCY IMPROVEMENT BY AUTOMATED LEARNING AND OPTIMISED PREDICTIVE MAINTENANCE TECHNIQUES (INFRALERT)	Pilot	Transport (Road Network, Railroad Network)	Portugal, Sweden

Co-funded by the Erasmus+ Programme of the European Union

The age of machine learning and data mining-assisted governments isn't a few years away: it's already here. The most effective public institutions around the world today rely on machine learning and data mining to increase constituent satisfaction and work more efficiently.

Consider the following ways machine learning and data mining helps governments transform their work:

- Public bodies that innovate and put citizens' needs at the centre of their service design will ultimately maximise engagement with services that drive revenue.
- Using dynamic dashboards, city leaders can evaluate collected data in one place to make better decisions.
- tools can help citizens navigate city websites and receive more personalised notifications.
- cities can catch up to the big brands on the market and provide citizens with the high-quality experiences they expect.
- Imagine if a city knew about infrastructure issues before they happened.



In particular, the analysis of the already implemented or already running projects based on their TRL, the application area they cover and the contributed governmental organizations in the projects' implementations, results in the following observations:

- Considering the Technology Readiness Level, the majority of the projects fall into the second category among the three different groups in which they were categorised: (a) proof of concept, (b) pilot applications and (c) large-scale implementations.
- Flexibility as one of the key benefits of the ML applications identified in the previous step of the methodology is verified, since a multitude of application do- mains have been revealed from the analysis. The di- verse sectors covered by the projects are as follows: Health, Energy, Transport, Society, Climate, ICT Research & Innovation, Entrepreneurship, Culture, Social Sciences & Humanities, Industry, Environment, Food and Agriculture, Finance, Future of Europe, Transparency, Legislation, Education, Security.
- In all projects, there is a cooperation among governmental and private organizations for their implementation and in most of the cases, governmental organizations contribute as pilots.
- Although the majority of ML initiatives, as we mentioned above, are being implemented with the cooperation among public and private sector, the solutions can be beneficial for both sectors.
- Until now, all ML initiatives are mainly used as supporting systems for data-driven decision-making solutions.

Co-funded by the Erasmus+ Programme of the European Union

- In most of the cases, two or more governmental organizations from different countries cooperated for the implementation of an ML initiative.

3.3.3 Module 9: Blockchain and Smart Contracting

Compiled by: Dr. Harris Alexopoulos, University of the Aegean (Greece)

3.3.3.1 Reader

Introduction

Distributed ledger technology is any type of consensus-oriented distributed database that records information on a shared ledger.

Blockchain is a type of Distributed Ledger Technology in which new appendages to the ledger are added in the form of blocks, where the blocks are hash chained to each other.

In other words, Blockchain is a chain of blocks which contain specific information (database), but in a secure and genuine way that is grouped together in a network (peer-to-peer).

Content

Blockchain Structure

The blockchain data structure is explained as a back-linked record of blocks of transactions, which is ordered. It can be saved as a file or in a plain database. Each block can be recognized by a hash, created utilizing the SHA256 cryptographic hash algorithm on the header of the block. Each block mentions a former block, also identified as the parent block, in the "previous block hash" field, in the block header. Let's first look at each term more closely.

Index – This term symbolizes the location of the block inside the blockchain. The first block is indexed '0', the next '1', and so on.

- Hash – Hash is the function which facilitates the rapid classification of data in the dataset
- Previous hash – Each and every block in blockchain data structure, is associated with its ancestors. This characteristic adds to its immutability as a variety in the order of blocks.
- numTx – This wares a tally of the number of transaction enumerated in the block.
- Timestamp – It saves the time aspects of when the block was built.
- Nonce – It saves the integer (32 or 64bits) that is utilized in the mining method.
- Transaction – This is a different track saved as arrays in the frame of the block. They save the specific version of a transaction executed so far in the block.
- Merkle Tree– A Merkle tree, also perceived as a binary hash tree, is a data structure utilized for efficiently compiling and validating the uprightness of large sets of data.

Blockchain Categories & Characteristics

Current blockchain systems are categorized roughly into three types: public blockchain, private blockchain and consortium blockchain. In public blockchain, all records are visible to the public and everyone could take part in the consensus process. Differently, only a group of pre-selected nodes would participate in the consensus process of a consortium blockchain. As for private blockchain, only those nodes that come from one specific organization would be allowed to join the consensus process.

A private blockchain is regarded as a centralized network since it is fully controlled by one organization. The consortium blockchain constructed by several organizations is partially decentralized since only a small portion of nodes would be selected to determine the consensus. The comparison among the three types of blockchains is listed in Table I.

Co-funded by the Erasmus+ Programme of the European Union

- Consensus determination. In public blockchain, each node could take part in the consensus process. And only a selected set of nodes are responsible for validating the block in consortium blockchain. As for private chain, it is fully controlled by one organization and the organization could determine the final consensus.
- Read permission. Transactions in a public blockchain are visible to the public while it depends when it comes to a private blockchain or a consortium blockchain.
- Immutability. Since records are stored on a large number of participants, it is nearly impossible to tamper transactions in a public blockchain. Differently, transactions in a private blockchain or a consortium blockchain could be tampered easily as there are only limited number of participants.
- Efficiency. It takes plenty of time to propagate transactions and blocks as there are a large number of nodes on public blockchain network. As a result, transaction throughput is limited and the latency is high. With fewer validators, consortium blockchain and private blockchain could be more efficient.
- Centralized. The main difference among the three types of blockchains is that public blockchain is decentralized, consortium blockchain is partially centralized and private blockchain is fully centralized as it is controlled by a single group.
- Consensus process. Everyone in the world could join the consensus process of the public blockchain. Different from public blockchain, both consortium blockchain and private blockchain are permissioned. Since public blockchain is open to the world, it can attract many users and communities are active. Many public blockchains emerge day by day. As for consortium blockchain, it could be applied into many business applications. Currently Hyperledger is developing business consortium blockchain frameworks. Ethereum also has provided tools for building consortium blockchains.

Table 7: Blockchain Applications

Implementation Partners	*Government*	*Application Level*	*BCT Type*	*Technology Readiness*	*Domain*	*About*
Blockcerts[1]	**Malta**	**National**	**Public**	**Ongoing Pilot**	**Academic Certificates**	**Blockcerts is an open standard for creating, issuing, viewing, and verifying blockchain based certificates.**
Uport[2]	Switzerland	Municipal	Public	Ongoing Large Scale Impl.	Identity Management	uPort is a self-sovereign identity system that allows people to own their identity.
R3[3]	United Kingdom	National	Private	Production Level -Large Scale Impl.	B2B Solutions	R3 is an enterprise software firm developing Corda, a distributed ledger platform designed specifically for financial services.
Guardtime[4]	Estonia	National	Private	Ongoing – Large Scale Impl.	Health	Guardtime is a technology platform called KSI that allows to tackle hard problems in security, supply chain, compliance and networking.

[1] https://newsbreak.edu.mt/2018/03/05/thousands-of-maltese-students-to-get-their-certificates-on-blockchain/

[2] https://www.ethnews.com/uport-announces-zug-digital-ethereum-id-pilot

[3] https://en.wikipedia.org/wiki/R3_(company)

[4] https://guardtime.com/blog/increasing-healthcare-security-with-Blockchain-technology

Cambridge Blockchain[5]	Luxembourg	National	Private	Ongoing – Large Scale Impl.	eID	Cambridge Blockchain's distributed architecture resolves the competing challenges of transparency and privacy, leading to stronger regulatory compliance, lower costs and a seamless customer experiences.
Loyyal[6]	Norway	National	Private	Completed Pilot	Loyalty Program	Loyyal is the universal loyalty and rewards platform, built with blockchain and smart contract technology.
Chroma way[7]	Sweden	National	Private	Completed proof-of-concept	Land Registry	ChromaWay provides go-to-market solutions for different financial sectors.
Procivis[8]	Switzerland	National	Private	Ongoing proof-of-concept	eID	Procivis was founded by a clear mission: to empower individuals everywhere by providing them with trusted and compliant digital identity solutions they can fully own and control.
Disc Holding[9]	United Kingdom	National	Private	Ongoing proof-of-concept	Blockchain Provider - payments	DISC is continuously developing its own proprietary applications in payments, credit and messaging that demonstrate and showcase these attributes and are already generating practical benefits for users.
Credits[10]	United Kingdom	National	Public	Ongoing proof-of-concept	Blockchain Provider	CREDITS is an open blockchain platform with autonomous smart contracts and the internal cryptocurrency. The platform is designed to create services for blockchain systems using self-executing smart contracts and a public data registry.
Agora Voting // nvotes[11]	Spain	Organizational	Private	Completed Pilot	eVoting	Electronic voting systems based on blockchain around the world
Moni[12]	Finland	National	Public	Production Level – Large Scale Impl.	Finnish Immigration Service	MONI's technology uses one of a number of public blockchains as the means of transferring value—but in a way that to the users seems like using a debit card.
e-Law[13]	Estonia	National	Private	Production Level – Large Scale Impl.	Legislation	The e-Law system is an online database for the Estonian Ministry of Justice that allows the public to read every draft law submitted, using blockchain technology

Table 8: Blockchain Benefits for public sector

[5] http://blue-dun.com/2018/01/02/digital-identities-cambridge-blockchain/

[6] https://cointelegraph.com/news/dubai-and-norway-use-blockchain-to-redefine-tourism

[7] https://cointelegraph.com/news/swedish-government-land-registry-soon-to-conduct-first-blockchain-property-transaction

[8] https://procivis.ch/eid/use-cases/

[9] https://www.ethnews.com/uk-government-considers-expanding-blockchain-trial-for-benefits

[10] https://www.bna.com/blockchain-boost-governments-n73014477132/

[11] https://www.opendemocracy.net/marco-deseriis-david-ruescas/agora-votingnvotes

[12] https://reliefweb.int/report/finland/how-finland-using-blockchain-revolutionise-financial-services-refugees

[13] https://e-estonia.com/solutions/security-and-safety/e-law/

Co-funded by the Erasmus+ Programme of the European Union

TOPIC	DETAILS
QUALITY & QUANTITY	BCT can empower public services by improving their interoperability, the speed of serviceand Increasing their predictive capability
PROCESSES SIMPLIFICATION	BCT boosts government's processes by speeding up necessary sub- processes since information's access is easiest and quickest.
TRANSPARENCY	Transactions and historical data of transactions are publicly visible on a chain and cannot be modified.
OPENESS – ACCESSIBLE	Information stored in a chain is open and accessible by anyone.
INFORMATION SHARING	Stored data in a chain can be easily shared among all participants (organizations, citizens etc.)
DATA SAFETY	Consensus mechanism is being used by BCT and ensures the integrity of the chain (data).
PRIVACY	User's or information's anonymity can be accomplished by the usage of private keys
REDUCE COST	Transaction's costs can be reduced since by using BCT the need for third parties is being removed.
GOVERNMENT CREDIBILITY	BCT-based platforms can be used to give citizens access to reliable governmental information increasing citizens' trust to governments.
STANDARDIZATION	There are eight ISO standards under development for BCT
FLEXIBILITY	BCT can be used in several ways in order to improve public services.

