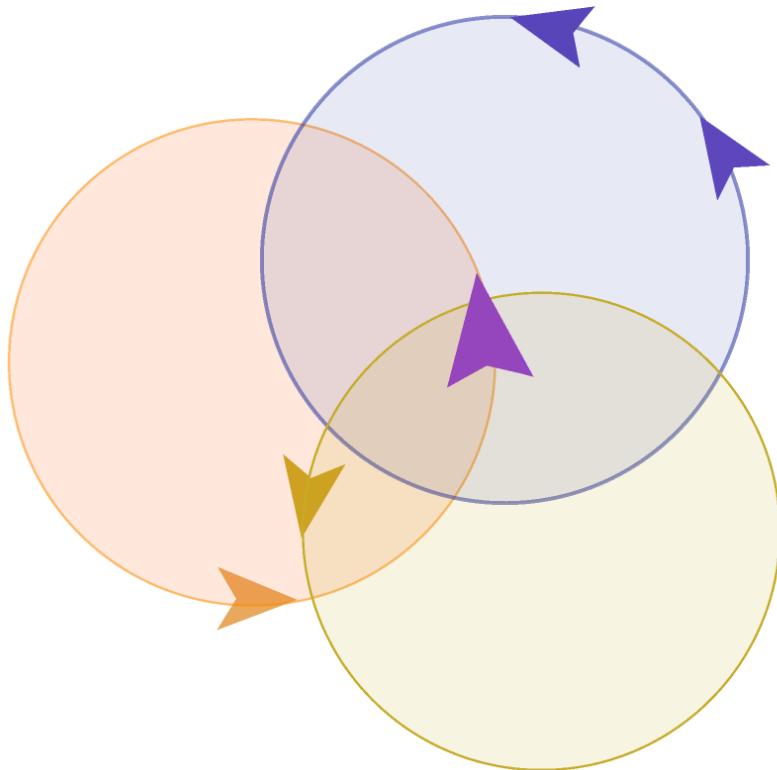


Exploring the **boundaries** between **law**, **ABM** and **policy-making**

On the clash between formal and informal norms

8th December 2021

Margherita Vestoso
Ilaria Cecere
University of Sannio, Benevento

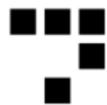


Exploring the **boundaries** between **law**, **ABM** and **policy-making**

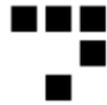
On the clash between formal and informal norms

8th December 2021

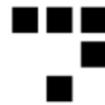
Margherita Vestoso
Ilaria Cecere
University of Sannio, Benevento



