ЕКОНОМСКИ ИНСТИТУТ
ECONOMICS INSTITUTE
1947

ekonomski
institut
est. 1960

inženjerskibiro

Univerza *v Ljubljani*

Executive Agency for Higher
Education, Research, Development
and Innovation Funding

OPEN LABS
FLOSS. KOMUNITET. HACKERSPACE.

Data-Driven Innovation in South-East Europe

White Paper

December 2014

Table of contents

Prepared by

Economics Institute, Serbia

Inženjerski biro, Croatia

Economics Institute, Bosnia and Herzegovina

Economic Program Center for the Study of Democracy, Bulgaria

Executive Agency for Higher Education, Research, Development and Innovation Funding, Romania

Open Labs, Albania

University of Ljubljana, Slovenia

Supported by

Google

1. Introduction

The world has entered the era of leveraging data which paves the way for Data-Driven Innovation - the use of data to make new products and services, to change business processes in order to make them more efficient and optimal or to reduce costs and bring new economic benefits. The rapid growth of new data has created both exciting opportunities and new challenges for all aspects of society. Small and medium-size businesses can benefit from new opportunities by analysing and processing their data; governments can find new levels of efficiency by opening up useful datasets to innovation by the public; and social enterprises of all kinds can better serve citizens by better making better use of the data available to them.

These new opportunities demand a new set of skills to ensure the potential of data-driven innovation is realized. The computational and combinatorial skills that fuel the advances in innovation and efficiency are in short supply. The EU has already identified a major skills gap with up to 1 million ICT jobs going unfilled,[1] which also refers to data specialists. The risk is equally as great for data-driven innovation.

With these opportunities also come challenges. The increase of new data and the tools to analyse it create greater need for the right handling and protection of personal information. The sensitive nature of medical records, financial transactions, personal communications, or location-base reactionary calls for government to intervene. However, before the potential of data-driven innovation is sniffed out by fear-driven regulation, it is critical that policymakers fully understand the implication of their actions.

The already manifested opportunities and challenges are more likely going to multiply in the future. Among the drivers of change for this emerging scenario there can be included the following:

- *New data sources*: Internet of things & Wearable computing;
- *Faster communication*: 5G;
- *Practical applications of artificial intelligence:* Image recognition & automatic translation;
- *New boundaries between human and machine*: Augmented reality & Brain computer interface & Bionics;
- *Faster translation of data into reality*: 3D and 4D printing.

The most developed countries of the world already prepared themselves for the changes at the strategic level. In this context, there can be mentioned the following strategic documents:

- *Australia: The Australian Public Service Big Data Strategy*, Australian Government, August 2013;
- UK: *Seizing the Data Opportunity. A Strategy for UK data capability*, HM Government, October 2013;
- US: *Big data: seizing opportunities, preserving values*, Executive Office of the President, May 2014;
- European Commission: Towards a thriving data-driven economy, July 2014.

[1] http://eskills-monitor2013.eu/fileadmin/monitor2013/documents/MONITOR_Final_Report.pdf

Therefore, a strategic approach to these issues in South-East Europe is strongly recommended. Moreover, it is very important because it could be a great chance for South-East European countries to close the economic gap with the developed world based on the data-driven socio-technological wave.

The following sections will provide a framework for policymakers to use to help balance the competing issues at hand and ensure that Europe reaches its full potential through data-driven innovation without putting at risk the privacy and security of European citizens.

2. Understanding Data-Driven Innovation

The economic opportunity of data-driven innovation is massive. As OECD concludes, „the increased volume, velocity and variety of data used across the economy, and more importantly their greater social and economic value, signal a shift towards a data-driven socioeconomic model. In this model, data are a core asset that can create a significant competitive advantage and drive innovation, sustainable growth and development“ [2].

The growth in the amount of data generated on a daily basis has now exceeded any potential understanding of its size. A recent estimate put it at 161 exabytes a year - or roughly equal to the amount of information stored in 37,000 libraries the size of the US Library of Congress.[3] With that size comes enormous economic and social potential.

This value from the analysis of data can be calculated in real economic terms. Spending on IT infrastructure for data analytics was estimated by Gartner to reach $37 billion in 2013. The same report suggested that by 2015, innovation around data would create 4.4 million IT jobs globally.[4]

Understanding the value that be derived from data-driven innovation is critical as data itself has no inherent value. The amount of data being generated often confuses or misplaces the opportunity and distracts the debate by issues of scale rather than analysis. As Hilbert argues, “Independent from the peta-, exa-, or zettabytes scale, the key feature of the paradigmatic change is that *analytic treatment of data is systemically placed at the forefront of intelligence decision-making.”*[5] The economic statistics often serve only as proxies for the value that data-driven innovation creates. As many of the efficiencies of digital information are not captured by traditional economic measures like GDP or GVA. It is only through the analysis, the combination, the new products or service does this mountain of data generate value or efficiencies for society.