Table 9: Blockchain Obstacles for public sector

TOPIC	DETAILS
SCALABILITY	Since only few transactions per second can be processed, transactions might be delayed.
PRIVACY LEAKAGE	Public keys of any transaction are being visible, so safety challenges may be detected
SELFISH MINING	Selfish miners may try to acquire nodes' computing power in order to reverse transactions.
TRUST OF THE TECHNOLOGY	A blind trust which relies exclusive on the BC's technology may include risks
LEGALLY BINDING	Although chain is accessible by any node, information may be invalid in other nation states.
APPLICABILITY IN TERMS OF GDPR	GPDR's goal is opposite effective in some cases compared with BCT's especially in the domain of personal data.

Smart Contracting

BCT has also a great potential for use in the public sector. Since any transaction can be completed without the use of any intermediary, Blockchain is a promising solution for a variety of services such as smart contracts, public services as Blockchain can improve the security of "core government data", Internet of Things (IoT) , reputation systems and security services. Blockchain is cited as a promising technology especially for public services that could influence society or even businesses.

Smart contracts help you exchange money, property, shares, or anything of value in a transparent, conflict-free way while avoiding the services of a middleman.

The best way to describe smart contracts is to compare the technology to a vending machine. Ordinarily, you would go to a lawyer or a notary, pay them, and wait while you get the document. With smart contracts, you simply drop a bitcoin into the vending machine (i.e. ledger), and your escrow, driver's license, or whatever drops into your account. More so, smart contracts not only define the rules and penalties around an agreement in the same way that a traditional contract does, but also automatically enforce those obligations.

References

Co-funded by the Erasmus+ Programme of the European Union

Alexopoulos, C., Charalabidis, Y., Androutsopoulou, A., Loutsaris, M. A., & Lachana, Z. (2019, January). Benefits and Obstacles of Blockchain Applications in e-Government. In *Proceedings of the 52nd Hawaii International Conference on System Sciences*.

Meloni, A., Madanapalli, S., Divakaran, S. K., Browdy, S. F., Paranthaman, A., Jasti, A., ... & Kumar, D. (2018). Exploiting the IoT Potential of Blockchain in the IEEE P1931. 1 ROOF Standard. *IEEE Communications Standards Magazine*, *2*(3), 38-44.

Wall, E., & Malm, G. (2016). Using Blockchain technology and smart contracts to create a distributed securities depository..

Foroglou, G., & Tsilidou, A. L. (2015). Further applications of the blockchain. In 12th Student Conference on Managerial Science and Technology.

Gervais, A., Karame, G. O., Wüst, K., Glykantzis, V., Ritzdorf, H., & Capkun, S. (2016). On the security and performance of proof of work blockchains. Proceedings of the 2016 ACM SIGSAC conference on computer and communications security (pp. 3–16). ACM

Atzori, M. (2015). Blockchain technology and decentralized governance: Is the state still necessary?.

Engelenburg, S.v., Janssen, M., & Klievink, B. (2017). Design of a software architecture supporting business-togovernment information sharing to improve public safety and security: Combining business rules, events and blockchain technology. Journal of Intelligent Information Systems. (forthcoming)

Sullivan, C., & Burger, E. (2017). E-residency and blockchain. Computer Law & Security Review, 33(4)

Zheng, Z., Xie, S., Dai, H. N., & Wang, H. (2016). Blockchain challenges and opportunities: A survey. Work Pap.–2016.

Warburg, B. (2016). How the blockchain will radically transform the economy. TEDSummitTED Talk (June 2016. Retrieved from https://www.ted.com/talks/bettina_warburg_how_the_blockc
hain_will_radically_transform_the_economy?language=en).

Sullivan, C., & Burger, E. (2017). E-residency and blockchain. Computer Law & Security Review, 33(4)

Benjamin W. Akins, Jennifer L. Chapman, and Jason M. Gordon. A whole new world: Income tax considerations of the bitcoin economy. 2013

Morabito, V. (2017). Blockchain Governance. In Business Innovation Through Blockchain (pp. 41-59). Springer, Cham.

Noyes, C. (2016). Bitav: Fast anti-malware by distributed blockchain consensus and feedforward scanning. arXiv preprint arXiv:1601.01405.

Zyskind, G., & Nathan, O. (2015). Decentralizing privacy: Using blockchain to protect personal data. IEEE security and privacy workshops (SPW2015) (pp. 180–184).

Webb, A. (2015). 8 tech trends to watch in 2016. Harvard business review, December 8th 2015 (Retrieved from https://hbr.org/2015/12/8-tech-trends-to-watch-in2016).

Back, A., Corallo, M., Dashjr, L., Friedenbach, M., Maxwell, G., Miller, A., ... Wuille, P. (2014). Enabling blockchain innovations with pegged sidechains. Open science review (https://www.blockstream.ca/sidechains.pdf).

European Parliament, 2.50.04.02 Electronic money and payments, cross-border credit transfers, March 2016

Nielsen, M. M., & Krimmer, R. (2015, May). Reuse of Data for Personal and Proactive Service: An Opportunity Not Yet Utilised. In CeDEM15: Conference for E-Democracy and Open Government (Vol. 273). MV-Verlag.

Zheng, Z., Xie, S., Dai, H., Chen, X., & Wang, H. (2017, June). An overview of blockchain technology: Architecture, consensus, and future trends. In *2017 IEEE international congress on big data (BigData congress)* (pp. 557-564). IEEE.

Hou H. (2017, July). The Application of Blockchain Technology in E-Government in China. In Computer Communication and Networks (ICCCN), 2017 26th International Conference on (pp. 1-4). IEEE.

3.3.3.2 MOOC

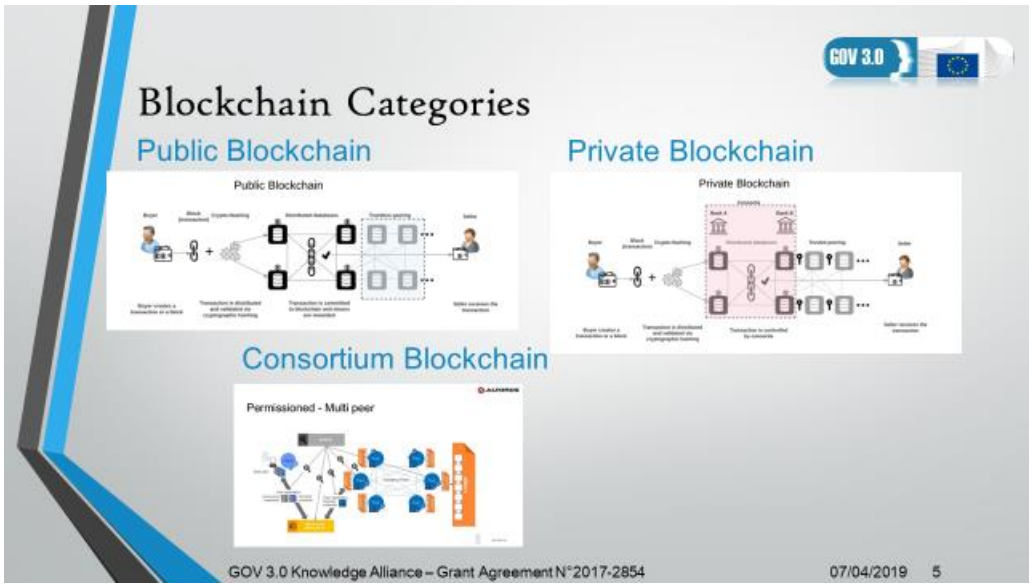
Hello, I'm Harris Alexopoulos, a postdoc in eGovernment & Open Data at the University of the Aegean. In this presentation, I will tell you about Blockchain and Smart Contracts and how BC and Smart Contract applications can affect public administration.

In particular, Blockchain Technology (BCT) is a type of Distributed Ledger Technology (DLT). DLT is a consensus of replicated, shared, and synchronized digital data geographically spread across multiple sites, countries, or institutions. There is no central administrator or centralised data storage.

Blockchain (BC) is a digital ledger in which transactions made in bitcoin or anything from currencies to property rights (e.g. of stock) are recorded chronologically and publicly.

Generally, BC is a combination of computers linked to each other instead of a central server, meaning that the whole network is decentralized. To make it even simpler, the blockchain concept can be compared to work done with Google Docs. You may recall the days of tossing over doc. documents and waiting for other participants to make necessary edits. These days, with the help of Google Docs, it is possible to work on the same document simultaneously.

Co-funded by the Erasmus+ Programme of the European Union

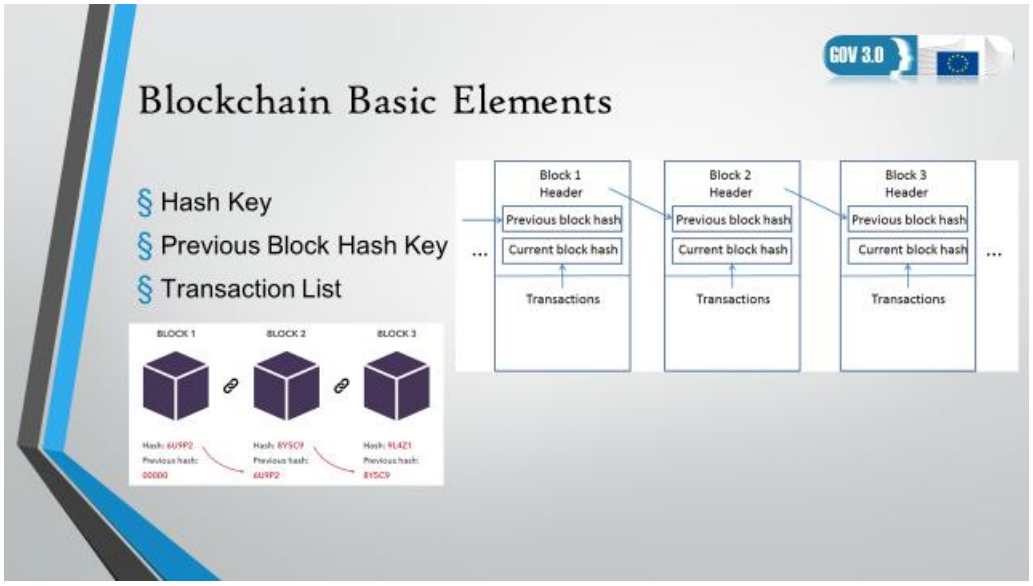


There mainly three types of Blockchains that have emerged after Bitcoin introduced Blockchain to the world.

- **Public Blockchain**

There are three things you need to remember that define a Public Blockchain.