1. About the presentation



2. Law, policy-making & ABM



3. ABM in legal field:
insights from an empirical view



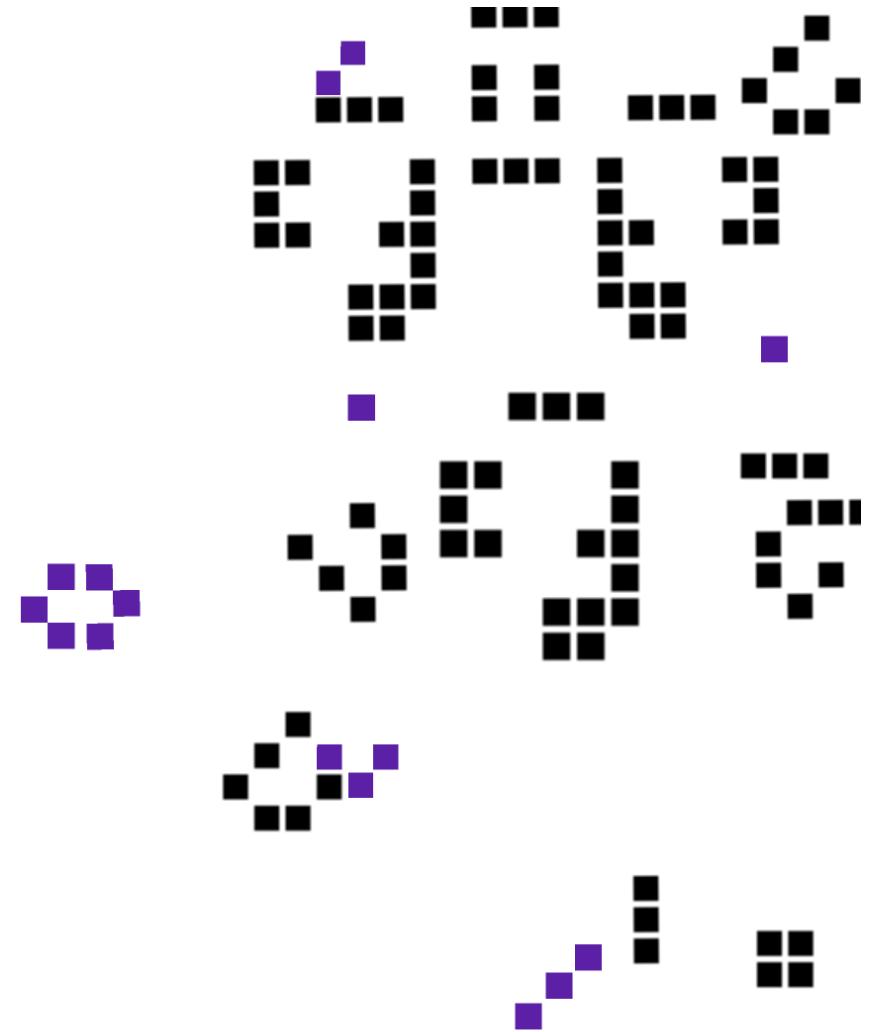
4. Focus: formal vs. informal norms



5. Fiddling with norms conflict simulation



6. Final remarks





1.

About the presentation

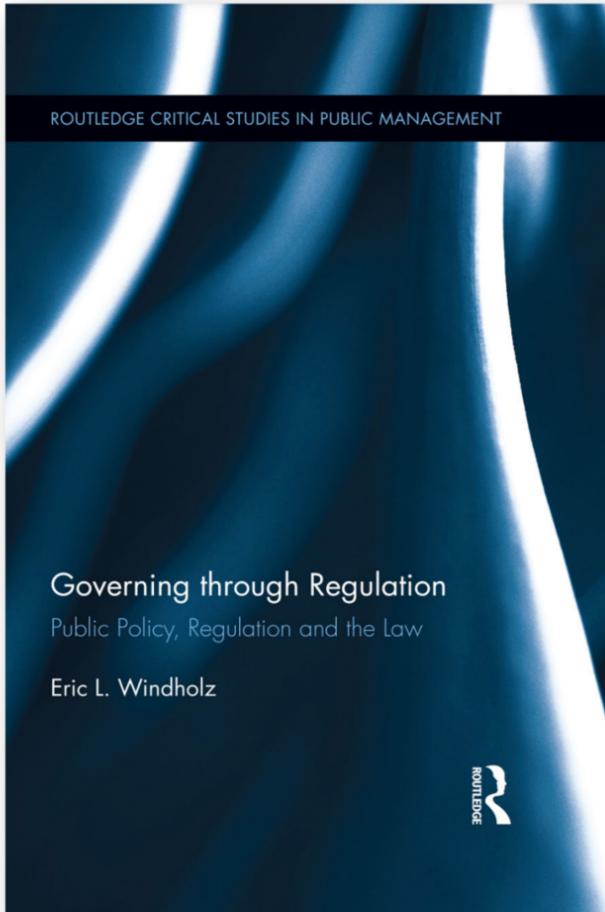
We dwell on the **potential intersections** between **ABM** and **policy-making** from a **legal perspective**, drawing inspiration from a new research view suggesting a sort of computationally-enhanced legal empiricism.

In particular, we draw attention to **the clash between formal and informal norms**, a topic lying at this border area we will discuss based on results of a recent agent-based research experience.

2.

Law, policy-making & ABM

A first intersection...



The **law** provides the **vehicles** through which **governments** undertake their **core functions** of provision, (re)distribution and regulation.

"[...] the law prescribes and proscribes desired standards of behaviour; establishes institutions to undertake regulatory activities; creates and shapes the regulatory tools those institutions use; furnishes the infrastructure for enforcement and dispute resolution; and establishes mechanisms through which regulatory institutions and actors are held accountable for the decisions they make and the activities they undertake"

Windholz, E. L. (2017). *Governing through regulation: public policy, regulation and the law*. Routledge.

There is a **overlap** between illuminating
dynamics behind legal norms and
improving policy effectiveness



Behind unsuccessful policies, there are often laws or other legal implementation tools designed without **any knowledge** of mental models, beliefs, societal norms and other contextual factors that influence people behaviours.