---

[2] OECD (2013), “Exploring Data-Driven Innovation as a New Source of Growth: Mapping the Policy Issues Raised by "Big Data"”, OECD Digital Economy Papers, No. 222, OECD Publishing.
[3] Software & Information Industry Association, “Data-Driven Innovation” http://siia.net/index.php?option=com_content&view=article&id=1293:data-driven-innovation&catid=163:public-policy-articles&Itemid=1411
[4] “Gartner Says Big Data Will Drive $28 Billion of IT Spending in 2012.” News | Business Wire. Business Wire, 17 Oct. 2012. Web. http://www.gartner.com/newsroom/id/2200815
[5] http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2205145

The value from data-driven innovation is not reserved to either the private or public sector. Eric Byrnjolfsson found that firms that adopt data-driven decision making improved output and productivity by 5-6 percent.[6] Equally, governments can improve the services they provide to their citizens by bringing these skills and techniques to bear on their own data. Also there is an increasing pressure for governments to make their policies evidence based; to follow the rule that "what is measured is improved". This calls for collection of additional data but also for its processing. It is not likely that the governments alone can come up with every idea on how to use the data collected. Data also saves money: the OECD found that governments in the EU could reduce administrative costs by 15-20 percent, creating the equivalent of €150-300 billion.[7]

There are now countless increasing examples of governments that have made datasets open to the public to innovate with. Whether that is opening up public transport schedules for app developers to create new consumer products or increasing transparency in government services by opening data to NGOs, the opportunities for public sector organizations is critical in this debate. In fact, most South-East European countries have joined the Open Government Partnership [OGP] and committed to increase access to new technologies for openness and accountability. Via the OGP, governments leverage new technologies to empower people and promote transparency, aiming to enable their citizens to influence decisions.

The opportunities are both economic and social. Hospitals and health systems are able to save lives and address systemic risks through data-driven innovation; schools can analyse how students interact with teaching material to improve education outcomes; policing resources are distributed more efficiently by forces that use data analytics.[8] The truth is that the possibilities are endless as long as we have the platforms and skills to analyse the trove of data being created and collected.

All of these economic and social opportunities also create dangers and risks that require careful analysis and response. The primary challenge is to ensure that personal information is not made public unknowingly or unwillingly through the sharing of datasets. These concerns must be addressed and the risks mitigated head on in order to maintain the continued confidence of the public to use digital services and for society to reap the advantages data-driven innovation provides. This can benefit individuals as much as society at large and so the approach of policymakers should be an intelligence set of rules rather than an exhaustive list of prohibitions.

---

[6] Brynjolfsson, E., L. M. Hitt, and H. H. Kim. 2011. "Strength in Numbers: How Does Data-Driven Decisionmaking Affect Firm Performance?" April 22. http://dx.doi.org/10.2139/ssrn.1819486

[7] OECD (2013), "Exploring Data-Driven Innovation as a New Source of Growth: Mapping the Policy Issues Raised by "Big Data"", OECD Digital Economy Papers, No. 222, OECD Publishing. http://dx.doi.org/10.1787/5k47zw3fcp43-en

[8] Software & Information Industry Association, "Data-Driven Innovation" http://siia.net/index.php?option=com_content&view=article&id=1293:data-driven-innovation&catid=163:public-policy-articles&Itemid=1411

3. A Policy Framework for Data-Driven Innovation

Policymakers should take an approach to data-driven innovation that allows for permissionless innovation to thrive. Adam Thier argues that "experimentation with new technologies and business models should generally be permitted by default. Unless a compelling case can be made that a new intervention will bring serious harm to society, innovation should be allowed to continue unabated."[9] This principle should drive any policy framework pursued in South-East Europe to ensure that this region can reap the benefits of this innovation.

The following are principles that should drive policy making around data-driven innovation:

- **Embrace open standards:** Governments should embrace open standards for data-driven innovation and make room for industry to take the lead in developing and setting those standards. The ability to integrate and combine datasets is critical to this innovation and open standards are essential to this innovation.

