Measuring the Impact of e-Government: Economic, Political and Social outcomes (SHRG.02.025)

1. General Information

Credits: (6 ECTS)
For whom: compulsory for students of Democracy and Governance MA program; open for all MA and BA students.
Schedule: Spring term 2017, Tuesdays 10.15-11.45, Lossi 36-214 **or as an online-course (for open university/students in sessional study programs)**
Language: Course is held in English; project work can be submitted in Estonian.

2. Instructors and contacts
Kristjan Vassil (kristjan.vassil@ut.ee) Lossi 36-304
Office hours: Tuesdays 9.00-11.30

Mihkel Solvak (mihkel.solvak@ut.ee), Lossi 36-304
Office hours: upon request

Andres Võrk (andres.vork@ut.ee), Lossi 36-304
Office hours: upon request

Taavi Unt (taavi.unt@ut.ee), Lossi 36-304
Office hours: upon request

Organizational questions should be addressed to Anna Beitane (anna.beitane@ut.ee). Questions on specific lectures should be addressed to the instructor responsible for the given lecture (see Schedule below).

3. General aim
Currently, Estonia offers about 1600 e-services in its e-governance ecosystem, producing over 600 million interactions in 2015 alone – 1.6 million a day. Last year, Estonian residents digitally identified themselves more than 8 million times and provided more than 6 million digital signatures. The spread of e-governance and its usage is indeed extensive. Yet, surprisingly little is known about the economic, political and social impact of Estonian e-services. This class is designed to focus precisely on the following:

(1) What is the economic, political and social impact of Estonian e-governance and digital services?
(2) How to accurately measure and model impact in these domains?
(3) How to make use of and analyze large datasets generated by the e-government ecosystem?

By design, this class is an empirical, problem-based class where you will acquire specific skills that are essential to understand and estimate the underlying concepts of impact evaluation in general and public e-services in particular. You will acquire knowledge on

theories of technological diffusion and adoption, you will learn how to request and work with data automatically generated by the Estonian e-governance system, and you will apply analytical techniques on actual data provided by the state institutions. The latter include data from the logs of X-Road, digital ID, internet voting, and various survey data that measure technology usage. Usage of system generated datasets for e-service impact analysis makes this class unique and one of a kind in Estonia.

4. Learning outcomes

This course is an applied problem based class where participants acquire specific and unique skills that help them to carry out relevant analytical or policy-related tasks in future work. As per specific study outcomes the course is aimed at students being able to:

- Have a good understanding of the ecosystem of Estonian e-government, public digital services and its development;
- Can understand and analyze the relationship between Estonian e-government and problems from her own field of specialization;
- Can describe and analyze the social, political and economic impact of specific technological solutions;
- Knows the main theoretical explanations of technology diffusion and impact;
- Knows which institutional, political and legal prerequisites are needed for successful implementation of select e-services;
- Can analyze the potential diffusion and impact of specific e-services based on evidence and data analytics;
- Can construct metrics and use these to evaluate the impact of e-services;
- Knows what data structures and types are needed for impact analysis;
- Can analyze datasets generated by scholars from her own and other disciplines;
- Can find numeric associations, interpret their meaning and present these in a easily understandable matter with practical suggestions for IT developers, policy makers and the general public;
- Can generalize and apply the Estonian e-government experience to e-service implementation and impact to the experience of other countries.

5. Grading

There are two tracks for this course, for full time students and for students who attend Open University lectures or whose study program is sessional (i.e. lectures only taking place on weekends). Rules of participation and grading are slightly different for the two tracks, depicted below:

Lectures – full-time students:

Active in-class participation required. Missed classes cannot be compensated, but are available on video. 20% of the final grade

Lectures – Open University students / students in sessional study programmes:

Video lectures online, short test after each lecture. 20% of the final grade.

Online workshop:

All participants must complete 4 analytical exercises within a given timeframe. 35% of the final grade.

Project work:

All participants must write a project as a group of max 5 students. 45% of the final grade.

Participation (20% of the grade)

We require attendance in classes and active participation in discussions. For those conducting the course online, participation points will be awarded based on the completion of tests after viewing video lectures.

Online workshops (35% of the grade)

The course contains a total of 4 practical analysis exercises conducted online. These entail detailed and easy to follow step-by-step instructions on how to conduct an analysis on the given dataset using a specific analytic tool (with data and code provided) together with the annotated output for interpretation. For example, how to conduct a t-test to see if there is an increase in turnout after the introduction of voting online or how to predict the share of people voting online in the next election using a regression method or S-curve. Don't be afraid of the buzzwords, the exercise use non-technical language and are designed in a manner understandable and usable also by beginners in data analysis. Using open source software, the student can either follow the provided instructions or/and play around with the data. The provided instructions are focused on the analytical technique and can hence also be used as a blueprint of "how to?" for any other analysis in the future where such a technique might be suitable. The exercises end with a short test questionnaire that can be answered based on the exercise.

