Code and Norms in Smart Cities

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Contents

1 I. State of the Art

1.1 Background

Internet has during its 40 year development come to influence almost all aspects of society and have become a key driver in developments of globalization and transformation of society in its wake. It has come from an isolated system to becoming a part of business, politics, law as well as everyday interactions.

There has also been a wide range of research on the impact of the internet from a sociological point of view, especially the last ten years with Castells marking a beginning of that period. Some researchers focus on new possibilities enabled by the internet, for example peer-to-peer production of commons (Benkler), democratization of innovation (Hippel) and increased participation in democracy (?). Others have focused on the negative aspects of contemporary internet and the internet as a new form of social control (Zittrain). One of the defining concepts of the relation between internet and law has been the idea that "Code is Law" put forward by Lawrence Lessig.

Internet and computational devices today is however not restricted to computers, servers and "cyberspace" alone. The last years have seen developments where digital technology move *out* of cyberspace and become embedded in society. From a technical point of view, this has been driven by the so called "Internet of Things", the ability give everyday objects an internet address. Together with sensor technology, this makes computing and networking "context-aware" and able to react in changes in the systems environment in real-time. The process has been called ubiquitous or pervasive computing, referring to a "post-desktop model of human-computer interaction in which information processing has been thoroughly integrated into everyday objects and activities"

An important technology in this development is the internet-capable smart mobile phone which has allowed social media to become a real-time phenomena and has notably been used for citizen journalism and real-time political organization. Another is urban video surveillance and sensor technology used for example to monitoring public and private spaces and manage traffic and public transportation.

Digital and networked technologies is now being mobilized to solve the urban problems of the future of cities. Such problems include sustainability issues related to energy systems and food supply, urban density issues related to population growth and increased complexity of urban life and innovation issues related to citizen participation and economic growth.

Several initiatives in this area are currently clustered under the umbrella term "Smart Cities", a term used within the EU research community for projects that link ICT developments to economic, social and environmental change within cities. The term is also used by companies such as IBM and CISCO for software platforms for city management as well as a marketing term for some cities that wants to highlight that they are in the forefront of the urban use of ICT.

"Smart city" initiatives usually involve two types of initiatives. One is developments in digitizing and networking city infrastructure such as smart energy grids and waste management. The other is more "softer" initiatives relating to citizen partic-

ipation in public administration, influencing norms of behavior such as sustainable transportation choices and creating flourishing innovation cultures.

1.2 Purpose

The purpose of my research is to adapt the theory of "code is law" — as it has been used to analyze information systems on the internet — to deal with phenomenas such as "smart cities" where information systems are interacting with their environments in the form of social and material systems. This adaption will be done with the help of Luhmanns theory of interacting social systems and in particular his sociology of law.

1.3 Theory

1.3.1 Code is Law

For Lawrence Lessig, every act in a computer system is the result of a computation that works in binary ways. The code regulates all behavior in a computer system, without exception. This leads to code acquiring law-like regulatory capacities, hence the expression "code is law". While Lessig is enthusiastic about the possibilities that the internet offers in terms of freedom of expression, access to knowledge and tools for creativity, he emphasizes that code runs the risk of over-regulating and over-enforcing behavior that transgresses the law compared to an interpretive legal system. Lessigs most used example is the diminishing of "fair use" of copyrighted material where platforms such as Youtube make use of automatically triggering algorithms to determine if copyright infringement has occurred without considering if the infringement was part of satire or commentary that would fall under fair use if taken to court. Code thus forms a competing regulatory system to the law.

The idea has received some critique. Wu and Goldsmith has shown how the law does not lose power to code but are able to influence the architecture and the operation of the internet. Wu also shows that code is not only able to regulate behavior but is also used to escape law, for example with file-sharing networks. According to Wu, individuals who does not want to comply with the law face the two option of either changing the law or avoiding the law. For individuals who does not trust law-making institutions or does not perceive that they have the ability to influence the law in their favor, the code act as a kind of poor man's law.