RESEARCH ARTICLE

A Social Science-Inspired Complexity Policy: Beyond the Mantra of Incentivization

FLAMINIO SQUAZZONI

Department of Economics and Management, University of Brescia, 25122 Brescia, Italy

Received 12 February 2013; accepted 3 March 2014

This study suggests that cross-fertilization between complexity and social science could provide a new rationale for policy. We look at the weakness of conventional policy thinking and excessive faith in incentives and the underestimation of social interaction on individual choices. Recent examples of experimental and computational research on social interaction indicate the importance of understanding preexisting social norms and network structures for targeting appropriately contextualized policies. This would allow us to conceive policy not as something that takes place "off-line" outside systems but as a constitutive process interacting with self-organized system behavior. This article aims to pave the way for a complexity-friendly policy that allows us to understand and manage more than predict and control top-down. © 2014 Wiley Periodicals, Inc. Complexity 000: 00–00, 2014

Key Words: complexity friendly policy; incentivization; social norms; social networks; social interaction

INTRODUCTION

We live in a complex and largely unpredictable world where boundaries between technology, economic, and social systems are more and more porous. This implies that changes in one system, even apparently insignificant ones, might have serious consequences on another system's behavior. This in turn could have implications on the original system in a cumulative, nonlinear way. For instance, the advent of Facebook and

Twitter has modified how people interact and has increased available information on preferences and behavior of distant people. This in turn increased the extent and spatiotemporal magnitude of social influence everyone is exposed to. Thus, there have been significant changes, for instances, in the relationship between customers' behavior and companies' marketing strategies or between political election candidates and the public opinion, with mass collaboration in information sharing and peer-to-peer communication in all sectors. New applications have been developed to support innovative sharing activity between users, reinforcing in turn the importance of Facebook and Twitter users' opinion in these sectors.

Even just a few years ago, nobody could have predicted this complex coevolution of technological, social, and

©2014 Wiley Periodicals, Inc. Vol. 00 No. 00
DOI 10.1002/CP.2100
Published online 00 Month 2014 in Wiley Online Library
(wileyonlinelibrary.com)

COMPLEXITY 1

"[...]it must be recognized that the principal cause of policy failure is not the size of the state or the magnitude of the action or resources involved, [...] The real cause lies in the **intellectual framework** in which a policy is conceived. This also includes the **theory** and **methodology** used for **policy design** and **implementation**"

Squazzoni, F. (2014).
A social scienceinspired complexity policy: Beyond the
mantra of incentivization.
Complexity.

Exploring
epistemological and **methodological** issues
emerging at this border area is
a **worthy effort** also for legal scholars

3.

ABM in legal field: insights from an empirical view

Neminem laedere. An evolutionary agent-based model of the interplay between punishment and damaging behaviours

Nicola Lettieri · Domenico Parisi

© Springer Science+Business Media Dordrecht 2013

Abstract This article a

between ICT, computer social simulation. Enabk Distributed Artificial Int oriented programming p analysis of social dynan evaluation of public polici and of its impact on soci devised to analyze, even interest of legal scientist and social mechanisms o based simulation can be social phenomena but als



An Agent-Based Model of Judicial Power

9 Journal of Law (6 J. Legal Metrics) (2019)
[University of Hong Kong Faculty of Law Research Paper No. 2019/104](#)

44 Pages • Posted: 11 Oct 2019 • Last revised: 4 Dec 2019

Alex Schwartz

The University of Hong Kong - Faculty of Law

Date Written: October 1, 2019

Abstract

That a court possesses the formal power of judicial review is no guarantee that its decisions will be obeyed. This article explores how mitigating the risk of challenging the preferred interpretation more influence on legal cases. These findings "by steps", i.e., relatively gradual supremacy.

PERSPECTIVE
published: 21 June 2019
doi: 10.3389/jphy.2021.660396



Agent-Based Modeling as a Legal Theory Tool

Sebastian Bentall and Katherine J. Strandburg*

*School of Law and Information Law Institute, New York University, New York, NY, United States