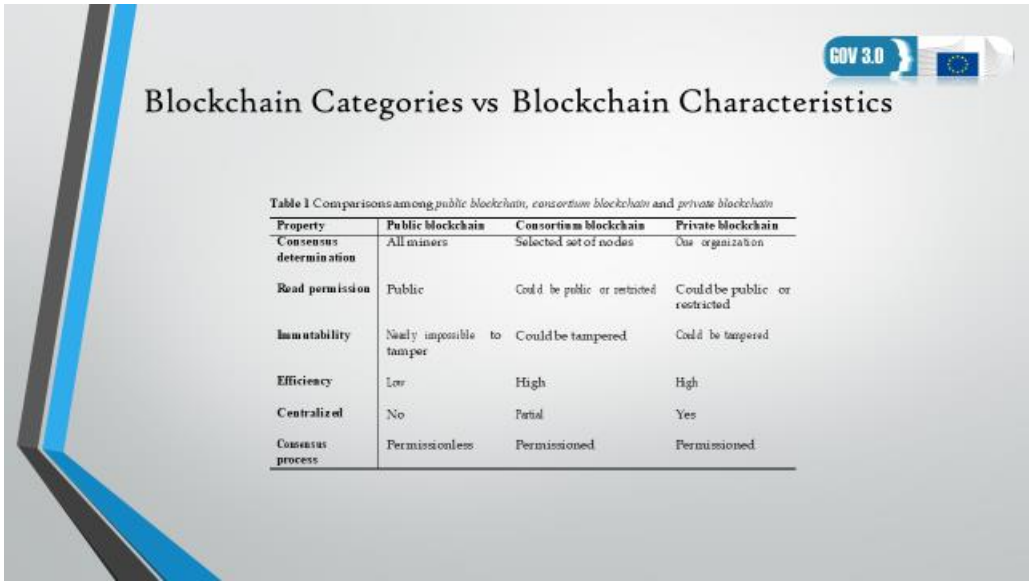
- The code to operate a Public Blockchain is openly This gives anyone the right to participate in the process that decides which blocks get added to the chain as well as the current shape and size of the Blockchain.
- Anyone can perform transactions on the network. The transactions, as long as they are valid, will go through.
- With a block explorer, anyone can gain access to and read transactions. Transactions are anonymous and transparent.
- **Private Blockchain**
  Private Blockchains are mostly used in database management, auditing among other fields. There uses are internal to a single company, and so the companies will not want the data to be accessible to the public. They use Blockchain technology by setting up groups and participants who can verify transactions internally.
- **Consortium or Federated Blockchain**
  The Consortium or Federated Blockchain is a hybrid of the Public and Private Blockchain. It is partly decentralized. The consensus process is controlled by a pre-selected set of nodes, for instance, financial institutions.



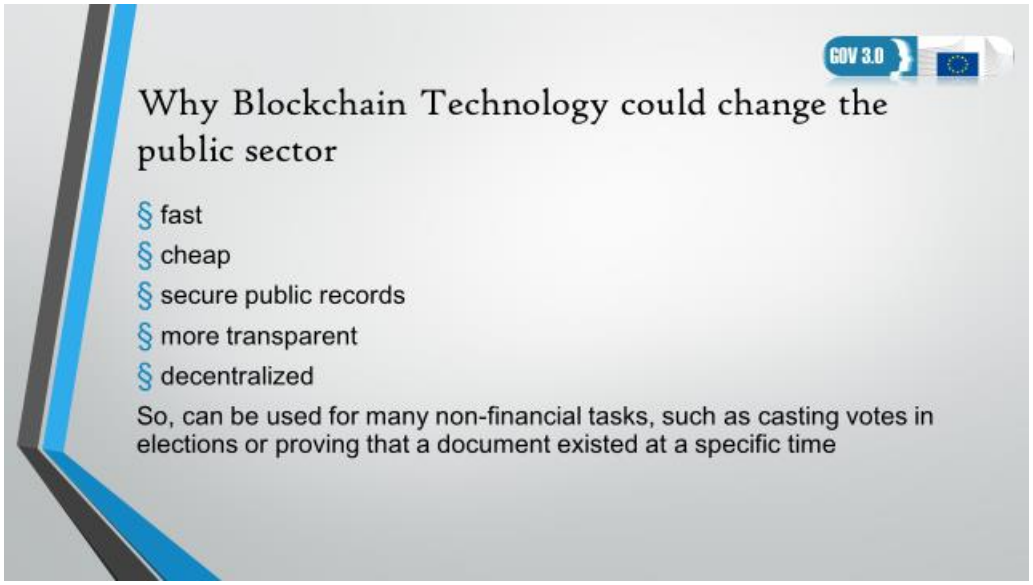
Co-funded by the Erasmus+ Programme of the European Union

The main three elements of blockchain are:

- **Hash** – Hash is the function which facilitates the rapid classification of data in the dataset
- **Previous hash** – Each and every block in blockchain data structure, is associated with its ancestors. This characteristic adds to its immutability as a variety in the order of blocks.
- **Transaction** – This is a different track saved as arrays in the frame of the block. They save the specific version of a transaction executed so far in the block.



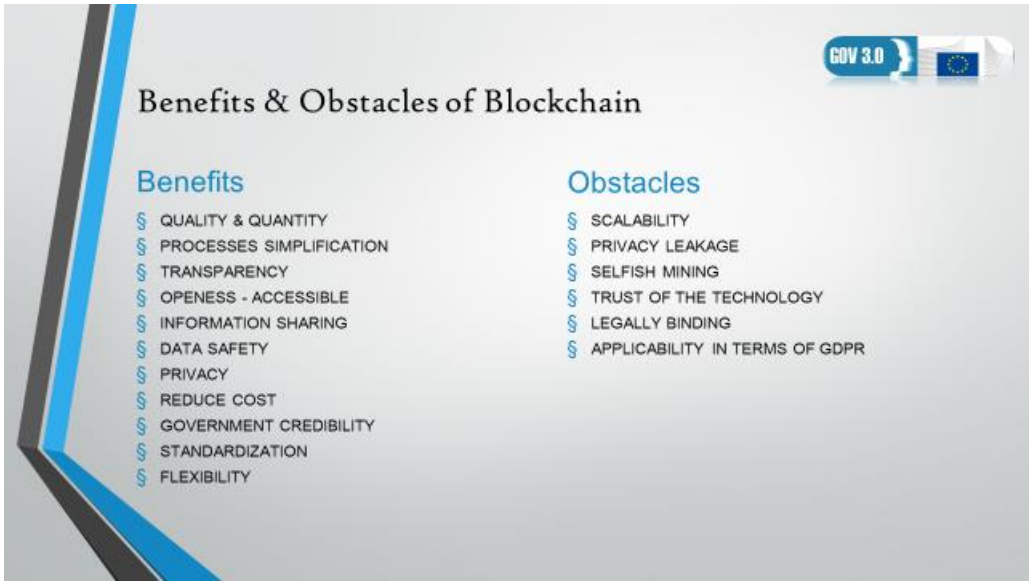
The continuously growing number of BCT initiatives that are being adopted in the public sector by various states is a strong indicator of the current trend advocating the utilization of key BCT capabilities in the respective services. The adoption of BCT by the Estonian government is the more advanced example of the exploitation of the technology in the public sector. Specifically, the Estonian e-Government approach is built around a service-rich ecosystem consisting of approximately 3000 services including identity management, tax collection, voting, etc. Similar initiatives have been also implemented by other states -although at a narrower scale in terms of number of services- such as the United Kingdom, where services like welfare payments are powered by BCT. The full list of the identified BCT applications in EU is presented in the Appendix.



Co-funded by the Erasmus+ Programme of the European Union

In general, the use of BCT in the public sector is still limited to few relevant cases. The most relevant cases are reported in the chapter of notes that presents a short list of BCT solutions for the public sector. BCT represent a core segment of technology innovations that create significant opportunities for a major and disruptive refresh of a wide spectrum of infrastructure and applications. The analysis of these BCT applications results in the following observations:

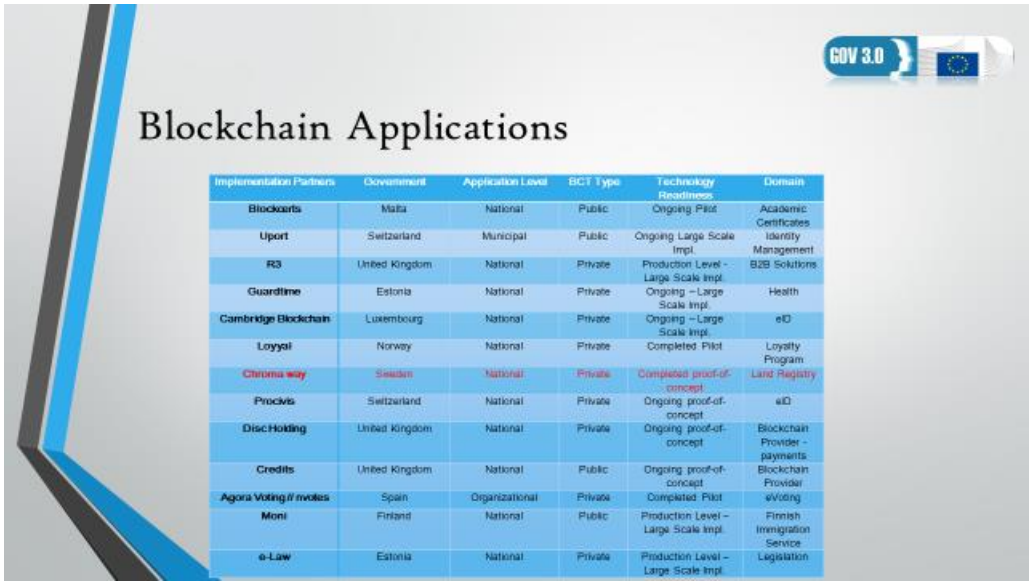
- The applications have covered a lot of domains: health records, identity management, land registry, document exchange and academic certificates.
- The majority of BCT implementations in the EU area results from partnerships with private companies, undertaking the role of technology providers that implement BCT based solution to governments.
- The applications and/or case studies could be categorised in three different groups according to their Technology Readiness Level: (a) large-scale implementations, (b) pilot applications and (c) proof of concept.
- The applications and/or case studies utilise both public and private BCT regardless of their scope. For example, identity management and land registry projects utilise both public and private ones. Projects dealing with health records utilising private BCT implementation.
- There are different levels of initiatives extension. They are applied at the organisational, municipal and national level. The majority of the case studies have been implemented at national level. There is no correlation between the level of extension and the type of application according to their TRL level. Some large-scale implementations applied to the national level while other national implementations have developed proof of concept. This probably depends on the experience of the staff involved and the orientation of national governments towards the adoption of innovation (i.e. how much they trust or are convinced about the benefits of the new BCT).