Project work (45% of the grade)

Project work is carried out in groups consisting of maximum 5 students and entails a concise empirical impact analysis of a chosen e-service (max 10 pages, 1.5 spacing, size 12 Times New Roman). The project needs to outline a specific problem based on the issues covered in class or the student's own field of specialization. We will provide a list of five e-services from which your group needs to choose one and do the project on that chose e-service. We will not limit the aim and scope of the projects, they can be as innovative and unconventional as you can imagine, provided they are feasible and evidenced based. Given that we are working with actual data on Estonian e-services and will have multiple guest speakers who are responsible for running many of these services the projects could ideally even lead to proposals to add some new functionality to certain

services, all innovative ideas are welcome. In any case, the projects need to discuss how to measure the problem at hand and run a preliminary analysis with the available data. A more detailed instruction on how to do the project work together with the list of services will be provided in class. The best projects will be selected for further development into a possible master or BA thesis or a peer reviewed publication with the help of an experienced analytics team.

6. Course detailed overview

Estonia's use of modern information and communication technologies in public sector and governance has placed the country at the forefront of states aiming to modernize their public services and increase efficiency in governance. Numerous online services are available to Estonian residents including digital identification and signatures, electronic tax filing, online medical prescriptions, internet voting, etc.

Currently, Estonia offers about 1600 e-services in its e-governance ecosystem, producing over 600 million interactions in 2015 alone – 1.6 million a day. Last year, Estonian residents digitally identified themselves more than 8 million times and provided more than 6 million digital signatures. The spread of e-governance and its usage is indeed extensive. Yet, surprisingly little is known about the economic, political and social impact of Estonian e-services. This class is designed to focus precisely on the following:

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This class is divided into two conceptually distinct sets: theory and foundational prerequisites of e-government; problem based applied impact analysis using actual data produced by systems of e-government with presentation of results, including data visualization and interpretation.

1. Theory and foundational prerequisites of e-government and impact assessment (4 sessions)
   In this section, we provide you with the framework for understanding the foundational prerequisites of Estonian e-governance ecosystem and theoretical models of technology adaption and innovation diffusion. You will learn how to conceptualize and measure economic, political and social impact of public e-services. And finally, you learn how to apply the Estonian experience to other countries in order to estimate the potential impact of a particular e-service in a counterfactual situation in another country.
2. Problem based applied impact analysis of public e-services (11 sessions)
   In this section we will make use of the actual data generated by the Estonian e-government applications (most notably the X-Road as a central intersection of all data traffic, digital ID and internet voting) and learn how to combine these data with external datasets in order to estimate the impact of e-services. You will learn how to

conceptualize and define empirical indicators to measure impact in various domains; how to structure and re-structure input data and how to run actual models that quantify the impact of e-services.

The problem-based part of the class works in combination with lectures and hands-on online workshops where you will work with specific datasets in order to respond to specific problem based tasks. We would like to emphasize that no extensive knowledge in mathematics or statistics is required. It would help though, if you keep an open mind toward quantification, measurement and evidence based analytics.

We will have at least one study trip to Tallinn including lectures by people who are in charge of developing, designing and supervising Estonian e-services to provide you with an applied account on the topic. Finally, as an outcome of this class you can submit paper on empirical impact evaluation of a public e-service in Estonia, which can ultimately be developed further into a full scale academic paper and a BA or MA thesis. The class is an MA level course, also open to BA-students.

7. Schedule

<table>
<tr><td colspan="3">Theory of impact assessment, technology adoption and prerequisites of e-government</td></tr>
<tr>
<td>07.02.2017</td>
<td>Topic: Intro to Estonian ecosystem of e-governance
Overview: Course overview, introduction to the ecosystem of Estonian e-governance and the concept of impact evaluation; prerequisites of successful e-governance; main infrastructure of Estonian e-governance.
Readings: K. Vassil, (2015). "E-Government Ecosystem. Foundation, Applications, Outcomes." Case Study for the World Development Report, World Bank.</td>
<td>Vassil, Solvak, Võrk</td>
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<tr>
<td>14.02.2017</td>
<td>Topic: Architecture and design of e-government
Overview: What design ideas are behind the current structure of Estonian e-government, human - technology interactions, future outlook on governing and IT.
Guest speaker: Andres Kütt (IT architect at Estonian Information System's Authority).
Readings: TBC</td>
<td>Kütt</td>
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<td>21.02.2017</td>
<td>Topic: Theories on diffusion of technological innovations and technology adoption.
Overview: Diffusion of innovations, general diffusion patterns (S-curve pattern), determinants of individual level technology adoption.
Readings: Rogers, Everett M. Diffusion of innovations. Simon and Schuster, 2010. (Chapter 1, pages 1-37).</td>
<td>Solvak</td>
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	Venkatesh, Viswanath, et al. User acceptance of information technology: Toward a unified view. *MIS quarterly* (2003): 425-478. **Online workshop 1:** How to fit non-linear diffusion models	
28.02.2017	**Topic:** Intro to impact evaluation **Overview:** Pre- and post-implementation impact evaluation models, standard cost model. **Readings:** TBC	Võrk
X-Road: the bridge between the state and residents (data structure and sources)		
07.03.2017 (video lecture)	**Topic:** Introduction to X-Road, functionality, relevance to government agencies and private companies. **Overview:** X-Road as the key infrastructure for e-service provision; nature of data produced by X-Road. **Guest speaker:** Mr. Heiko Vainsalu (X-Road domain manager at Information System Authority) **Readings:** Intro to X-Road (part 1, 2, 3) https://www.ria.ee/en/introduction-to-xroad-part1.html https://www.ria.ee/en/introduction-to-xroad-part2.html https://www.ria.ee/en/introduction-to-xroad-part3.html Ukraine Interoperability Solution, UIS Test Report (24.10.2015)	Vainsalu
14.03.2017	**Topic:** Cost-benefit analysis, example using X-Road. **Overview:** How to apply impact analysis models to X-Road, what is the economic impact of the system **Readings:** TBC	Võrk, Vassil
21.03.2017	**Topic:** Cost-benefit analysis of the digital prescription service **Data:** X-Road log data on digital prescription usage **Readings:** TBC **Online workshop 2:** What kind of indicators are needed to evaluate impact of a selected e-service.	Vassil, Solvak
28.03.2017	**Project break**	
04.04.2017	**Field trip to Tallinn** **Overview:** e-Estonia showroom with lecture by Taavi Kotka or Siim Sikkut; tour of Mektory at Tallinn Tech; lecture on new e-service at Mektory	