Apart from Lessig, this research proposal also connects to otherstudies of hte relation between law and the internet. In particular to the Cybernormer group at Lund University that has made a name of investigating changing social norms on the internet. Reidenbergs "Lex Informatica" is also relevant due to its emphasis on the difference between code and the sovereign, of interpretation and automation and of law-makings democratic process and the technological development of code. Also Cornelia Vismann & Markus Krajewskis "Computer Juridisms" writes about a competition between law and code to define reality.

1.3.2 Luhmann

Of central importance to this research proposal is Niklas Luhmanns theory of social systems and especially his theory of law as a social system. Luhmann understands law as an autopoietic, that is self-referential, system that interprets the world in terms of legal/illegal. That law is an autonomous system should not be confused with the anglo-american ideal of the autonomy of law. An autonomous system is open to influence and in turn influences other social systems, but it does so by understanding its environment only on its own terms.

On the surface, his theories share some similarities with those of Lessigs in the sense that Lessigs theory could be expressed as code being an autonomous self-referencing system that views the world only on its own terms. It should be said though that Lessig does not refer explicitly to Luhmann nor uses systems terms himself.

On the other end, Luhmann had notoriously little to say about the emergence of new information technology, always stating that the specifies of media and technology did not have an impact on his theory of communication. This led among other things to Luhmann being criticized by media theorist Friedrich Kittler.

The exception is one passage that has been quoted by several commentators:

> Already today computers are in use whose operations are not accessible to the mind or to communication [. . .] Although manufactured and programmed machines, such computers work in ways that remain intransparent to consciousness and communication–but which by way of structural coupling nevertheless influence consciousness and communication. They are, strictly speaking, invisible machines. To ask whether computers are machines that operate in ways analogous to the mind or whether they can replace or even surpass it, is to pose the wrong question [. . .]. Rather, one will have to drop all these analogies and instead ask what the consequences will be when computers can create a fully independent structural coupling between a reality they can construct and psychic or communicative systems.

Ultimately though, Luhmann was not interested in making his systems theory dependent on technological media.

> In an interview with Rudolf Maresch–in which the latter reiterated all the critiques raised by Kittler–Luhmann conceded that the technologizing of a communication system is a "special case" that would have to be studied on its own, but maintained that to technologize systems theory as a whole by resorting to input/output descriptions would amount to a "mistake."

1.3.3 Other Sociology of Law

The tradition of sociology of law is actualized in several ways in this proposal. Webers understanding of law as enforcement opens up an understanding of law as de-

fined more broadly that just legislation of which code is a potential candidate. Similarly but more broadly, Erlich concept of "living law" challenges the centrality of state law in understanding social order and opens up for a plurality of investigations into of how it is achieved. The emphasis on code also underscores the distinction of "law in action" and "law in books" that the legal realism tradition has long emphasized. David Nelken states that while this distinction might be old news, how this gap is handled should be the departure for sociology of law. Here too, code is one way that this gap is being bridged (or for that matter extended).

Finally, Teubner puts on emphasis on the positive, or generative, aspect of social order as opposed to the regulatory and limiting when he says:

> [We should replace the study of] .. rule, sanction and social control with speech acts, coding transformation of differences and paradox. It is not rules but communicative events that should be our focus and it is the self-organising process of rules that is important in understanding the symbolic reality of legal validity, not the possibility of imposing sanctions.

This reflects my emphasis that code is not only limiting but also generative of new social norms and behaviors. Since he is a sociologist of law that by large is following Luhmanns theory, Teubners theory can potentially be reconciled with a broadened understanding of "Code is Law".

1.3.4 Other Theories

While it is too early to say for sure, my suspicion is that the merger of Luhmanns theory with that of Lessigs, as well as its application on smart cities, would require the assistance of other theoretical fields.

One such field is Science and Technology Studies (STS) where several theorists have developed an understanding of information systems as always being "sociotechnical" systems that in practice always contain a human component as well. To paraphrase legal realism one could say that they have emphasized the difference between code in action and code in the books. Since I am interested in looking at what happens when the code interacts with other social systems, this more sophisticated understanding of situated information systems would be helpful.