- **Bring data-driven innovation to government:** Governments will continue to benefit from data-driven innovation to reduce costs, improve services and decision-making by encouraging the use of data-driven innovation within government. Taking an open approach to working with the private sector will also encourage more innovation.

- **Balance the approach to privacy rights:** Policymakers should take an approach that takes a realistic view of the risks to individuals and society and balances those risks with the opportunities of innovation. Norms around privacy rights continue to evolve and policymakers should reflect that evolution.

- **Encourage the de-identification of data:** Personal information drives many of the fears around data-driven innovation. However PII is often not critical to unlocking the potential of data. Encouraging de-identification would help to reduce risks.

- **Take a realistic view of consent:** The role of consent in data-driven innovation is critical to ensuring that users' privacy is not violated while potential innovation can be unlocked. Often, consent clauses are overly complicated or not practical to anticipate future innovation. Policy should reflect social norms and be specific about the requirements of consent.
- **Harmonize privacy rules across Europe:** As data is collected by firms and organizations across multiple borders, competing rules and policies around data privacy needlessly put a brake on innovation. Policy at an EU level should be harmonized to provide certainty and consistency across borders.

[9] Adam Thier, "Permissionless Innovation:The Continuing Case for Comprehensive Technological Freedom" 2014. http://mercatus.org/sites/default/files/Permissionless.Innovation.web_.v2_0.pdf

4. International Case Studies

- **Preventing building fires in New York City**.

  Tens of thousands of tenants in New York City are potentially living in illegal apartments due to landlords converting a dwelling to allow for more occupants. This overpopulation causes a higher fire risk and in 2011 there were deaths of civilians and firefighters after two fires in illegal dwelling.

  Previously the New York City fire inspectors would visit potential illegal dwellings that they had heard about from a 311 helpline and would vacate the building if they were not up to code. With only 200 inspectors on staff this reactive response was not the most efficient use of resources and Michael Flowers, Director of Analytics for New York City was tasked with finding a solution.

  Michael and his team used deconstructed open government data to target these dwellings and found many of them were in areas that weren't receiving a high number of inspections.

  He used a variety of reports from government data such as building registrations, zoning permits, inspection data, property ownership, complaints and referrals. With this data he analysed hot spots where lower earning citizens would be more likely to live in illegal dwellings by checking variables against owners financial conditions, age of the building compared to the age of the building code.

  Prior to this exercise only 13% of the buildings were vacated fully, after 18 months of targeted inspections 70% of the buildings were vacated. Once the data was analysed it was used almost immediately with building inspectors.

  Ref: Michael Flowers keynote at Strata Conference.
  https://www.youtube.com/watch?v=_M_20UjRvr0

- **Creating a local neighbourhood network**

  Near hood, run by Born Local is a Finnish start up using local open data sources as well as data from social media networks to create a hyper local social media network for each neighbourhood and village. Using data from police records, city planning and other public authorities, the network allows citizens to view local issues in one place. It also allows businesses to reach out to a targeted network in their direct area.

5. Local best practices from South-East Europe

In this chapter, there are explained best practices from the South-East European countries. Most practices listed below are implemented in more than one country of the region.

5.1. Best practices from Serbia

- **Digitalization and networking of local government, its administration and public enterprises**

Local governments of some municipalities in Serbia developed web portals which enabled digitalization and sharing of geospatial data, information and services among local administration, public utilities, local real estate cadastre, building directorates etc. The portals are intended for use by local governments, various users from public and private sector of the economy, as well as by the citizens.

Benefits to local governments which developed such portals are numerous and include in the first line the following efficiency improvements:

- increase of resource management efficiency,
- improvement of quality of services,
- more efficient planning in various fields (urbanism, utilities infrastructure, ecology, demographics, agriculture, forestry, erosion and flood protection etc.),
- enhanced collection of public revenues,
- development of more efficient administration and maintenance of utilities infrastructure.

Citizens on the other hand can get insight into urban development plans and monitor and control the resource management. They are also enabled to report irregularities and problems, as well as to send their requirements to appropriate departments, to follow the status of their requirements etc. [10]

- **Development of information systems in elementary and secondary schools**

In many schools in Serbia there is installed an information system for school administration. Within the system, there are users which can enter data (management, teachers and administrative staff of schools), users which can only approach data (students, parents) and at the highest level users which can analyse data (municipalities, school districts, ministry of education).