BCT can bring many benefits including improvements in the quality and quantity of Government services by the simplification of most Government processes, such as bureaucratic processes, Government information with greater transparency, open and accessible Government information to citizens and businesses including information-sharing across different organizations development, and even assistance in building an individual credit system. Citizens and businesses can easily gain access to government's information thus government's credibility could be improved by using BCT platforms and data safety in every transmission could also be part on every transaction among any authorized party including participant's anonymity by the usage of encryption keys. Moreover, storing any secured information using BCT it consists a profitable solution for public services. Thus, offered Government services could be personalized and borderless transforming society into a more collaborative one.

Co-funded by the Erasmus+ Programme of the European Union

On the other hand, the application of the BCT to the domain of e-Government is associated with some challenges. Scalability consists an important challenge problem, since only seven transactions per second can be processed. If we consider BCT as a payment solution used by Government with a requirement of processing millions of transactions, many of these transactions might be delayed. Furthermore, while BCT uses public keys publicly visible of any transaction there might be safety challenges including information leakage. Another challenge is Selfish Mining. While selfish miners trying to hack the chain, not only nodes with more than a half (51%+) computing power can reverse a transaction but it is shown that also around the half computing power is dangerous. Another challenge which is faced by the usage of BCT is the impression that only the trust of the technology is enough for a system to be safe. Alternative, authentication can be offered to be valid in one country for instance e-IDs, but they are not necessarily legally binding in any other nation state.



Implementation Partners	Government	Application Level	BCT Type	Technology Readiness	Domain
Blockcerts	Malta	National	Public	Ongoing Pilot	Academic Certificates
Uport	Switzerland	Municipal	Public	Ongoing Large Scale Impl.	Identity Management
R3	United Kingdom	National	Private	Production Level - Large Scale Impl.	B2B Solutions
Guardtime	Estonia	National	Private	Ongoing – Large Scale Impl.	Health
Cambridge Blockchain	Luxembourg	National	Private	Ongoing – Large Scale Impl.	eID
Loyyal	Norway	National	Private	Completed Pilot	Loyalty Program
Chromia way	Sweden	National	Private	Completed proof-of-concept	Land Registry
Procivis	Switzerland	National	Private	Ongoing proof-of-concept	eID
DiscHolding	United Kingdom	National	Private	Ongoing proof-of-concept	Blockchain Provider - payments
Credits	United Kingdom	National	Public	Ongoing proof-of-concept	Blockchain Provider
Agora Voting // nvotes	Spain	Organizational	Private	Completed Pilot	eVoting
Moni	Finland	National	Public	Production Level – Large Scale Impl.	Finnish Immigration Service
e-Law	Estonia	National	Private	Production Level – Large Scale Impl.	Legislation

Finally, there are a variety of services that BCT can be used as smart contracts. A smart contract isn't unlike its paper predecessor. It helps you exchange property, services, and currency. But unlike that hardly-enforceable paper stack just barely stapled together, this contract is a self-executing document. In actuality, smart contracts aren't exactly "new." The term was invented by Nick Szabo in 1994. A scholar of both law and computer science, the reclusive Szabo has been involved in cryptocurrency since day one (check out his Bit Gold contribution). With smart contracts, he desired to remove the

Co-funded by the Erasmus+ Programme of the European Union

middleman, who traditionally played the role of the contract enforcer. Instead, he envisioned smart contracts to be like a vending machine. Think about the procedure of a vending machine – it's the simplest transaction you can make. You decide what you want and insert money into the machine. Once you click on the button or insert the code for the item of the same value, the machine automatically releases it. Smart contracts essentially work in the same way. These contracts automatically enforce themselves once certain conditions are met.

Co-funded by the Erasmus+ Programme of the European Union

3.3.4 Module 10: Augmented Reality/Virtual Reality

Compiled by: Dr. Francesco Mureddu, Lisbon Council

3.3.4.1 Reader

Introduction

In virtual reality (VR) a person is placed in a computer-generated world. In other words, through a VR headset and special hands controllers, you are transported somewhere else and the outside world is completely replaced with a virtual one. In augmented reality (AR) virtual objects are overlaid on the real world environment. In this case the glasses are transparent, permitting you to see as you were wearing normal sunglasses but adding information, images, data over whatever you are looking at. AR provides more freedom for the user because it does not need to be a head-mounted display, virtual objects can be added directly on a display. Well-known examples of this are the holograms used in the first Star Wars films or the game app PokemonGo, which uses your phone's camera to track your surroundings and overlay additional information on top of it. Some popular AR devices are Microsoft HoloLens, Magic Leap One.

Content

The idea behind VR is that you are separated from the real world and experience the virtual world as being real. In virtual reality you have tons of possibilities, you could fly a starfighter or simply walk on a sandy beach. The VR experience is obviously more immersive than AR experience. Some popular VR devices are Oculus Rift, HTC Vive, Sony Playstation VR and Google Cardboard.

There is also mixed reality (MR) that does not only overlays but also anchors virtual objects to the real world and allows users to interact with the virtual object. It is certain that this kind of technology is going to increase in the future and its potential is high.

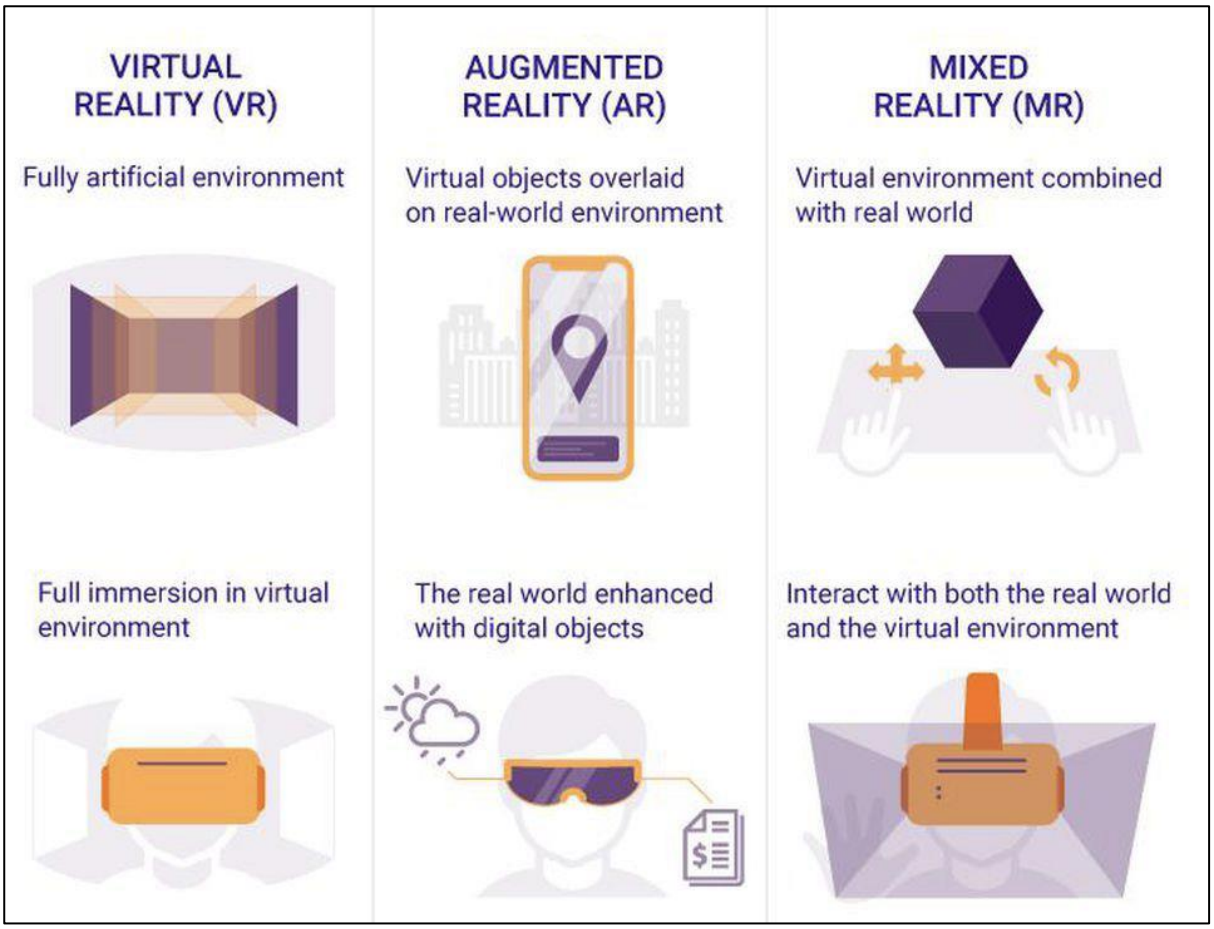


Figure 9: Difference between Virtual Reality, Augmented Reality and Mixed Reality

Source: https://www.quora.com/What-is-the-difference-between-virtual-reality-augmented-reality-and-mixed-reality/answer/Julia-Tokareva-3?fbclid=IwAR1qnKY7aqmXkoZ37XC83XzWKKkCiYzN8BXkzVrp818WsSjan3rJwxMdPw4

Applications of VR-AR include: training, policing, education, maintenance, public and health safety, urban planning, digital safety, eGovernment, culture and tourism, big data applications.

Policing

With AR systems providing details on the environment officers would be facilitated in many ways. For instance, knowing in advance prior reports about dangerous situations or past arrests at the same address. AR systems may also help them collect evidence and preserve crime scenes. Dutch police are using AR technology to help first responders who may be less qualified to work on a just discovered crime scene. The idea is to avoid as much as possible a scene contamination. With these systems less qualified officers on scene can wear a camera and by using their smartphone or a headset can be guided in the operation by a qualified expert investigator, maybe sitting in an office miles away. If the investigation is spread through the whole country all teams involved can follow the operations as they were present to the scene. In the next future AR could be used for example to recreate a crime scene for a jury.

The augmented reality interface seen by the remote expert.

Image via Dactu, Lukosch, Lukosch

Figure 10: Augmented Reality Helps Dutch Police Out on Crime Scenes

Source: https://augmented.reality.news/news/augmented-reality-helps-dutch-police-out-crime-scenes-0175132/

Co-funded by the Erasmus+ Programme of the European Union

Figure 11: Virtual Reality Training Improves Operating Room Performance: Results of a Randomized, Double-Blinded Study

Source: https://www.researchgate.net/publication/269347545_Virtual_Reality_Training_Improves_Operating_Room_Performance_Results_of_a_Randomized_Double-Blinded_Study

Training

By recreating a real-world experience, AR and VR can help training military, first responders, law enforcement, pilots and any other category of personnel with expensive and usually dangerous training. With AR and VR it would be possible to simulate situations that are too difficult to recreate in real life, allowing the trainees to be prepared for any kind of situation they may encounter. AR and VR can really revolutionize training for city employees in many areas of expertise, especially the dangerous one, because this kind of training environment is often difficult to recreate. According to GBC (Government Business Council) integrating more Virtual simulations into the services' training regimens, the military can reduce costs while better preparing for new challenges. On the other hand infantry, which needs more physical training (they need to run, climb, dive and interact with real world and with each other) would have more benefits with AR, because in this way soldiers still see a physical environment around them, but that could be enriched with overlaid objects, obstacles, adversaries or civilians to protect. In addition to that, it is worth mentioning the immense advantage for medical professionals, which can improve their surgical abilities in a virtual operating room (OR). According to studies in the medical field, VR surgical simulation significantly improves OR performance. VR trained residents are faster and less inclined to make mistakes.