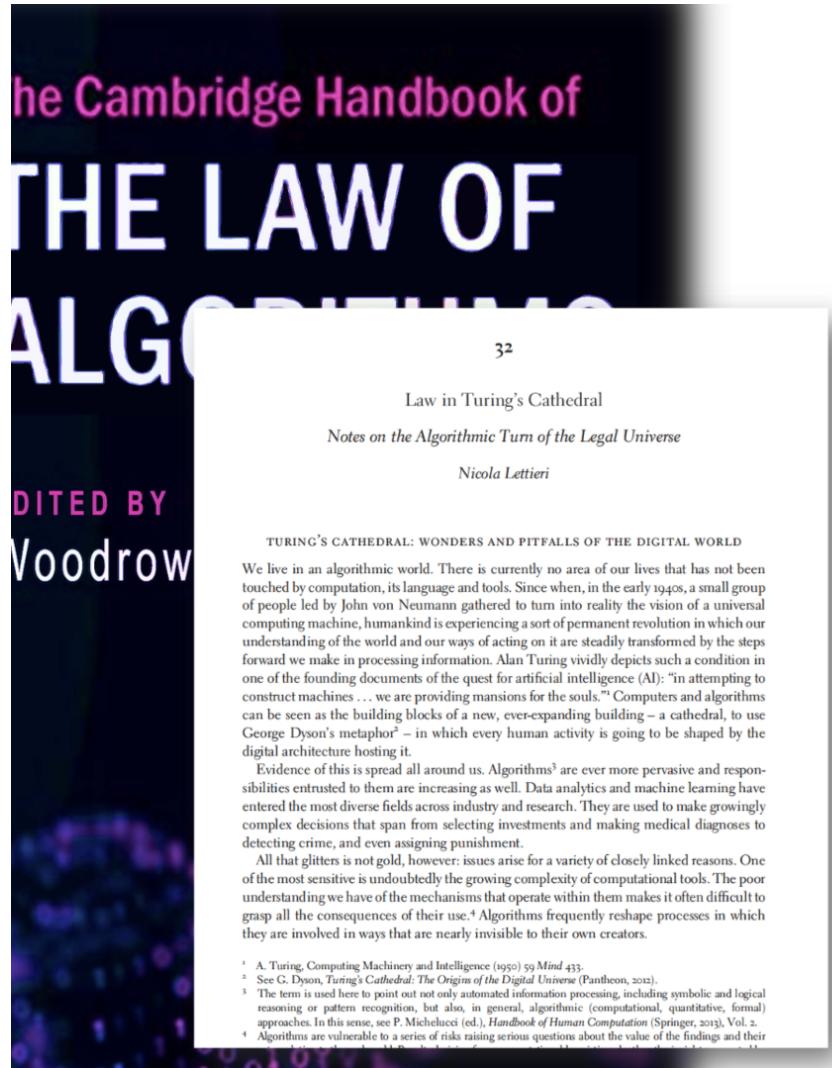
Agent-based modeling (ABM) is a versatile social scientific research tool that adapts insights from sociology and physics to study complex social systems. Currently, ABM is nearly absent from legal literature that evaluates and proposes laws and regulations to achieve various social goals. Rather, quantitative legal scholarship is currently most characterized by the Law and Economics (L&E) approach, which relies on a more limited modeling framework. The time is ripe for more use of ABM in this scholarship. Recent developments in legal theory have highlighted the complexity of society and law's structural and systemic effects on it. ABM's wide adoption as a method in the social sciences, including recently in economics, demonstrates its ability to address precisely these regulatory design issues.

Keywords: agent-based modeling, simulation, complexity, law and economics, law and macroeconomics, law and political economy

OPEN ACCESS

In the legal field,
the use of social simulation is a
relatively unexplored frontier...

A new empirical and computational
legal research view...



32

Law in Turing's Cathedral

Notes on the Algorithmic Turn of the Legal Universe

Nicola Lettieri

TURING'S CATHEDRAL: WONDERS AND PITFALLS OF THE DIGITAL WORLD

We live in an algorithmic world. There is currently no area of our lives that has not been touched by computation, its language and tools. Since when, in the early 1940s, a small group of people led by John von Neumann gathered to turn into reality the vision of a universal computing machine, humankind is experiencing a sort of permanent revolution in which our understanding of the world and our ways of acting on it are steadily transformed by the steps forward we make in processing information. Alan Turing vividly depicts such a condition in one of the founding documents of the quest for artificial intelligence (AI): "in attempting to construct machines... we are providing mansions for the souls."¹ Computers and algorithms can be seen as the building blocks of a new, ever-expanding building – a cathedral, to use George Dyson's metaphor² – in which every human activity is going to be shaped by the digital architecture hosting it.

Evidence of this is spread all around us. Algorithms³ are ever more pervasive and responsibilities entrusted to them are increasing as well. Data analytics and machine learning have entered the most diverse fields across industry and research. They are used to make growingly complex decisions that span from selecting investments and making medical diagnoses to detecting crime, and even assigning punishment.

All that glitters is not gold, however: issues arise for a variety of closely linked reasons. One of the most sensitive is undoubtedly the growing complexity of computational tools. The poor understanding we have of the mechanisms that operate within them makes it often difficult to grasp all the consequences of their use.⁴ Algorithms frequently reshape processes in which they are involved in ways that are nearly invisible to their own creators.

¹ A. Turing, Computing Machinery and Intelligence (1950) 59 *Mind* 433.