This system enables the following:

- search for students according to various parameters (ID, name, grade, department, school, sex, place, age, etc.) and production of appropriate reports,
- basic data about employees (general personal data, engagement etc.) and production of appropriate reports,
- entry of data about scores, absences and penalties
- development of reports about scores in school by departments, organizational units, teachers, subjects, etc.

[10] Web Geoportal of the Municipality of Pirot, http://212.200.53.83/GISPirotPublic/Home/About

- printing of official documentation (certificates, diplomas, records, etc.),
- control of students payments (trips, various funds, proms etc.)
- access of parents to all relevant data related to their child (so called electronic markbook), etc.

The benefits for the educational system are numerous and include the following:

- modernization of management and promotion of decision making process based on reliable and verified data,
- more efficient resource management and planning process,
- rationalization of financing,
- easier monitoring of activities at all levels of education management,
- ease of sharing information between schools, ministries, local governments and other competent institutions,
- monitoring of development indicators and identification of problems and needs for reform, etc.[11]

- **Development of the E-Government portal**

Through the E-Government portal citizens can make an appointment to apply for the following: new ID and passport, registration and the renewal of registration of vehicles, replacing the old driver's license and a number of other services. In addition, local municipalities throughout Serbia through the e-Government portal can issue an extract from the register of births, marriages and deaths. Currently their services through E-Government portal offer 116 of the state administration and local self-government bodies. Introduction of the centralized system of electronic public administration service enables citizens to establish much easier communication with state bodies and public administration, retrieval of documents and submission of the request and receipt of the decision and other documents also becomes much easier and efficient. E-government is the simplest way to reduce queues, avoid corruption and to increase transparency and efficiency.

E-Government portal is essential for Serbian citizens as well as for citizens of other countries who wants better, more efficient and faster state administration's services. New information technologies allow all of this, and also reduce costs to citizens and entrepreneurs, and the costs of the state.[12]

- **Establishment of Belgrade University Computer Centre (RCUB)**

Belgrade University Computer Centre (RCUB) began its work in 1992, in order to provide computer services to the members of the University of Belgrade. RCUB's main role was the developing of the University Information System (UIS) that would be used for the integration of faculties' and institutes' data, centralized issuing of diplomas, analysis of the work of higher education institutions, as well as support for university's processes. There are 120 institutions in Belgrade that are connected to RCUB, such as faculties of the University of Belgrade and the University of Arts, Institutes, student dorms, libraries, teaching units of the Faculty of Medicine, and other research and education institutions.

[11] Project Center of the School of Electrical Engineering, http://projekti.rc.etf.bg.ac.rs/projekti/idejni_jisp
[12] http://www.digitalnaagenda.gov.rs/vesti/predstavljanje_znacaja_portala_euprava/

RCUB presents AMRES service centre and a central node. As such, RCUB represents a central point for connecting the academic institutions, education establishments, libraries, research centres, cultural institutions and student services. The support that RCUB extends applies not only to those organizations, but to their subsidiaries, individual users, (research, teaching, administrative and other staff, students, pupils, researchers, etc.).[13]

- **Development of the Integrated Health Information System (EU-IHIS)**

The Integrated Health Information System (EU-IHIS) is a 2.5 million Euro project funded through European Union (EU) Pre-accession assistance (IPA). The project foresees implementation of hospital information systems (HIS) in 19 selected hospitals throughout Serbia as well as development of electronic health record (EHR). The EU-IHIS project is jointly carried out by the Ministry of Health and EU. The project will last until 2015 and will use the positive experiences and results of previous EU and World Bank projects in this area.

The purpose of the EU-IHIS is also the improvement of information and communications technologies used in the health system of the Republic of Serbia. Based on the functions and mandate of the health institutions, the project will address issues like data entry, flow and sharing, data security, patients' rights and privacy.

Through all these activities, the project will:

- Provide patients with lifelong electronic health records,
- Enable health providers to record and easily access health and care related data,
- Establish gathering of information that can be used to optimize and improve performance of Serbian hospitals and the health care system,
- Assist in the establishment of a sustainable IT backbone for the Serbian health care system.

Ultimately, the developed tools, procedures, mechanisms and improved communication will lead to enhanced patient centred care and contribute to the individual and public health, rational use of resources, monitoring, evaluation and thus increased efficiency, quality and safety.[14]

5.2. Best practices from Croatia

Croatia expressed willingness to support the development of an information society and took part in the Competitiveness and Innovation Framework Program 2007-2013. In 2011 Croatia took part in the Open Government Partnership, a multilateral initiative aimed at promoting transparency in governmental institutions, and in 2012 founded the Commission for Public Administration Informatisation, the members of which are Croatian Government officials, whose role it is to steer development and coordination of all tasks and projects concerning ICT application in the public sector aimed at increasing the quality of public services with reducing costs. This Commission coordinates the implementation of all strategic EU documents with an emphasis on the Digital Agenda for Europe.