Co-funded by the Erasmus+ Programme of the European Union

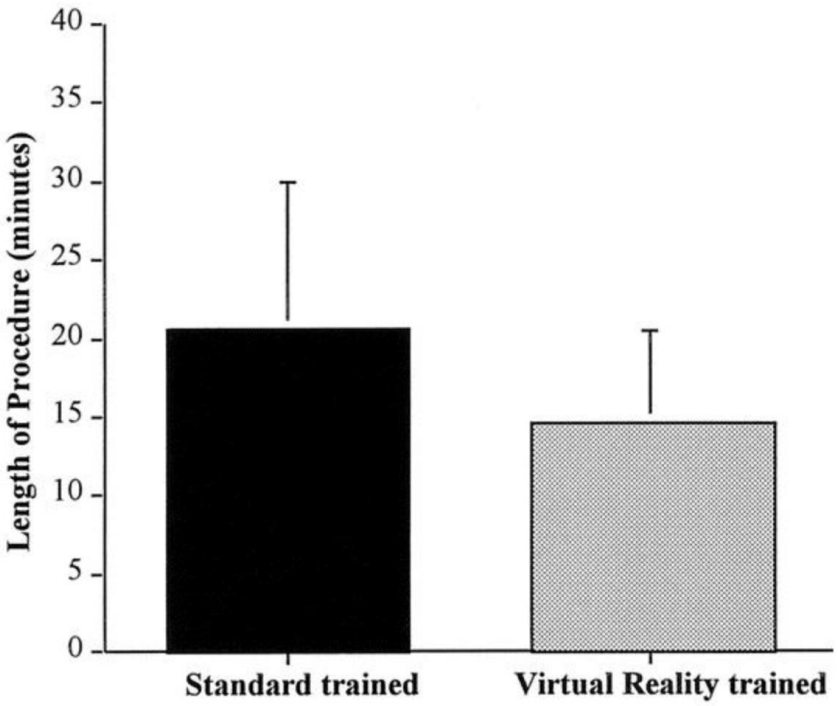


Figure 12: Mean duration of operative procedure for the VR and ST groups

Source: Seymour ad others, Virtual Reality Training Improves OR Performance Image retrieved from Quora.com

Co-funded by the Erasmus+ Programme of the European Union

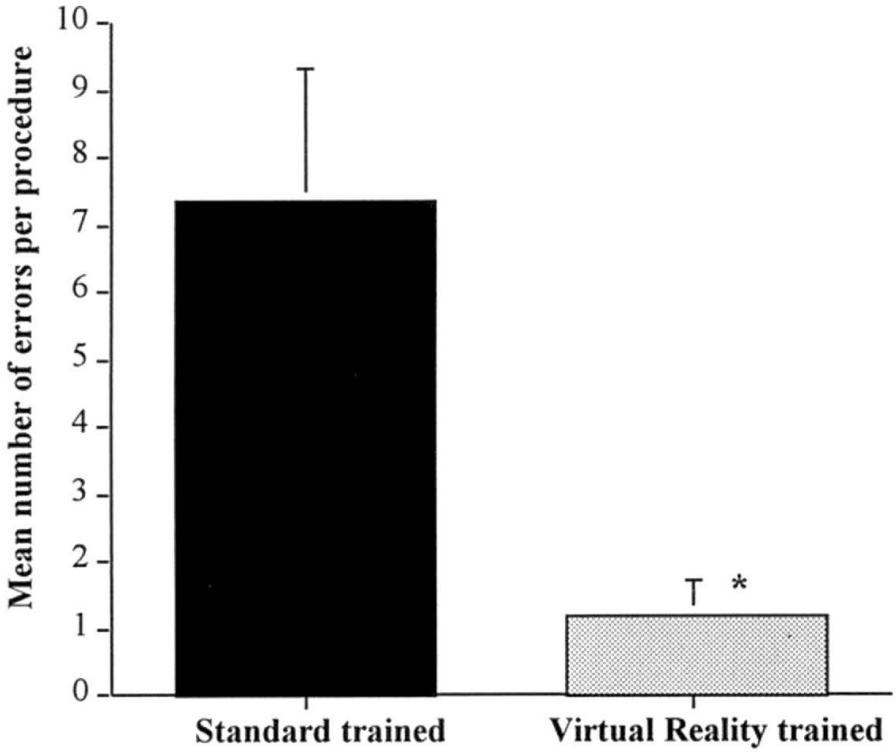


Figure 13: Total number of errors scored per procedure for VR and ST groups. The mean number of errors per procedure was significantly greater in the ST group than in the VR group (P < .006).

Source: Seymour ad others, Virtual Reality Training Improves OR Performance

Education

Education could be available to students from everywhere, with more engaging and entertaining lessons than a standard online class. With VR even students in health care facilities or remote rural areas may get an easy access to education. With digital reality, teachers can create an immersive learning environment, while students may enhance their learning experience over time and space and also have fun. According to an article by Arushi Gupta on Quora, the major benefits of using VR in education were the following:

- 68% excites students to learn
- 39% encourages creativity
- 32% makes difficult concepts easier
- 23% significantly lower costs field trips
- 15% enables students to attend school from anywhere
- 5% eliminates distractions

Co-funded by the Erasmus+ Programme of the European Union

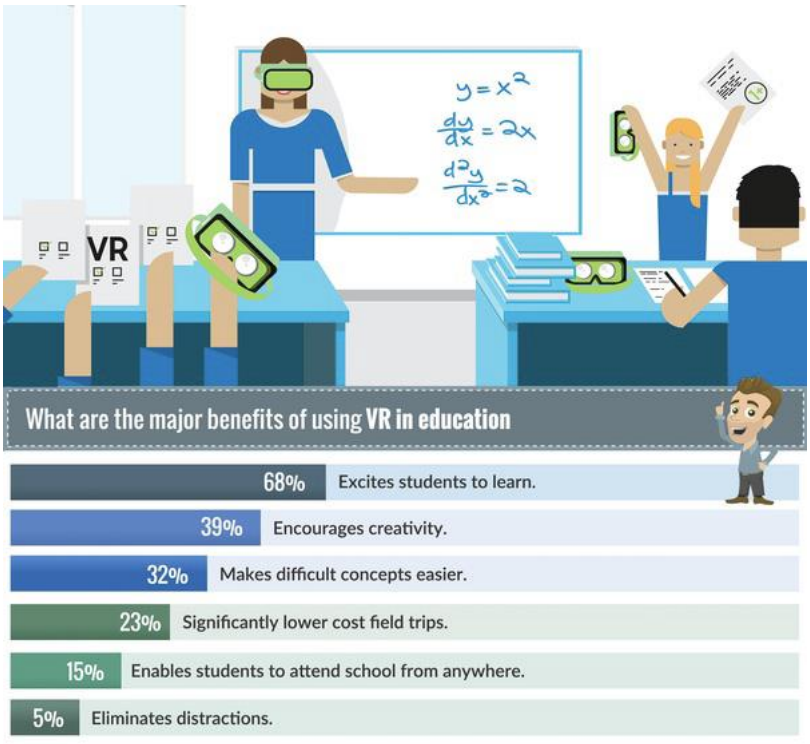


Figure 14: What are the pros and cons of Virtual Reality?

Source: https://www.quora.com/What-are-the-pros-and-cons-of-Virtual-Reality

Maintenance

With AR field workers may have the possibility to determine the need of maintenance of a machine or a structure checking previous data and they could have the immediate availability of virtual manuals in their field of vision, without the need to stop working to check a bulky papery manual. They could get immediate support and guidance from specialists and supervisors even from distance. With AR remote connections municipal workers would be able to efficiently maintain city assets like streetlights, cell towers, fire hydrants, water wells, etc., using head-up windshield displays on maintenance vehicles, smart goggles or hat-mounted devices and other handsfree AR devices. Similar cases have shown that eliminating the inconvenience of glancing back to a book and flipping pages resulted in 34% increase in speed of accomplishing task. Digital technologies can augment workers abilities, resulting in dramatic improved performances and workers satisfaction. AR glasses can for example overlay computer generated videos, graphics or text information onto physical objects, for instance step by step instruction hovering over a machine part, guiding a worker through the job. Such technologies increase productivity and thus economic growth and better jobs. AR will allow more workers to do high-skill jobs and improve their performances.

Co-funded by the Erasmus+ Programme of the European Union

Figure 15: Augmented Reality E Virtual Reality Nel Mondo Delle Aziende

Source: https://discutere.it/blog/2018/02/22/augmented-reality-e-virtual-reality-nel-mondo-delle-aziende/

Public Health and Safety (emergency management, mental health services)

By wearing special glasses, the user has the possibility to see all the available data on a factory, a plant or a building to immediately verify conformity and see if there is any code violation. AR equipment gives first responders knowledge of the surroundings helping them rescue residents in need by highlighting the fastest and safest way through smoke, fire or other difficult conditions. By wearing AR glasses, they can see the blueprints of the buildings and infrastructure and this could help them find access and escape points rapidly, allowing them to prioritize the hardest hit areas most in need of assistance. AR and VR have also the potential to help people with mental health problems, such as anxiety and PTSD. A study by Northwestern University in collaboration with Veterans Affairs researchers showed how a VR computer system helped veterans to cope with PTSD, and also helped them giving job interviews by using videoclips of a live actress who plays a human resources representative for a retail outlet and interact with users based on how they answer the questions. The research had similar results from the training for people with severe mental illness or higher-function autism. The study showed promising results. In fact, more than 90% of participants found the training useful and more than 80% said it gave them confidence.

Co-funded by the Erasmus+ Programme of the European Union

Figure 16: Screenshot of Edgybees's augmented reality mapping software used in emergency management situations.

Source: https://www.timesofisrael.com/israeli-video-game-company-adapts-software-to-assist-first-responders/

Digital Services (E-gov)

Instead of using static digital forms to fill in order to receive services, every government form and application could be improved by providing the citizens an interactive experience and by helping them through the application process with a full range of accessibility aids, such as language translations, sound, visual and graphics instructions. The AR and VR technology would facilitate users and reduce errors. Moreover, it is possible to show the citizens, through AR, what planned public works will actually look like and even the possibility to interact with the augmented project.