² See G. Dyson, *Turing's Cathedral: The Origins of the Digital Universe* (Pantheon, 2012).

³ The term is used here to point out not only automated information processing, including symbolic and logical reasoning or pattern recognition, but also, in general, algorithmic (computational, quantitative, formal) approaches. In this sense, see P. Michelucci (ed.), *Handbook of Human Computation* (Springer, 2013), Vol. 2.

⁴ Algorithms are vulnerable to a series of risks raising serious questions about the value of the findings and their

"Algorithms and heuristics currently available could open up the gates to what we define as "**computation-enhanced legal empiricism**", a vision of legal empiricism exploiting computation [...] also to **investigate other aspects of the legal phenomenon**, like the intricate networks of cognitive and social **mechanisms through which law emerges, is applied, and exerts its effects.**"

Lettieri, N. (2020).

Law in the turing's cathedral: Notes on
the algorithmic turn of the legal universe.
The Cambridge Handbook of the Law of Algorithms.

In this view, computational social sciences methods are seen as an enabling factor for an evolution in empirical sense of the way legal phenomena are conceptualized and studied.



future internet



Article

Computational Social Science, the Evolution of Policy Design and Rule Making in Smart Societies

Nicola Lettieri^{1,2}

¹ ISQOL, Institute for the Development of Vocational Training, Corso d'Italia 33, 00198 Rome, Italy; n.lettieri@isqol.it; Tel.: +39-0624-351-232

² Department of Law, Economics, Management, Quantitative Methods, University of Sannio, Piazza Ascoli III, 82100 Benevento, Italy

Academic Editor: Dino Giulli

Received: 12 March 2016; Accepted: 27 April 2016; Published: 12 May 2016

Abstract: In the last 20 years, the convergence of different factors—the rise of the complexity of science, the “data deluge” and the advances in information technologies—triggered a paradigm shift in the way we understand complex social systems and their evolution. Beyond shedding new light onto social dynamics, the emerging research area of Computational Social Science (CSS) is providing a new rationale for a more scientifically-grounded and effective policy design. The paper discusses the opportunities potentially deriving from the intersection between policy design issues and CSS methods. After a general introduction to the limits of traditional policy-making and a brief review of the most promising CSS methodologies, the work deals with way in which the insights potentially offered by CSS can concretely flow in policy choices. The attention is focused, to this end, on the legal mechanisms regulating the formulation and the evaluation of public policies. Our goal is two-fold: sketch how the project of a “smart society” is connected to the evolution of social sciences and emphasize the need for change in the way in which public policies are conceived of, designed and implemented.

Keywords: computational social science; policy modeling; rule making; smart society; social simulation

1. Introduction: Policy Failures as Failures of Knowledge

In a talk given in 2005, while presenting the *Committee on Global Thought* (New York, NY, USA, 14 December 2005), a commission intended to build an international program for the study of globalization and its issues, Lee Bollinger, the Dean of Columbia University said:

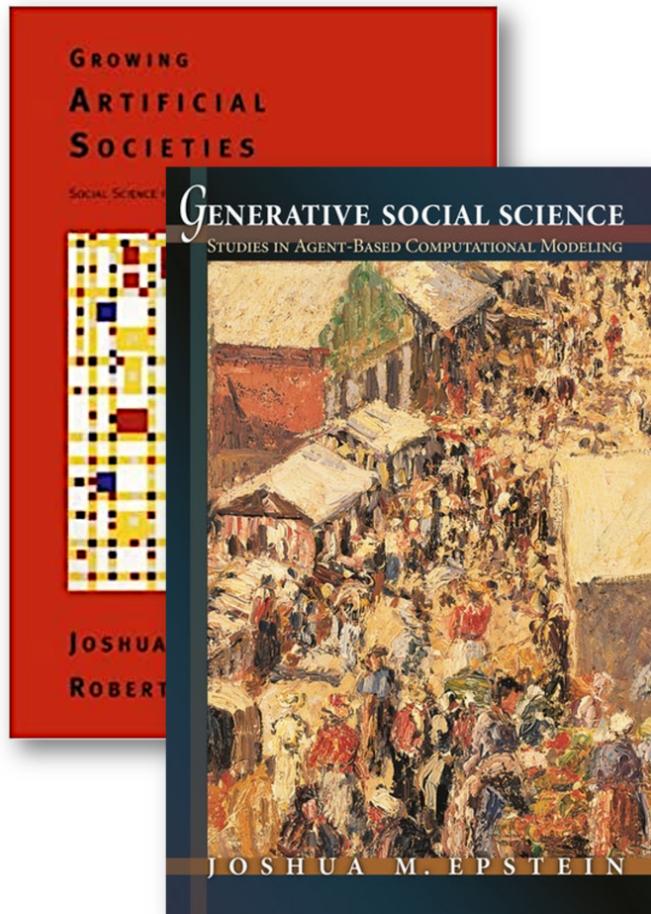
“The forces affecting societies around the world and creating a global community are powerful and novel. The spread of global market systems, the rise of (and resistance to) various forms of democracy, the emergence of extraordinary opportunities for increased communication and of an increasingly global culture, and the actions of governments and nongovernmental organizations are all reshaping our world and our sense of responsibility for it and, in the process, raising profound questions. These questions call for the kinds of analyses and understandings that academic institutions are uniquely capable of providing. Too many policy failures are fundamentally failures of knowledge...” [1]