[13] http://www.rcub.bg.ac.rs/en/usluge.html
[14] http://www.eu-ihis.rs/index_EN.html

- **Establishment of E-Croatia project**

The framework for the establishment of the e-Croatia project enabled the digitalization of various data, the creation of organized registers by interlinking databases, the modernization of a legislative framework to foster and encourage application of IT in public administration and government transparency. In 2013 the Government commenced with the e-Citizen project (Official Gazette 52/13) in order to enable communication between the citizens and the public sector and to compile all data related to the Government, ministries, public services and other relevant issues.

- **Development of Law Portal**

Digitalization and accessibility of judicial decisions and court records, as a part of the judicial reform, created an opportunity for Inženjerski biro, a Zagreb-based joint stock company, to develop in collaboration with academic and jurisdiction community a successful product and services for more efficient data-based decision-making processes in legislation and corporate law sectors. The ingbiro.com Law Portal is a Data-Driven Innovation saving time and money for its beneficiaries. It is an organized, interactive system containing all current and relevant legal information (regulations, court decisions and professional papers) in/for Croatia and EU legislation. The Portal encompasses the entire up-to-date state legislation with relevant EU legislation including the EU regulations to which Croatia's regulations refer to. The regulations are organized and systemised in a larger number of categories/subcategories depending on the nature and complexity of certain issues in a certain field of law making the regulations easily accessible through an organized navigation system. Links between individual regulations form a unique and integral system of regulations giving additional value to its users by analysing the existing data and combining them with other data for the most accurate output. The Portal provides a tool for fast decision-making concerning business and compliance with law, solving in a fast and accurate manner various legal issues on a daily basis in order to provide the user with a quick gateway to relevant, trustworthy and complete legal information.

- **Implementation of Smart City Zagreb project**

At the city level - the project Smart City Zagreb (2013) was launched using data in order to improve the local government, build smart infrastructure, promote sustainable energy, cut costs, provide better services to citizens and make the community a better place to live. The project is run by the City of Zagreb, Faculty of Electrical Engineering and Computing – Innovation Center, University of Zagreb and local business entities. This project is an answer to the challenges that all modern cities face in the new digital era. There are some positive examples of applications and services developed using accessible data related to traffic and public transportation and tourism and hospitality.

- **Implementation of Ferari project**

In the R&D sector there will be various possibilities once we set the stage for data-driven innovation. One positive example is a collaborative FERARI project financed by the EU (partners and beneficiaries: HT-Croatian Telekom, Fraunhoffer Institute, Technion Institute from Israel, IBM, Poslovna inteligencija from Zagreb) related to the prevention of mobile phone frauds and the prediction and detection of errors in cloud infrastructure. FERARI stands for flexible event processing for big data architectures.

5.3. Best practices from Bosnia and Herzegovina

- **B&H Register of pollutants and pollution range**

The Council of Ministry and Government of the Republic of Srpska and Government of the Federation of Bosnia and Herzegovina have developed a coherent and integrated environmental policy for improvement and protection of environment, one part which deals with data requirements and data acceptability of information regarding the environmental pollutants.

B&H Register of pollutants and pollution range[15] (BH PRTR Pollutant Release and Transfer Register) is national environmental database that provide information regarding of hazardous chemical substances and pollutants released to air, water and soil and off-site transfers of waste and pollutants in waste water. The BH PRTR may be presented geographically, by industry sectors, by facility, by chemical substance or groups of substances. This register provides public access to data via internet, publications and annual reports. Data transparency is achieved via legislative compliance requirements.

"Alumina" Company from Zvornik (alumina, hydrate, zeolite and water glass producer) while collecting and analysing the information for BH PRTR register regarding the pollutants created in the production process, came to important conclusion regarding the connection of humidity of alumina (during of the process of filtrations) and quality of the final product and decreased amounts of pollution. Conclusions of analysis was that decreasing the humidity during the productions process of alumina has positive effects on quality of products, production costs (decreased cost of energy) and at same time on decreased volumes of pollution created during the productions process.

So by data requirements defined by government and analysis of the same, Alumina Company managed to improve its production process and positive results for environment were achieved as well.