In order to bridge Luhmanns social theory with Lessigs theory of information systems, I would also enlist the help of Friedrich Kittler who had a different view of communication systems than Luhmann and one much more grounded in the technical realities of those systems. This distinction between Luhmann and Kittler could be helpful to revisit since my investigation would require a close look at the operations of particular systems. In the same tradition as Kittler there are other theorists that can be useful. Particularly worth mentioning is Florian Cramer's "Words Made Flesh" about code as executable discourse.

It would also make sense to relate to the field of urban studies and the challenges that face cities in the future and particularly studies of networked cities and the role of telecommunications and digital technologies in contemporary cities.

2   II. Research Proposal

My research proposal is a theoretically driven investigation that would see if it is possible to integrate Lessigs concept of "Code is Law" into the sociology of law proposed by Luhmann. The purpose of such a merger would be to nuance the understanding of law in Lessigs concept as well as to make it applicable to a broader range of phenomena of ICT in urban environments. The investigation would proceed in several steps as follows.

2.1   1) Merging Code is Law and Luhmann

Can Lessigs concept of "code is law" be expressed in terms of code being an autopoietic system similar to how Luhmann perceives law? The first step would be to attempt to express Lessigs code of law in the terms used by Luhmann. This would also include the critiques of Lessigs concept as put forward for example by Tim Wu. A sub-question of this research question is what the introduction of internet and code means for Luhmanns theory of law. *Does the introduction of code as law pose a challenge to Luhmanns sociology of law*?

2.2   2) Expanding Code is Law to contain generative and regulative

Is it possible to broaden and nuance the understading of law that Lessig applies with the help of Luhmanns theory and other sociology of law? Lessigs concept of "Code is Law" understands law as a one-sided regulatory capacity. When he talks about law-like regulatory capacities of code, he is referring to its ability to limit expression and control behavior (although he is in general positive to the opportunities offered by the internet). Even when Tim Wu extends the concept to also account for when code is used to *avoid* law, the code also remains a limiting concept. It can prevent law from being enforced, but does not generate something on its own.

    With Luhmanns social theory and also with the help of Teubner, it is possible to understand how code operates not just as a limiting force but also a generative force that generates self-regulation by communicative acts. Rather than a passive and limiting force, code can be understood as active and generative. This could be a potential addition to the concept of "code is law" that would use the discipline of sociology of law to come to a new understanding of it.

2.3   3) Using framework to illuminate ICT use in smart cities

When Lessigs theory of "code is law" has been supplemented by Luhmanns sociology of law it becomes possible to use the concepts to view "code is action" rather than "code in the books". Expressed in Luhmanns terms, it becomes possible to use "Code is Law" to look at how it operates in *inter-system relations* rather than just *intra-system relations. Can Luhmanns systems theory help "code is law" when applied to smart cities? Does the addition of this theory to smart cities bring about a new understanding of how code influence normative behaviors within the framework of smart cities?*

2.4   Method

The first step will consist of theoretical work. Here I will do a close reading of the theories of Luhmann and Lessig as well as the critique that has been presented against them. From this I will try to describe the theory of Lessig using the concepts of Luhmanns sociology of law so that the rest of Luhmanns theory becomes accessible to the insights gleaned from Lessig. To perform this I will most likely enlist the help of Teubner to expand the concept of "code is law" and of Friedrich Kittler to discuss what code and the internet means for Luhmanns theory.

The first step in applying the theoretical insights empirically will be an analysis of the discourse of "smart cities" as well as a literature study of the research of smart cities as well as ICT and cities in general. This material will be analyzed through the lens of the theoretical framework as it will emerge from the theoretical work.

2.4.1   Case study copenhagen

Finally, I will apply the theoretical framework to a case study of a particular "smart city" initiative. For this I have chosen Copenhagen, Denmark, located right across the sound from Lund and Malmö in southern Sweden.

Copenhagen is already considered one of the most livable cities in the world and has been praised for its sustainability, for example being named bicycle capital of the world. Copenhagen has an ambition to be CO_2 neutral by 2025 and smart city technology is considered a key factor in this.