Culture and Tourism

It is possible to enhance touristic or educational experiences with additional information and historical or cultural details to a monument, a museum or a national park. For instance, it would be possible to see an archaeological site as it was in its origin. Several countries are using digital technologies to increase tourism promoting declined regions. The government of Japan has launched 360-degrees VR videos to provide immersive experiences in the beauties of the country. They also created a series of 360-degrees videos, both with spring and summer scenarios, for visitors going to Japan for the 2020 Olympic Games to be seen prior to their arrive. One other example is the town of Cluny, in France, that has installed AR screens throughout its historic Abbey, in order to show how the community looked like in the Middle Ages. National parks, forests, coastlines could also benefit from AR which can provide safe paths for hikers and information about the surrounding flora and fauna with effective educational experiences, while encouraging and monitoring the appropriate use and preservation of natural resources.

Augmented Reality on-site

Co-funded by the Erasmus+ Programme of the European Union

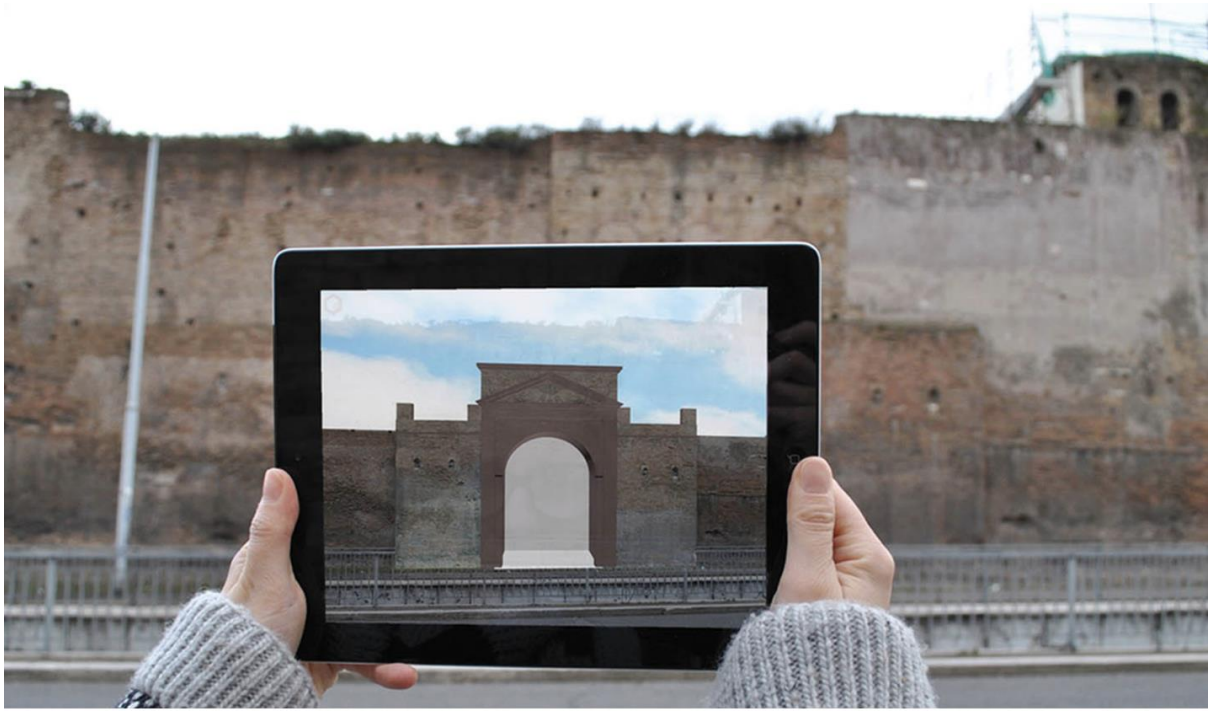


Figure 17: Augmented Reality on-site

Source: https://www.researchgate.net/figure/Augmented-Reality-on-site_fig2_304028177

Urban Planning (asset management and public works)

Collecting, analyzing and visualizing data will allow users to interact with the environment. With AR and VR models of new constructions it would be possible to visualize how a new building or a new bridge could affect auto traffic or the landscape. It would be possible to recreate various scenarios and see which one is the more suitable. By making these models available it would be possible to get feedback from the residents. Moreover, it would help workers with repairs and construction projects, making the working environment more efficient and safer, for instance highlighting the presence of hazardous conditions such as the presence of asbestos or other dangerous materials.

Figure 18: How Will Virtual Reality Change The Way We Plan Sustainable, Smart Cities?

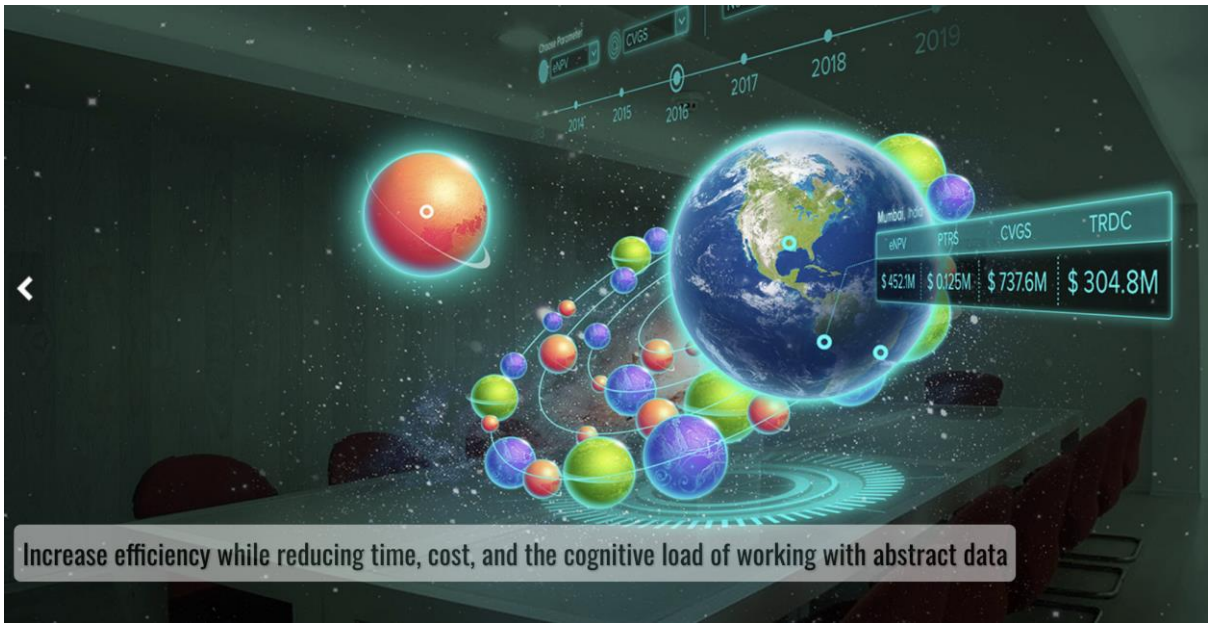
Co-funded by the Erasmus+ Programme of the European Union

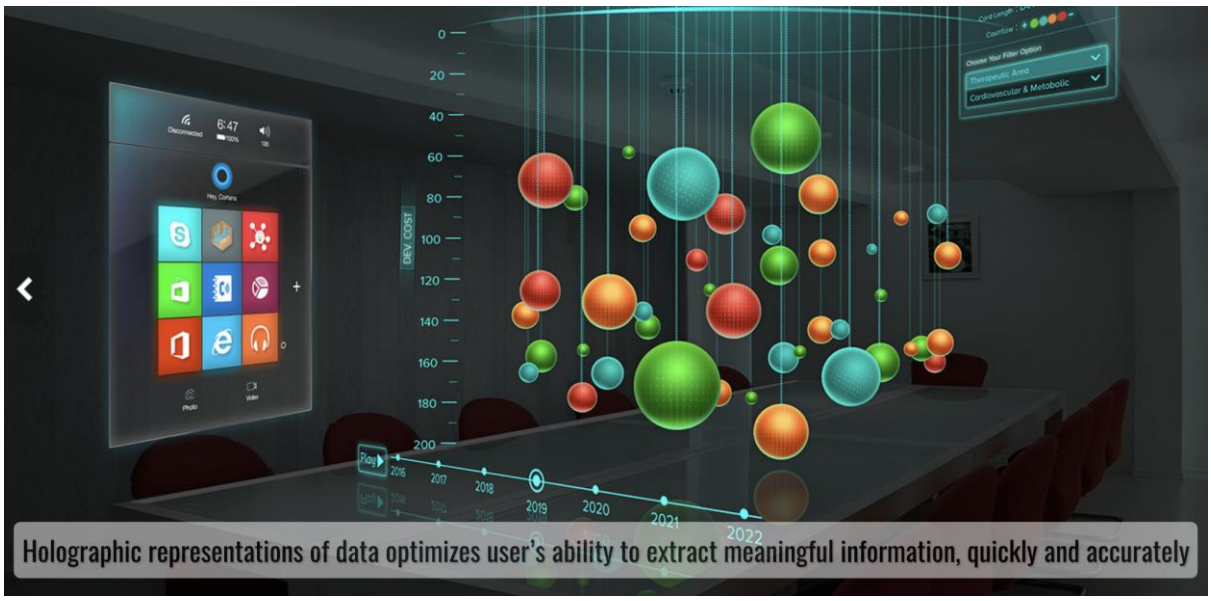
https://gowlingwlg.com/en/insights-resources/articles/2019/how-will-vr-change-the-way-we-plan-smart-cities/

Big Data

With AR/VR technology the presentation of data is more interactive, faster and effective. Interaction with data becomes more intuitive, it is possible to literally step inside them, interact with them, manipulate objects with our hands to view them from a different perspective, changing their size, colour or transparency. Another important advantage of VR and AR environments is that the "canvas" can be consulted by more than one person at the same time. Moreover, with VR, distractions can be eliminated, because all the users' senses are entirely focused on the virtual environment and on what matters, until they remove the headsets. One provider of such solution is Virtualitics, whose technology is currently being tested by clients in the finance, pharmaceuticals and energy industries. According to Michael Amori, CEO and founder at Virtualitics, VR and AR can bring two significant innovations: the ability to see many dimensions in data at the same time, and a collaborative environment, which is missing in current analytics tools.

Data visualization in augmented reality





Co-funded by the Erasmus+ Programme of the European Union

Figures 19, 20: Augmented Reality & Virtual Reality

Source: https://www.i2econsulting.com/innovations.php

Conclusion

Potential Obstacles

Digital reality is in constant growth but with evident advantages come also some downside, in particular concerning four subjects:

- **High costs.** One of the biggest issues is the necessity of funds to update government technology. It seems to be certain that with AR and VR technologies government agencies can increase efficiency and reduce cost. The actual challenge is to ensure that the transition to AR and VR technologies be funded. One solution could be to start with small-scale projects supported by strong leadership and keep track of the return on investment;
- **Cybersecurity and privacy.** It is of primary importance for government agencies to protect sensitive data of both the public and their own workforce. One of the possible approaches is to balance security with costs;
- **Legacy system.** AR/VR can help users process large amounts of data, but not all the different types of software can communicate with each other. The US Army for example operates various simulators to train troops in different sectors, from weapons to aircraft and it happened that in some situations they were not able to operate in the same virtual space. One solution is to modernize systems using API-based architectures, because these kinds of systems are a more discoverable, shareable and usable approach to integration than legacy systems. By using API-based solutions, systems can be upgraded and integrated to enable digital reality applications for government organizations;
- **Conflicting requirements.** For various reasons, new technologies such as AR/VR sometimes are approached by stakeholders with skepticism. That can range from a lack of understanding of the benefits to conflicting priorities. The solution could be to run a pilot program to get approval from the stakeholders.