- **Development of information systems for improving access to scientific and research data base**

In the Republic of Srpska (CO-OOPERATIVE Online Bibliographic System and Services - COBISS.RS) and the Federation of Bosnia and Herzegovina (BiH COBISS) via COBISS platform, 58 local libraries have been connected in one inclusive system of regional networks which is made of over the 700 libraries (COBISS.Net) with shared catalogue database and bibliographies. Via this system all participants within COBISS.Net can search any data originating from each single library and upload their own research data.

Implementation of COBISS RS and COBISS BH has enabled:

- fast, transparent and reliable overview of the authors and their work, based on the catalogue of published scientific articles;
- efficient support to managing of research activity;
- evaluation of bibliographic indicators of research performance;
- data dissemination through transparent system within the research community (free on line access to scientific creation);
- improved productivity of researchers;

[15] www.mvteo.gov.ba

- increased participation in international research projects;
- higher quality research activity in B&H;
- efficient utilisation of public funds for scientific projects.

- **Development of information systems of University**

Integrated student information system of Sarajevo University (ISSS[16]) is web based system which archives all data related to professors, students, exams and other relevant data.
The system is for one part available for public in segment of general information and for the other its closed system available only to professors and students in domain of personal private data.

System enables:
- overview and change of private data;
- overview of all subjects and program studies;
- exam time schedules;
- exam bookings;
- selection of subjects for the new semesters;
- grades overviews;
- confirmation letters and other documents requests;
- electronic documents issuing.

The benefits for the educational system are numerous and include the following:
- improving transparency of educational process;
- formality (administrative issue) simplified;
- raised educational standards;
- support to professional work of the staff;
- effective communication between students and professors;
- improved decision making process based on reliable and verified data;
- more efficient resource management and planning process;
- rationalization of financing;
- easier monitoring of activities at all levels of education process;
- ease of sharing information between faculties and other competent institutions.

5.4. Best practices from Bulgaria

- **Use of open public data for policy design in Bulgaria**

Open public data generated by public registers has been increasingly used in Bulgaria for feasibility studies within the framework of policy design and implementation.

- **Identifying broadband white areas**

In 2012, the Executive Agency Electronic Communication Networks and Information Systems (ECNIS) operating under the Ministry of Transport and ICT and the Applied Research and Communications Fund (ARC Fund)[17] conducted a socio-economic analysis to underpin the

[16] https://www.isss.ba/data/
[17] www.arcfund.net

design and implementation of the national broadband policy in economically underdeveloped and remote rural regions[18]. The feasibility study implemented a novel methodology, based on the use of open public data, in solving the main problem – to identify the so called "white" zones (places without broadband coverage) and to analyse the potential for socio-economic development on a single settlement level.

The challenges, faced by the implementation of the above methodology, have been common for the use of open public data in Bulgaria in general:

- Lack of interoperability and integration between the administrations' information systems / datasets;
- Lack of standardized classifications / definitions and technical standards;
- In most cases, only 'single record use' is technically allowed through the administrations' online platforms, and data are not accessible as structured databases.

As result of the introduction of ICT and e-services in all public administrations, there is a constantly increasing scope and size of available public data and the project, mentioned above, benefited from this. The use of data from several public registers, offers major advantages for the project:

- To have complementary and comprehensive background information for socio-demographic and economic situation on a settlement level;
- To produce analyses based on the clustering of territorial areas, characterized with similar socio-economic profiles, rather than based on predefined administrative borders of municipalities, districts or NUTS2 regions;
- To produce modelling-based scenarios for territorial developments based on reliable and comprehensive data on a settlement level.

The implemented methodology integrated data from several public registers, categorized in four groups:

- Territorial-administrative data:
    - National Register of the settlements in Bulgaria (National Statistical Institute);
    - Rural and mountain regions (Ministry of Agriculture);

- Social development data:
    - Population demography - age groups, sex (DG Citizens registration and administrative services), education level, economic activity (2011 Census data, National Statistical Institute);
    - Households statistics: number and size of households, use of internet, computers and TV in households (2011 Census data, National Statistical Institute);
    - National Registers of Educational Institutions: number and type of institutions (Ministry of Education, Youth and Science);
    - National Register of Physical and Legal Persons, Offering Health Services: number and type (National Health Insurance Fund;
    - Community centres /chitaliste/ and public libraries: number of organisations (BULSTAT register);
    - Not-for-profit organisations, registered in public benefit: number and size (BULSTAT register and NSI data);

[18] www.esmis.government.bg/en/page.php?c=83

- Economic development data:
    - National Register of VAT Registered Companies: number and legal registration form (National Revenue Agency);
    - National Tourist Register (Ministry of Economy, Energy and Tourism);
- Broadband/Internet coverage data:
    - Public Register of ISPs: number of ISPs (Communications Regulation Commission);
    - Broadband coverage - number of ISPs, internet speed, technology used (ARC Fund, based on public data desk research);
    - Use of internet, computers and TV in households (2011 Census data, National Statistical Institute).