As suggested by Bollinger’s words, humankind is dealing with a series of novel and global challenges spanning from the depletion of natural resources to migrations; from financial, institutional



ABM, in particular, is conceived as a potential ally to better understand the **factual underpinnings** of **phenomena heavily affecting** the evolution of the legal universe and, thus, **policy and rulemaking**

Lettieri, N. (2013).
Ius in silico. Diritto, computazione, simulazione.
Edizioni scientifiche italiane.



ABM paved the way to a fundamentally new standard of explanation in social science, allowing researchers to “grow” the phenomenon of interest in an artificial society of interacting agents.

By this way, they are able to observe how the macro-level structure of the phenomenon emerges from micro-interactions among individuals and between them and the environment.

Epstein, J. M. (2012).
Generative social science.
Princeton University Press.

The list of phenomena
relevant for policy and rulemaking
that can be explored this way
is long...

Agent-Based Simulation of Collective Cooperation: From Experiment to Model^{*}

Benedikt Kleinmuntz[†]
Munich University of Applied Sciences, Department of Computer Science and Mathematics, 80335 Munich, Germany and
Technical University of Munich, Department of Informatics, 85748 Garching, Germany

Gerta Köster[‡]
Munich University of Applied Sciences, Department of Computer Science and Mathematics, 80335 Munich, Germany

John Drury[§]
University of Sussex, School of Psychology, BN1 9RH, Brighton, United Kingdom

(Dated: October 8, 2020)

Simulation models of evacuation dynamics have become an invaluable tool for evacuation planning.

Electronic Government and Electronic Participation
E. Tambouris et al. (Eds.)

53

© 2015 The authors and IOS Press.

This article is published online with Open Access by IOS Press and distributed under the terms of the Creative Commons Attribution Non-Commercial License.
doi:10.3233/978-1-61499-570-8-53

Simulating the Core Dynamics of a Social Dilemma. Individual Choices, Time and Sanctions in the Tragedy of the Commons

Nicola LETTIERI[§]

[§]ISFC

^bUniversity of Sannio, Dept. of Law, E Ben

Abstract. The understanding of the interaction between individual and collective behavior can play a crucial role in supporting apparently effective policy can ease the interplay between individual decision making and collective action. This paper presents an ongoing research project that explores the core dynamics of the dilemma known for being behind pollution to resource depletion and the basic processes through which artificial society the effects of the phenomenon. Our attention is focused on the temporal dimension of the impact of sanctions.

Keywords. policy modeling, commons, agent-based models, evolution

Introduction

The understanding of the way in which the interaction between individual behavior and collective behavior can play a crucial role in supporting the design of public policies is that they often fail in doing so. This is because social systems are characterized by multiple connections, proceeding not only from the macro to the micro level, but also back from the macro to the micro level.

Recently, the complexity science re-

Colloquium

Modeling civil violence: An agent-based computational approach

Joshua M. Epstein[†]

Center on Social and Economic Dynamics, The Brookings Institution, 1775 Massachusetts Avenue, NW, Washington, DC 20036; and External Faculty, Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, NM 87501

This article presents an agent-based computational model of civil violence. Two variants of the civil violence model are presented. In the first a central authority seeks to suppress decentralized rebellion. In the second a central authority seeks to suppress communal violence between two warring ethnic groups.

This article presents an agent-based computational model of civil violence. Two variants of the civil violence model are presented. In the first a central authority seeks to suppress decentralized rebellion. In the second a central authority seeks to suppress communal violence between two warring ethnic groups. The term "civil violence" is used here to refer to acts of violence within a society or state rather than between states. The focus here is on the overthrow of an existing order, the latter being widely accepted as definitive of revolution, properly speaking. The dynamics of decentralized upheaval, rather than centralized subservience, is the focus here. In the second model a central authority seeks to suppress communal violence between two warring ethnic groups. And, as in model I, I am interested in generating certain characteristic phenomena and core dynamics; I do not purport to represent all possible patterns in detail, although as discussed in Epstein et al. (6), that is an obvious long-term objective.