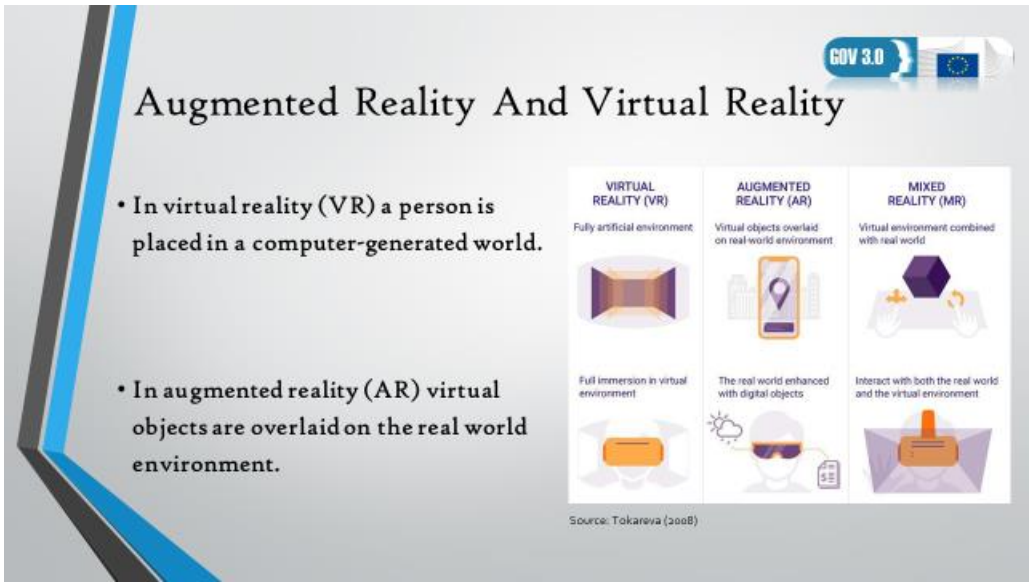
References

Tokareva, J. (2018). The Difference between Virtual Reality, Augmented Reality, and Mixed Reality. Forbes Magazine. Retrieved from https://www.forbes.com/sites/quora/2018/02/02/the-difference-between-virtual-reality-augmented-reality-and-mixed-reality/#62cac0712d07

Co-funded by the Erasmus+ Programme of the European Union

3.3.4.2 MOOC

Hello, I am Francesco Mureddu. In my presentation I will tell you about Digital Reality, more specifically about Augmented Reality (AR) and Virtual Reality (VR) and how they can help Government and public administration in numerous applications.



There are two fundamental differences between VR and AR: in VR a person is placed in a computer generated world, in AR virtual objects are overlaid on the real world environment.

More in detail, with VR all the real world is shut out by the digital environment, so that a person is completely immerse in a fully artificial environment. With the support of special headsets and hand controllers the user can interact with the virtual world, living a totally wrapping experience.

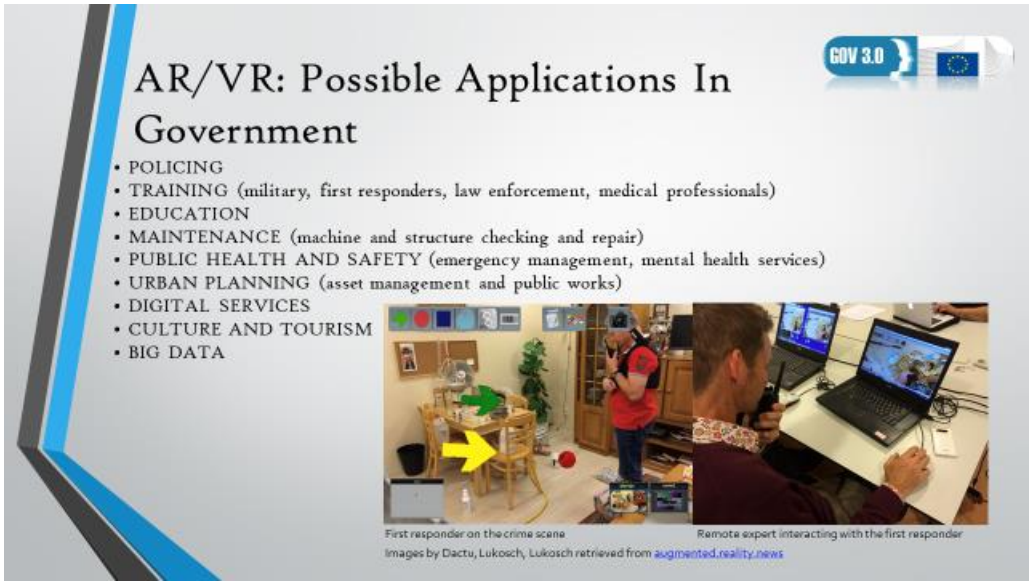
In AR, on the contrary, the users are in the real-world environment but can see virtual objects overlaid on their environment. One perfect example of AR is the mobile game Pokemon Go, where you can see, through your phone's

Co-funded by the Erasmus+ Programme of the European Union

camera, the famous creatures to capture. Like in VR also with AR it is possible to use special glasses and handsets to enhance the experience.

It is worth to mention also Mixed Reality (MR), which, as the name suggests, is a mix of both AR and VR. The particularity of MR is that not only overlays virtual objects to the real world, like AR does, but it anchors these objects and allows the users to interact with them.

It is certain that these kinds of technologies are going to increase in the future and their potential is limitless.



Now I am going to briefly illustrate some of the fields in which AR and VR can be undoubtedly useful and improving for governments.

Policing with AR systems can make officers work easier and faster. For example, while proceeding with an arrest, it promptly provides the officers information about the criminal record of a suspect. AR can also help them collect evidence from a crime scene. Less qualified officers on scene can wear a camera and by using their smartphone can be guided in the

Co-funded by the Erasmus+ Programme of the European Union

operation by qualified expert investigators, reducing the risk of scene contamination. In The Netherlands, the police is already adopting these technologies.

Also training in many areas of expertise, especially the dangerous ones, such as military, first responders, law enforcement and medical professional, can benefit from digital technology. With AR and VR systems it is possible to recreate various scenarios, allowing the trainees to be prepared for any kind of eventuality. According to experts, VR simulation in the military training can reduce costs while better preparing soldiers.

Same thing for surgical training, it is demonstrated that VR trained residents are faster and less inclined to make mistakes than standard trained residents.

Education is another sector that can take advantage from VR. With VR the lessons can be undoubtedly more engaging and entertaining. Teachers can create an immersive learning environment, while students may enhance their learning experience.

With digital reality even students in health care facilities or remote rural areas may get easy access to education.

Maintenance can also be truly facilitated by AR/VR technologies. For example, workers can determine the need of maintenance of a machine or a structure by rapidly checking previous data. They have the possibility to consult virtual manuals instead of heavy papery tomes.

They can also have immediate support form specialists and supervisors even from miles away.

AR glasses can project on physical objects useful information, such as step by step instructions. Such technologies increase productivity and improve workers' performances.

One other important subject is Public Health. AR equipment can help first responders in case of emergency evacuations, showing them, through special glasses, blueprints of the building or infrastructure, highlighting the fastest and safest way through smoke, fire, or other risky conditions.

VR has shown its potential also in the treatment of mental health problems, such as anxiety or PTSD, helping subjects to overcome their fears and traumas.

AR and VR are useful also in Urban Planning, for instance now, with AR/VR is possible to visualize how a new building, bridge or road could affect auto traffic or the landscape. It is possible to recreate and manipulate scenarios and see which one is more suitable.

By making these models available online it would also be possible to get feedback from the citizens.

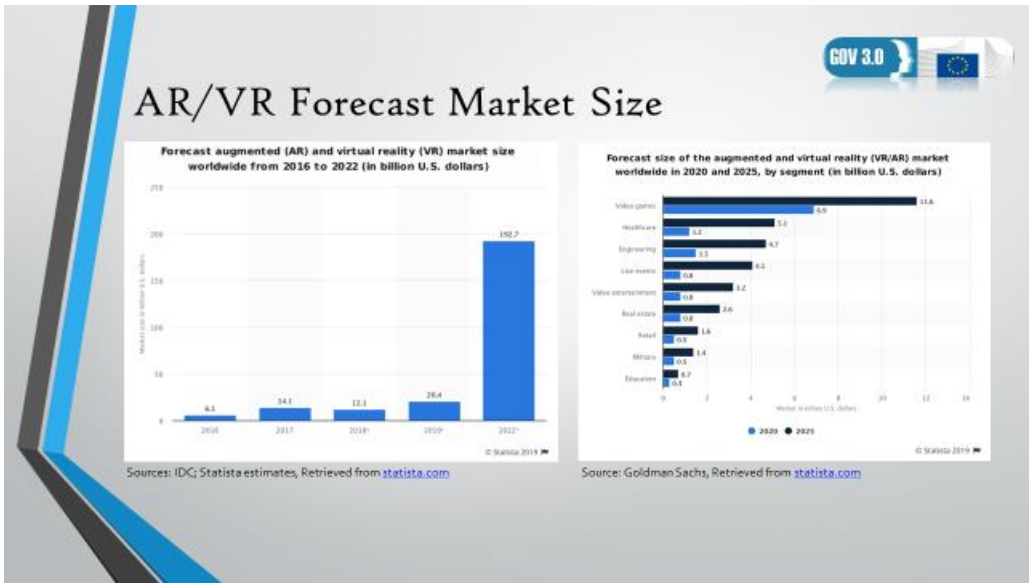
Concerning Digital Services, government and citizens would have more pleasant interactions if every government form and application was interactive, with a full range of aids, such as translations, sound, visual and graphic instruction. AR/VR technologies would facilitate users and reduce errors.

Several countries are already using digital technologies to increase Tourism and Culture.

Touristic and cultural experiences can be enhanced by additional information and historical or cultural details to a monument, a museum or a national park. It would be possible for example to see how an ancient city looked like in its origin, or, while hiking in a park, learn about details of plants and animals. The possibilities are really countless.

Big Data is also worth mentioning. AR and VR technologies can present data in an interactive way, giving the possibility to physically interact with data, manipulating objects with the touch of a finger, changing their size, colour or transparency. One fundamental advantage is that data can be consulted by more than one person at the same time, resulting in a more collaborative environment.