The results of the study were used for the identification of so called "white areas" (areas without broadband coverage) where the construction of high-speed broadband network was launched by the ECNIS Executive Agency under a EUR 20 million public project co-financed by Operational Programme Regional Development. The selected settlements have a total territory of almost 8000 km^2 or 7% of the territory of the country and a population of 277,000 people or 8% of the population living outside the regional towns and the capital.

- **Workload assessment of Bulgarian courts**

A similar approach is currently being used by the Bulgarian Supreme Judicial Council for a workload assessment of Bulgarian courts aiming to establish the relationship between the socio-economic and criminogenic characteristics of a region and the optimal structure and functioning of the national court system. This is the first attempt in the country to link open data related to crime incidence and court performance. In addition to the indicators and data sources employed in the abovementioned broadband analysis, the study also employs:

- Justice statistics (on Court's district level): crimes, persons convicted and accused persons by chapter of penal code and according to results of proceeding (National Statistical Institute); and
- Criminal statistics (on a district level) – registered and revealed crimes by type and place of registration (National police).

Despite existing good examples and due to the current partial access to incompatible datasets with the exception of business intelligence companies, open public data is still not widely used by social researchers and analysts.

5.5. Best practices from Romania

- **Development of Radar scanning system**

A large horizon scanning system (Radar) has been developed by the Executive Agency for Higher Education, Research, Development and Innovation Funding - UEFISCDI. The system collects weak signals through meta-analysis of a large spectrum of news repositories. The selection mechanism is based on a combination of semantic clustering, machine learning and gaming using human experts.

- **Development of Romanian Innovation Ecosystem**

Romanian Innovation Ecosystem 3.0 will be launched in first trimester 2014. It will bring together the National Registries of Researchers (Brain Romania 3.0), Research Organisations and Research Infrastructures, integrated with existing databases of projects, publications –mains stream, patents, SMS, export-import, etc., in the form of a social network in which peers can find relevant sources of information and monitor their impact in the community.
RIE 3.0 will be supported by strong analytics tools which enable the peers to visualise the innovation communities they are part of, and fed by the horizon scanning mechanism (the Radar).

By design RIE 3.0 is scalable so if successful can be replicated in other countries, regions as South-East Europe, West Balkans or Danube meta-region.

5.6. Best practices from Montenegro

- **Development of geographic information system for planning in tourism**

Municipalities of Budva and Kotor developed an information system for planning in tourism, with special stress to relationship between tourism and environmental protection. The system also allows quick and easy expansion to other business processes and implementation of other thematic cadastres.

The system provides numerous benefits to tourist, including the following:
- search of tourist capacities, including visualization of tourist destinations by using digital and interactive maps and other visual content,
- help by decision-making process of destination selection (route planning, information about accommodation, events, attractions etc.) etc.

On the other hand, the system enables local authorities to process data, carry out spatial analysis and assess potential influence of tourism on the area and environment.

5.7. Best practices from Albania

- **Development of WikiKultura.net: public data from the Ministry of Culture of the Republic of Albania published in open data format**

In September 2013, when the new government in Albania took power, the new administration had no easy way to find the history of the activities of the cultural public institutions. Everything was (and still is) documented in paper and any kind of electronic archive was nowhere to found. This was the moment when the idea of a public database of everything related to the ministry of culture and the related institutions was born. And the name of it: www.WikiKultura.net, a portal created in MediaWiki, the same open source software used by Wikipedia, with one goal: to publish all the public data of the M.C in open data format and make them more accessible than ever to the general public, the media and to any geek that wants to use the data for a web app, or a mobile app.

All the data of WikiKultura are published in Creative Commons licenses and include:

- name of the ministers in charge;
- points of interest of Albanian cultural heritage (work in progress);
- activities (with details) of the main cultural and historic institutions;
- contact points and links of the websites of other institutions;
- details of projects financed by the ministry of culture (for more transparency).

The project is estimated to end by September 2015 in collaboration with NGOs that are focused in open knowledge and open source projects.

