Governance of Complex Technological Systems

Lecture series
Instructor: Prof. dr. Lasse Gerrits
Note: the lecture series is taught in English
Test and grading: written exam, open book

Description: For long, technology has had a major influence on governance. For example, the arrival of the railway meant that geographical distances changed completely, bringing towns closer under central control of powers but also giving those towns a means to develop a more independent course. Such issues are still current. The relationship between technology and governance has become increasingly complex as technological systems expand and impact many aspects of daily life.
But what does it exactly mean to say that the complexity has increased? What characterizes the relationship between technology and governance? And what does governance look like in the face of technological change? This lecture series addresses these questions. We will discuss various theoretical concepts from the realm of complex systems that can help us in analyzing and understanding the issues raised here. Using empirical examples, we will look at dynamical aspects such as feedback, self-organization, path-dependency and chance. As such, we will gain a better understanding and appreciation of why governance works or fails under various circumstances.

Learning goals:
- To describe the core elements of complexity and governance
- To provide an overview of theories of complexity in relationship to governance
- To analyze a technological policy issue in terms of complex systems
- To propose possible solutions for such issues in terms of governance

Test: students will be required to take a written, open book exam in order to complete the course. The exam consists of open questions. Knowledge will be tested on five levels: reproduction, meaning, application, synthesis, and evaluation, but with an emphasis on application, synthesis and evaluation.

Literature (mandatory)
Gerrits, L. (2012). Punching Clouds. An introduction to the complexity of public decision-making. Litchfield Park, AZ: Emergent Publications

E-reader (mandatory)
Available online through Virtual Campus

This syllabus contains the program, the requirements for the test and the list of mandatory literature.

Program and reading guide

15 October 2015 Introduction to the subject

The lecture today will be used in order to get a broad overview of the subject: why is it important to learn about the governance of complex and innovative technological systems in contemporary society? What does ´complexity´ mean? And how does it relate to governance? We will use practical examples in order to obtain that panorama.

Reading:
- none

12 October 2015 What is complexity?

This lecture focuses on the question: what is complexity? It is an oft-used term, a cliché sometimes, to indicate anything that is experienced as difficult. But is that justified? Using a taxonomy, we will look into the properties of complexity. We will also spend ample attention to the personal experience of complexity.

Reading:
- Punching Clouds: chapter 1
- E-reader: Gell-Mann, M. (1995), What is complexity? Remarks on simplicity and complexity by the Nobel Prize-winning author of The Quark and the Jaguar. Complexity, 1: 16–19.
- Rescher, N. (1998). Technology, Complexity and Social Decision (pp. 173-190). In: Rescher: Complexity, an overview. London: Transaction Publishers
- Rescher, N. (1998). Complexity's Bearing of Philosophical Anthropology (pp. 191-205). In: Rescher: Complexity, an overview. London: Transaction Publishers

29 October 2015 No session today

5 November 2015 What are systems?

Following the previous lecture, we will now look into the properties of systems. We will revisit some of the important thinkers in this field, among others Von Bertalanffy (general systems theory), Parsons (structural functionalism, Checkland (soft systems methodology) and Latour (actor-network theory). We will look at how these ideas translate to the everyday reality of technology and society, for example by talking about the properties of internet.

- Punching Clouds: chapter 2
- E-reader: Barton, J., Emery, M., Flood, R.L., Selsky, J.W., Wolstenholme, E. (2004). A Maturing of Systems Thinking? Evidence from Three Perspectives. Systemic Practice and Action Research, 17(1): 3-36

12 November 2015 System dynamics

Systems are rarely entirely static. We will therefore talk about system dynamics today. Special attention will be paid to feedback as the main driver of such dynamics and the occurrence and effects of system-specific dynamics such as path-dependency, punctuated equilibrium and hysteresis. Naturally, we will use numerous examples, such as carbon capture and storage, waste water treatment and urban regeneration.

Reading:
- Punching Clouds: chapter 3
- E-reader: Howlett, M. and J. Rayner (2006). Understanding the Historical Turn in the Policy Sciences: A Critique of Stochastic, Narrative, Path Dependency and Process-Sequencing Models of Policy-Making over Time Policy Sciences, 39, 1-18.

19 November 2015 Time and process

As can be surmised from the previous lecture, it is necessary to understand the aspect of time in order to understand the complexity of systems. After all, it is only through time that the dynamics appear. We therefore need to take a closer look at what time is and how it matters for understanding the governance of complex systems.

Reading:
- E-reader: Abbott, A. (1992). From Causes to Events: Notes on Narrative Positivism. Sociological Methods & Research, 20: 428 – 455
- E-reader: Abbott, A. (2001). Epilogue. In: Abbott, A. Time Matters: on Theory and Method. (280 – 298)

26 November 2015 Risk and uncertainty

If the world is a complex one, i.e. one that is systemic and dynamic, it means that people are faced with uncertainty and a perception of risk. We will look into these aspects today, in particular at the difference between objective and subjective risk, the methods to deal with those such as through various assessment methods, and the ways in which people deal with uncertainty at a personal level.

Reading:
- Punching Clouds: chapter 4
- E-reader: Rescher, N. (1995) Luck: The Brilliant Randomness of Everyday Life. Farrar, Straus and Giroux. New York. Chapters 1 and 2

3 December 2015 Innovation

Now that we have looked at the core characteristics of complex systems, it is time to have a closer look at the theme of innovation. In fact, ´innovation´ is a term that is often used to indicate something novel and usually focuses on technology even though there is such a thing as social innovation. But what exactly is novelty? What are its sources and drivers? What can we say about the rate of innovation and does innovation contribute to a better society, as is often assumed?