Civil Violence Model I: Generalized Rebellion Against Central Authority

This model involves two categories of actors. "Agents" are members of the general population and may be actively rebellious or not. "Cops" are the forces of the central authority, who seek out and arrest rebellious agents. Let me describe the agents first. As in all agent-based models, they are heterogeneous in a number of respects. The attributes and behavioral rules of the agents are as follows.

The Agent Specification. First, in any model of rebellion there must be some representation of political grievance. My treatment of grievance will be extremely simple and will involve only two

types of agents: those being repelled from collective cooperation or a path through a opens when humans agent phenomena. We incorporate: agents' into a path following place. Agents' psychological model.

cooperation, be-
ated Work
led existing locomotion models
ough virtual environments and
of these models. For instance,
tangentially or sideways. Us-
on of exten-

assumed to be based on these variables. Of the many functional relationships one might posit, we will assume:

$$G = H(1 - L)$$

Grievance is the product of perceived hardship (H) and perceived "illegitimacy," if you will ($1 - L$).¹ The intuition behind this functional form is simple: If legitimacy is high, then hardship does not induce political grievance. For example, the British government enjoyed unchallenged legitimacy ($L = 1$) during World War II. Hence, the extreme hardship imposed by the British government did not induce grievance toward the government. By the same token, if people are suffering (high H), then the revelation of government corruption (low L) may be expected to produce increased levels of grievance.

Given this, the desire to reduce dependence on one's grievance. For example, some agents are simply more inclined to take risks than others. Accordingly, I define R as the agent's level of risk aversion. Heterogeneous screens, this (R) is assumed to be uniformly distributed. Each agent's R value is drawn from $U(0,1)$ and is fixed for the agent's lifetime.

All but the literally risk neutral will estimate the likelihood of becoming more actively joining a rebellion.

The estimation is assumed to be proportional to the cop-to-rebel ratio within the prospective rebel's vision.

To model this, I define v as the agent's vision. This is the number of lattice positions (north, south, east, and west of the agent's current position) that contain at least one other agent, regardless and equal across agents. As in most agent-based models, vision is limited: information is local. Letting (C/A) , denote the cop-to-active ratio within vision v , I assume the agent's estimated arrest probability P to be given by

$$P = 1 - \exp[-k(C/A)].$$

The constant k is set to ensure a plausible estimate (of $P = 0.9$) when $C = 1$ and $A = 1$. Notice that A is always at least 1, because

Benedikt Kleinmeier[†]
*lived Sciences, Department of Computer Science and Mathematics, 80335 Munich, Germany and
University of Munich, Department of Informatics, 85748 Garching, Germany*

Gerta Köster[†]
Applied Sciences, Department of Computer Science and Mathematics, 80335 Munich, Germany

John Drury[§]
University of Sussex, School of Psychology, BN1 9RH, Brighton, United Kingdom
(Dated: October 8, 2020)

models of pedestrian dynamics have become an invaluable tool for evacuation planning. 1. Simulated human model. Simulated humans are able to make collective cooperation decisions by a path through open spaces when human agents are present. We incorporate a agent-based migration from a portfolio of parking places. Agents' psychological model of cooperative behavior is based on the social learning theory.

Dynamics of a Social Choices, Time and of the Commons

olloquium

Modeling civil violence: An agent-based computational approach

Shua M. Epstein†

Center on Social and Economic Dynamics, The Brookings Institution, 1775 Massachusetts Avenue, NW, Washington, DC 20036; and External Faculty, Santa Fe Institute, 1399 Hyde Park Road, Santa Fe, NM 87501

This article presents an agent-based computational model of civil violence. Two variants of the civil violence model are presented. In the first a central authority seeks to suppress decentralized rebellion. In the second a central authority seeks to suppress communal violence between two warring ethnic groups.

his article presents an agent-based computational model of civil violence. First, I introduce the model. Then, I compare it to Epstein and Axtell (1). I present two main findings. The first in a central authority seeks suppressed decentralized rebellion. Where I use the term "rebellion," I do so advisedly, recognizing that no political or social order is represented in the model. Perforce, neither is the notion of an existing or latent belief, which would seem an intuitive way to approach the problem. The second finding is of centralized upheaval, rather than its political substance, is the us here.² In the second model a central authority seeks to control communal violence by dividing it among ethnic groups. This is interesting, but I am interested in a general characteristic phenomena and core dynamics; I do not purport reconstruct any particular case in detail, although, as discussed in Epstein et al. (6), that is an obvious long-term objective.