- **wiki.openlabs.cc: public knowledge base about free software and open source software in Albanian language.**

In December 2013 the ministry of innovation published a report about the state of the usage of open source software in public administration. This was also followed by an event where it was clear to the participants that there are not a lot of FLOSS developers in Albania and not much information about free software and open source software in the country.

We wanted to close this gap by creating an online hub, a knowledge base about everything open source in Albanian language. Most important: it had to be decentralized so that everyone could add more information and improve it anytime.

This is why we started working on creating wiki.openlabs.cc, a PmWiki based platform where all the members of the community add information related to:

- open source software (with description in Albanian);
- presentation of all the FLOSS activities in the country;
- record of public spending on software (proprietary or not).

Through all these activities, the project will:

- be a contact point about 'all things open source in Albanian;
- follow up regarding transparency issues of the government related to spending about software;
- present a database of respected developers that can offer support to companies and public administration related to FLOS software.

5.8. Best practices from Slovenia

- **National Interoperability Framework.**

Many of the services and tools to be mentioned in this section were created, not just because open data existed somewhere (both from national as well as municipal organizations), but because it could be discovered through this portal. It catalogues hundreds of data sources, access points, APIs etc. from what cars do ministries have to current volume of rivers flowing through Slovenia, not to mention the records of the national statistics office. The NIO portal (data.gov.si/nio/ alias nio.gov.si/nio/) is “dedicated to publishing of public data of authorities in one place and is the national interoperability portal and the central point for publishing of public sector open data which encourages their reuse«.

It is following the **Strategy on IT and electronic services development and connection of official records – SREP**. “The Strategy aims to lay down a framework and steps for the further development of IT and electronic services in public administration, introducing advanced approaches and a crucial shift in understanding the importance of e-services, with a view to overcoming current issues that hinder their development”. The NIO portal was commissioned by the Ministry of Public Administration and in part funded by the EU Social Fund. More information at: nio.gov.si

- **National infrastructure for open access publications.**

With its COBISS/SICRIS systems Slovenia has one of the most elaborate library information systems in the region, also exported to some other South-East European Countries. It is also used to collate publications of the Slovenian research community. With the ongoing trend towards open scientific publishing, and several personal and institutional open access repositories, efforts are ongoing to set up a national open access repository and both for scientific publications as well as for related data, and link to the existing systems that include the meta-data, thus leveraging the existing services offered by IZUM. This would significantly increase the visibility of Slovenian science globally. More info at http://www.openaccess.si/

- **OpenData.si**

This is an international project based on a belief “that all citizens of Slovenia are owners of some particular data sets”. The project is bringing together several individuals that have taken advantage of publicly available data to create web services or mobile apps related to a wide variety of content. Examples include:

- visualization of national election results,
- “social network” of Slovenian governments,
- visualization of the Slovenian budgets,
- expected arrival, departures and travel times in the Ljubljana public transport system (very popular app),
- live traffic information including current traffic load (very popular app),
- live weather data from the national meteorological centre and several related apps,
- geographical information system on the real estate prices in Slovenia,
- geographical information system on the locations where your car is most likely to be towed away for double parking in Ljubljana (guess this should be linked to foursquare),
- linguistic data was used to create Lammetizer for Slovenian language, Part of Speech tagger and Named Entity Extracor. The results are programming libraries to be used in software specific for Slovenian language

More info at: opendata.si

- **Supervisor.**

Created by the Commission for the Prevention of Corruption, the on-line service gives access to the expenses of public organizations, particularly the outsourcing. It makes it very transparent what businesses were working for what public office, when, and for how much. Transparent financial flows between the public and the private sector increases the public oversight and makes the entire public service more responsible. An open source API to this data has also been created. More info at: http://supervizor.kpk-rs.si/

6. Conclusion

There are clear benefits for individuals, governments, business and society at large to be had from data-driven innovation. There are clear benefits for individuals, governments and society at large to be had from data-driven innovation. But there are also real concerns around how personal information is used that must be addressed to ensure those benefits are accrued.

Policy makers have a great opportunity to set the conditions for innovation in this area that gives creative thinkers and experimenters the space they need to derive new benefits. The legislative framework has to be improved and relevant policies have to be adopted in order to embrace and support a data-friendly culture including enabling free access to data. Additionally, policy makers should also seek to reassure the general public and set parameters that personal information is respected and protected. Finally, new policy initiatives should also consider the increasing demand for highly skilled employees (scientists, engineers and beyond) who can innovate with data – the "top jobs" of the 21st century.