Reading:

- E-reader: Forrester, J.W. (1981). Innovation and economic change. Futures, 13(4) 323 - 331
- E-reader: Holling, C. (2001). Understanding the Complexity of Economic, Ecological, and Social Systems. Ecosystems 4: 390–405

10 December 2015 Fostering innovation

Following the previous lecture, we will look into the ways in which innovation can be fostered in organizations. This requires understanding of how organizations behave and evolve over time. What conditions promote or slow innovation? And can organizations manage to continue to innovate or is innovation something that comes and goes? We will need to think about the evolution of organizations to understand what happens here.

Reading:

- E-reader: Hobday, M. (1998) Product complexity, innovation and industrial organisation, Research Policy, Volume 26, Issue 6, pp. 689-710
- E-reader: Rip, Arie and Meulen van der, Barend J.R. (1996) The post-modern research system. Science and public policy, 23 (5). pp. 343-352

17 December 2015 Mega-projects

While it is interesting to learn about how discrete organizations foster innovation, it is also very important to understand how innovation comes about in an ecology of organizations. Probably the best examples at such attempts are the so-called mega-projects: attempts to build innovative systems in cooperation and within society. Examples of such projects include building and operating high-speed rail, developing alternative energy generation or the Airbus A380. While perhaps innovative and possibly disruptive, they are mostly known for being costly endeavors that are usually delivered years later than promised. What happens here? We will analyze such examples in terms of complex systems.

Reading:

- E-reader: Flyvbjerg, B., Bruzelius, N., Rothengatter, W. (2003). Substance and Spin in Mega-project Economics. In: Flyvbjerg, Bruzelius, Rothengatter, Megaprojects and Risk: an anatomy of ambition. Cambridge: Cambridge University Press.
- E-reader: Flyvbjerg, B. (2014). What You Should Know About Megaprojects and Why: An Overview. Project Management Journal, April/May 2014. Available at SSRN: http://ssrn.com/abstract=2424835
- E-reader: Diana White, Joyce Fortune, Current practice in project management — an empirical study. International Journal of Project Management, Volume 20, Issue 1, January 2002, Pages 1-11,

24 December 2015 No session due to Christmas

31 December 2015 No session due to New Years Eve

7 January 2016 *Society and stakeholders*

This lecture focuses specifically on the societal dynamics of technology and innovation. In today´s emancipated world, civilians are rarely uncritical of the implementation of technological innovation. The externalities of such innovations can backlash severely; consider e.g. the popular resistance against nuclear power plants. We will look into the societal dynamics behind such movements and will discuss various approaches to such movements such as explorative dialogues and stakeholder involvement.

Reading:

- E-reader: Ellen, G., Gerrits, L. & Slob, A. (2006). Risk Perception and Risk Communication. In S. Heise (Ed.), Sediment Risk Management and Communication (Sustainable management of sediment resources, 3) (pp. 233-248). Amsterdam: Elsevier.
- E-reader: Klijn, E.H., Koppenjan. J. (2015). Managing substantive complexities in governance networks (pp. 125 – 152). In: Klijn & Koppenjan, Governance Networks in the Public Sector. New York, etc.: Routledge

14 January 2016 *Governance I*

Now that we have addressed the full spectrum of complex innovative technological systems in a societal environment, it is time to talk about the properties of governance. What is governance? Where does it come from, what are its characteristics and what are the trends? We will look at the literature on this topic and the heaps of evidence that show that governance is the normal mode of delivery. Since it is such a considerable topic, we will spend two sessions on the topics.

- E-reader: Klijn, E.-H., Steijn, B. and Edelenbos, J. (2010). The impact of network management on outcomes in governance networks. Public Administration, 88: 1063–1082.
- E-reader: Provan, K. and Kenis, P. (2008). Modes of Network Governance: Structure, Management, and Effectiveness.
- E-reader: Klijn, E.H., Koppenjan. J. (2015). Governance, Networks and Democracy (pp. 207 – 222). In: Klijn & Koppenjan, Governance Networks in the Public Sector. New York, etc.: Routledge
- E-reader: Klijn, E.H., Koppenjan. J. (2015). Governance, Networks and Accountability (pp. 223 – 239). In: Klijn & Koppenjan, Governance Networks in the Public Sector. New York, etc.: Routledge

21 January 2016 *Governance II*

Today is a continuation of the previous session. See the description of January 14th for more information.

28 January 2016 *Exam*

Today's session is used for the exam. See below for the examination requirements.

Examination

The test for this course consists of a written, open book exam. The exam consists of open questions. Knowledge will be tested on five levels: reproduction, meaning, application, synthesis, and evaluation, but with an emphasis on application, synthesis and evaluation. Please note that the open-book nature of the test will not mean that everybody will pass regardless of effort. For this exam, it is allowed to bring your own study materials (texts, notes, slides etc.) with you during the exam. A laptop, tablet, smartphone connected to the internet is also allowed. Citing other authors is allowed. Group discussions and copying of texts without (correct) citations is not allowed. Also not allowed is copying of large chunks of texts. The exam has to demonstrate *your knowledge*, not the knowledge of others.