11.04.2017	**Topic:** E-government diffusion & forecasting **Overview:** What user groups have picked up e-services at what pace; service usage patterns; forecasting future usage. **Data:** X-Road log data on individual service usage **Readings:** TBC **Online workshop 3:** How to forecast using actual data.	Vassil, Solvak
Internet voting: the ultimate form of a public e-service		
18.04.2017 *(video lecture)*	**Topic:** Introduction to technical architecture of Estonian e-voting, essence of cryptography, double envelope system, commonalities with postal voting, vote verification. **Guest speaker:** Mr. Sven Heiberg (senior researcher, Cybernetica AS) **Readings:** Heiberg, S., P. Laud and J. Willemson. 2012. "The Application of I-voting for Estonian Parliamentary Elections of 2011." In A. Kiayias and H. Lipmaa (eds). *E-Voting and Identity: Third International Conference, VoteID 2011, Tallinn, Estonia, September 28- 30, 2011, Revised Selected Papers.* Berlin/Heidelberg: Springer, 208-223. Heiberg, S. and J. Willemson. 2014. "Verifiable Internet Voting in Estonia." In R. Krimmer and M. Volkamer (eds.). *Proceedings of Electronic Voting 2014 (EVOTE2014)*. Tallinn: TUT Press, 7-13.	Heiberg, Vassil
25.04.2017	**Topic:** Internet voting diffusion 2005-2015. Current usage patterns based on population level log file analysis 2013- 2015. **Readings:** Kristjan Vassil, Mihkel Solvak, Priit Vinkel, Alexander H. Trechsel, R. Michael Alvarez. The diffusion of internet voting. Usage patterns of internet voting in Estonia between 2005 and 2015. Government Information Quarterly, 33, 2016. Solvak & Vassil "E-voting in Estonia: Technological Diffusion and Other Developments Over Ten Years (2005-2015)". Chapter 5 - logs (pp.71-92) **Data:** survey data, estimate rate of diffusion. **Online workshop 4:** how to empirically determine whether internet voting in Estonia has indeed diffused or not – linking theory and practice in impact assessment?	Vassil, Solvak

02.05.2017	**Topic:** Impact of internet voting on voter turnout. **Overview:** You are required to watch a video on the topic prior to class; the class consists of an actual hands on data analysis performed by the lecturer. **Readings:** Video **Data:** aggregate election results on district's level, propensity score matching.	Vassil
09.05.2017	**Topic:** Mobilization potential and possible political bias of internet voting. **Overview:** What voter groups are mobilized by internet voting, does internet voting bias the election outcome. **Data:** survey data on electronic voting 2005-2015. **Readings:** Vassil, K. and T. Weber. 2011. "A Bottleneck Model of E-Voting: Why Technology Fails to Boost Turnout." New Media & Society 13(8), 1336-1354. Solvak & Vassil "E-voting in Estonia: Technological Diffusion and Other Developments Over Ten Years (2005-2015)". Chapter 6 - mobilization (pp.93-105) & Chapter 10 – neutrality (pp. 142-162).	Solvak

Digital ID and e-residency

16.05.2017	**Topic:** The origin and historical evolution of digital ID, technical underpinnings of 2-factor digital ID, the diffusion of usage in the population, Swiss ID. **Guest speaker:** D. Gassteiger (Switzerland) **Readings:** *TBC*	Vassil
23.05.2017 (*video lecture*)	**Topic:** Estonian e-residency: idea, foundation, outcomes; potential for economic growth, impact on economy, social life and politics. **Guest speaker:** Mr. Kaspar Korjus (Estonian e-residency project manager) **Readings:** Taavi Kotka, Carlos Ivan Vargas Alvarez del Castillo, and Kaspar Korjus (2015) "Estonian e-Residency: Redefining the Nation-State in the Digital Era" Working Paper No.3, Oxford Working Paper Series.	