Co-funded by the Erasmus+ Programme of the European Union



The advantages of AR and VR are numerous, in fact the sector is in constant growth. Certainly, there are also some downsides, such as cybersecurity/privacy, legacy system, conflicting requirements and high costs but nothing that cannot be overcome.

Thank you for your attention!

Co-funded by the Erasmus+ Programme of the European Union

4. FINAL REMARKS

This is the first part of the deliverable including the description of the first 10 modules to be implemented in the MOOC and updated in the existing courses of the academic partners. The following modules were described:

Module 1: Introduction to e-Government and Information Society Principles

Module 2: Digital Government and Service Innovation

Module 3: Standardization and Interoperability

Module 4: Legal Implications of Data-driven Decision Making

Module 5: Datafication/Big Data Analytics

Module 6: Open Government Data

Module 7: Smart City Government/IoT

Module 8: Machine Learning and Data Mining

Module 9: Blockchain and Smart Contracting

Module 10: Augmented Reality/Virtual Reality

The next steps of WP3 include in T3.2:

- Describe the Joint Master curriculum
- Develop 7 modules/lectures for the master program and MOOC

Based on the results of the workshop and evaluation report, the following modules are planned:

- Once Only Principle
- Policy Modelling
- Ethics as a horizontal course addressing all the disruptive technologies
- Cloud Computing
- Theories in government
- Natural Language Processing
- Social media (Interface with co-creation and NLP)

For T3.3 the following activities are planned:

- Develop 10 special modules for seminars and summer schools with focus on professionals and entrepreneurs (new courses supporting entrepreneurship)
    1. Entrepreneurship and Technology Management
    2. Gaming-based simulation
    3. Diffusion of Innovation
    4. Community Awareness Platforms
    5. Service co-creation
    6. Design Science
    7. Sustainability and societal challenges
    8. Security's management side and cybersecurity
    9. Digital inclusions

Co-funded by the Erasmus+ Programme of the European Union

10. Privacy

- Validate with experts and students through workshops/seminars/interviews (government officials)
- Implement the modules in the Samos Summer School M21 (July 2019)

ANNEX A: ICEGOV 2019 WORKSHOP

Content

Provide the workshop title, abstract, objectives, format, relevance, and expected outcomes.

NUMBER	[To be filled by the ICEGOV Secretariat following what is agreed with the workshop organizers]
TIME	[To be filled by the ICEGOV Secretariat following what is agreed with the workshop organizers]
TITLE	On a science base for Digital Government/Transformation
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. *"Government 3.0 refers to the use of disruptive ICTs (blockchain, big data and artificial intelligence technologies) in combination with established ICTs (distributed technologies for data storage and service delivery) and the wisdom of crowd (crowd-sourcing and co-creation) towards data-driven and evidence-based decision and policy making."* This workshop aims to establish the current baseline of e-Governance curricula and describe their fundamental aspects. Information discussed in this workshop is valuable to the e-Governance educators and curriculum designers, as well as to the e-Governance practitioners, to better understand the foundational knowledge transmitted to graduates in the field.
OBJECTIVES	The objectives of the workshop are as follows: - Present and discuss the current status on training needs within the e-Government field - Validate modules and courses of a Training Programme in Government 3.0 - Identify scientific theories and methodologies related to digital transformation in government
FORMAT	In order to address the objectives, the workshop will be divided into four distinct activities: 1) Introductory presentation of research findings on training needs 2) Group brainstorming session on the training needs; 3) Interactive discussion on digital transformation in government. The first session will contain presentations by the ERASMUS+ Gov 3.0 project members as well as additional presentations by invited speakers. The workshop will base on the data collected during the first stages of the Gov 3.0 project on training needs within e-Government research field. The participants of the workshop will be asked to validate possible future developments in Government 3.0 with the aim to uncover possible alternative visions of the future to create use cases as learning material. The second part will introduce previous identified courses for a Training Programme in Government 3.0 followed by a brainstorming session that will focus on (a) the content of the modules and relation to Government 3.0; (b) courses that should be included in a Master program; (c) what modules could be included in the courses; (d) the country-specific modules on the post-graduate levels. The groups will be split among regions or target groups (for instance academic and executive levels). The third part of the workshop consists of an interactive discussion on the scientific theories and methodological competences related to digital transformation in government. The workshop will conclude with a plenary presentation, summarizing the work conducted during the workshop. The intended audience of the workshop are researchers and practitioners in electronic governance coming both from the public and the private sector.
RELEVANCE	The topic of the Workshop is closely aligned especially with Track 1 regarding the digital transformation of public services and governments, which is the foundation of the proposed government 3.0 domain, but also with Tracks 4 and 5 since in one hand smart cities are considered the realisation of the Government 3.0 technologies and in other hand blockchain, big data, artificial intelligence and virtual reality are among disruptive technologies that form the new generation of digital government.
OUTCOMES	- Research-Educational directions on the emerging Government 3.0 field - Feedback on the courses for a Master Programme in Government 3.0 - Science base framework for Digital Government/Transformation

People

Provide the name, affiliation, function, email address, and short bio of the workshop Chair (only 1) and the remaining people who will play an active role in the Workshop. Note that a **minimum of 3 and a maximum of 5 people** can be included in the proposal. If possible, bear in mind gender and age balance.

WORKSHOP CHAIR (only 1 allowed)	NAME: Harris Alexopoulos AFFILIATION: University of the Aegean FUNCTION: Postdoc researcher EMAIL ADDRESS: alexop@aegean.gr SHORT BIO: Harris holds a PhD diploma from the Department of Information and Communications Systems Engineering at the University of the Aegean on open data. He is a Senior Researcher and Project Manager at the Information Systems Laboratory of the same department, working on European and National funded research and pilot application projects (ENGAGE, SHARE-PSI 2.0, EU-COMMUNITY, PADGETS, NOMAD, NET-EUCEN, PLUG-IN) for governments and enterprises. He has been responsible for the International Relations of the Innovation and Entrepreneurship Unit of the University and he serves as a mentor for many startups contests. Harris also serves as Programme and Organisation Committee Member, Track and Minitrack chair for Samos Summit, HICSS, MCIS. He is also a course manager of two summer schools and he is teaching e-government and business management at pre-graduate and postgraduate level. His research interests lie on the fields of Decision Support Systems, Open Data, e-government and interoperability.
PEOPLE 1	NAME: Gabriela Viale Pereira AFFILIATION: Danube University Krems, Austria FUNCTION: Associate Researcher EMAIL ADDRESS: gabriela.viale-pereira@donau-uni.ac.at SHORT BIO: Gabriela Viale Pereira is Associate Researcher at the Department for E-Governance and Administration at Danube University Krems and Visiting Post-doc at EAESP/FGV. She holds a master and a doctoral degree in Business Administration at PUCRS. Gabriela's activities include research in electronic government and ICT-related Governance projects involving smart governance, smart cities, open data, data analytics and government 3.0. She is Coordinator of the Strengthening Governance Capacity for Smart Sustainable Cities project for the Latin America region under the Erasmus+ funding. Her experience covers research at national level in Brazil and Austria, as well as EU-funded projects in the fields of electronic government, smart governance, smart cities and open data. Gabriela is track chair on Smart Governance for Smart Cities, Communities, and Regions at ICEGOV 2019, chair of the PhD Colloquium and co-chair of the General E-Government & Open Government Track at EGOV2019, and member of the Smart City Smart Government Research Practice Consortium.
PEOPLE 2	NAME: Demetrios Sarantis AFFILIATION: UNU-EGOV FUNCTION: Postdoctoral Fellow EMAIL ADDRESS: sarantis@unu.edu SHORT BIO: Demetrios Sarantis is Postdoctoral Fellow at UNU-EGOV. Demetrios graduated in Electrical and Computer Engineering by the National Technical University of Athens, holds a MSc in Operational Research and Information Systems from the London School of Economics and Political Science, and a PhD in e-Government from the National Technical University of Athens. He has been employed in software industry and in the Hellenic Telecommunications and Post Commission (EETT), deploying and managing information systems and services and supporting database information infrastructures. He has also worked as researcher in e-Government Unit in Decision Systems Laboratory of School of Electrical and Computer Engineering at the National Technical University of Athens (NTUA), participating in national and international research projects, in the areas of Government Transformation, Interoperability Frameworks, eParticipation, eGovernment, Process Modelling and Re-engineering in Public Sector. He has worked as researcher in Yale

Co-funded by the Erasmus+ Programme of the European Union

	University (USA) in the area of Ontology Data Modelling in Biomedicine. His current research interests are Data Modelling-Ontologies, e-Governance. Public Administration, Information Systems Interoperability and Smart Cities.
PEOPLE 3	NAME: Yannis Charalabidis AFFILIATION: University of the Aegean, FUNCTION: Associate professor EMAIL ADDRESS: yannisx@aegean.gr SHORT BIO: Yannis Charalabidis is Associate Professor in the Department of Information and Communication Systems Engineering of the University of Aegean. In parallel, he serves as Director of the Innovation and Entrepreneurship Unit of the University, designing and managing youth entrepreneurship activities, and Head of Information Systems Laboratory, coordinating policy making, research and pilot application projects for governments and enterprises worldwide. He has more than 20 years of experience in designing, implementing, managing and applying complex information systems as project manager, in Greece and Europe. He has been employed for 8 years as an executive director in SingularLogic Group, leading software development and company expansion in Greece, Eastern Europe, India and the US.
PEOPLE 4	NAME: Leif Skiftenes Flak AFFILIATION: University of Agder FUNCTION: Professor, Director, Centre for Digital Transformation EMAIL ADDRESS: leif.flak@uia.no SHORT BIO: Leif Skiftenes Flak is Associate Professor of Information Systems at University of Agder. He holds a PhD in computer science from Aalborg University. His research interests are on e-Government in general with emphasis on local e-Government efforts, municipal cooperation and benefits management in particular. His work has been published in information systems and e-Government journals like Communication of AIS, Government Information Quarterly and Scandinavian Journal of Information Systems. Dr. Flak is currently leading the research group on e-Government at UoA and is active within the international e-Government research community through memberships in networks such as the DEMO-net European network of excellence and the Norwegian network of eGovernment researchers, where he serves as a board member. He is also member of the AIS SIG eGov and is involved in various e-Government research and practice projects in Norway. Dr. Flak is currently Associate Editor of the journal Transforming Government: People, Process and Policy.

Acknowledgement

By submitting this form, you acknowledge that, if the proposal is accept, the people responsible for the Workshops are expected to define the format and content of the session and ensure that all people necessary for the session register and attend the conference. It is also highly encouraged that everyone involved remains for the whole conference, although this is not mandatory.

Submission

The form is hereby submitted by:

NAME	Gabriela Viale Pereira
EMAIL	gabriela.viale-pereira@donau-uni.ac.at
DATE	10/12/2018

Co-funded by the Erasmus+ Programme of the European Union