Copenhagen has already embarked on projects to create a "smart infrastructure" where for example energy systems and waste management are being connected with network technology. Smart infrastructure is also a key driver of the development of "Nordhavn", a former port area in the northern parts of Copenhagen that will be a new sustainable district with smart city technology.

Copenhagen also has a number of "softer" initiatives that is merging ICT and the city, for example "Skab din by" (create your city) that asks citizens to help municipal administrators to re-imagine how the city should be used. The "Copenhagen Wheel" developed by MIT is an add-on to bicycles that collects environmental data as your ride through the city that can be viewed on a smart phone as well as shared with the municipality. Copenhagen also has a public transportation system that integrates real-time location tracking of vehicles, integrated digital ticketing system, traffic light management and real-time updated web services for transportation planning. To add to this, Copenhagen has high penetration of smart phones and good coverage of mobile networks — technologies that are increasingly being used for location-aware applications and services — thus making it a highly networked city.

The purpose of the case study in Copenhagen would be to get a richer picture of the effects of ICT on normative behavior in the city, especially regarding mobility and sustainable life-choices.

In this case study I would first look at the intentions on behalf of the municipality and companies that are involved in Smart City Copenhagen as to how they imagine that ICT will influence mobility and sustainable behavior. As part of this I would also analyze the actual software systems and what functions they implement.

I will also study the actual effects of these systems. How they really work, how they integrate with each other and how it influences behaviors and norms of citizens.

In both aspects of the case study, the method employed would be a combination of the analysis of written sources such as vision documents, software specifications and news articles as well as interviews and observation of systems in action. To prepare for this, I have already established preliminary contacts with the municipality's "Center for Byudvikling", the municipality center for urban development; the Danish Architecture Center, who is involved in the Smart City initiative; Copenhagen Institute of Interaction Design, who is involved in design projects involving ICT and the city; and Negotiating (In)visibilities, a research network at the University of Copenhagen that "explores questions relating to cultural changes in the visible and the invisible", such as surveillance technologies in everyday life and the culture of social networks.

2.5   Potential weaknesses

There is a risk that the theories of Luhmann and Lessig is not compatible with each other, or needs to be complemented by several other frameworks. In this case I would focus my theoretical work of specifying exactly where their differences are and continue the research with them as separate frameworks able to explain different aspects. In the empirical phase I would have to map the two theories on different aspects of smart cities and show how they are able to account for different aspects of ICT use in smart cities.

Even if I am able to merge the two theories, there is a risk that they turn out to be inadequate to explain the influence of ICT on normative behavior in smart cities. In this case, I will be as exact as possible as to what kinds of phenomena the theory is unable to account for and then suggest how the theories need to improve to be able to do so.

Finally, there is a risk that the smart city initiatives that I intend to study is too weakly implemented to evaluate the effects of. Projects might be cancelled prematurely or insufficient data might become a problem. In that case I would have to focus more on the planning and development phase of the initiatives and study how the visions and designs of ICT use guide the development processes.

2.6   Project plan

- Year 1

Literature studies of theory
Theoretical work to merge theories
Preparing case study

- Year 2

Analysis of discourse of smart cities
Case study: Data gathering

- Year 3

Case study: Data analysis
Thesis writing

3 III. Expected Results

3.1 Theoretical relevance

My hope is that the thesis will be successful in bridging the two theories of Luhmann and Lessig respectively. By doing that I would also bridge two field of study — sociology of law (in the Luhmann tradition) and legal studies of code and internet.

This merger and the empirical study would be an attempt to establish a framework that would allow internet studies and the type of normative research of internet that the Cybernormer group is doing to also be able to tackle phenomena of ICT use in networked cities.

It is also my hope that the thesis would bring insights from of sociology of law — both in the Luhmann tradition and the broader understanding of legal pluralism and living law within the field — to the community of researchers that study smart cities and other aspects of networked cities.

3.2 Applied relevance

Outside of academia, the thesis has the potential to bring new perspectives on changes in norms and behavior inflicted by software system in urban environments. This in on the one hand relevant to software engineers and interaction designers that are in the process of designing and building such systems and on the other hand relevant to policy makers, urban planners and citizen activists that are concerned with what the best approaches are to the interface between ICT, the city and its citizens.