Violence Model I: Generalized Rebellion Against Central Authority

model involves two categories of actors. "Agents" are members of the general population and may be actively rebelling us or not. "Cops" are the forces of the central authority, who track down and arrest actively rebellious agents. Let me describe the agents first. As in all agent-based models, they are heterogeneous in a number of respects. The attributes and behavioral rules of the agents are as follows.

Agent Specification. First, in any model of rebellion there must some representation of political grievance. My treatment of evance will be extremely simple and will involve only two

$$F = 1 - \exp[-\kappa(C/A)_c].$$

The constant k is set to ensure a plausible estimate (of $P = 0.5$) when $C = 1$ and $A = 1$. Notice that A is always at least 1, because

The emergence of **informal norms** and their interplay with formal ones is a meaningful example...

4.

Focus: formal vs.
informal norms

Do informal norms
affect law and **policy-making**?

Legal norms are not the only driver of regulation...

Collective behaviours are often affected by moral, cultural or other **informal rules** which are **not encoded in formal provisions**

The Grammar of Society

The Nature and Dynamics
of Social Norms

Cristina Bicchieri



CAMBRIDGE

The Grammar of Society

The Nature and Dynamics of Social Norms

Cristina Bicchieri

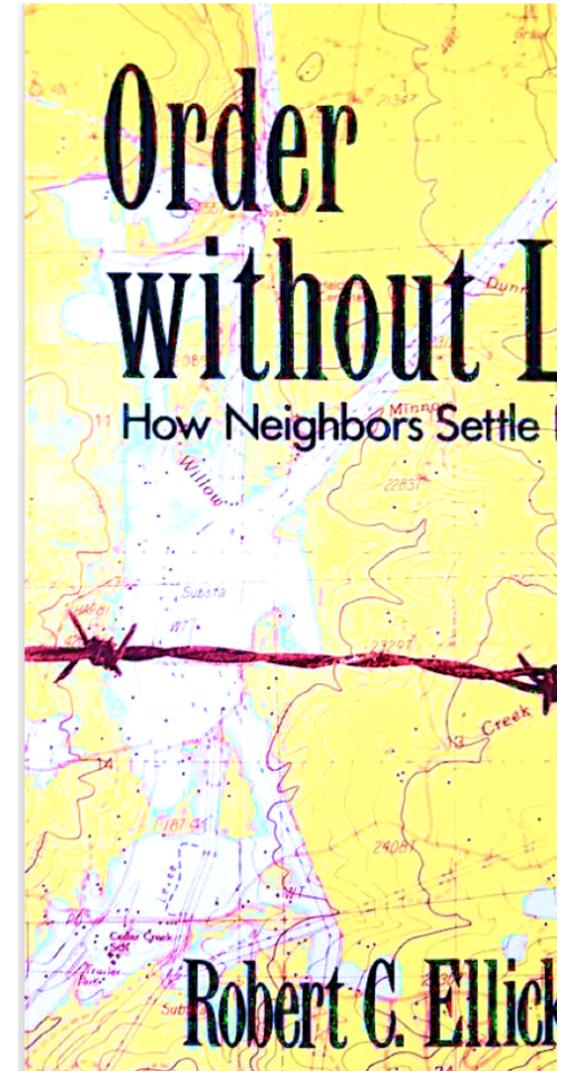


CAMBRIDGE

" [...] When they are enforced, the **sanctions** are **informal**, as when the violation of a group norm brings about responses that range from gossip to open censure, ostracism, or dishonor for the transgressor. Some **such norms may become part of our system of values**, and we may feel a strong obligation to obey them"

Bicchieri, Cristina, 2006.
The grammar of society: The nature and dynamics of social norms. Cambridge University Press.

An issue that can heavily
impacts policy effectiveness

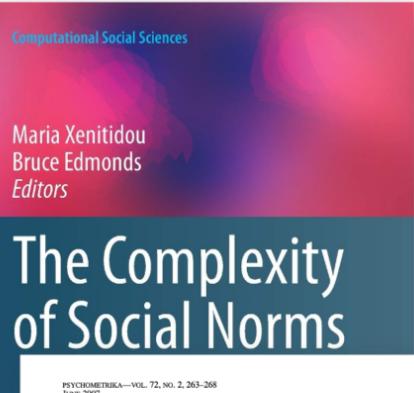


Order without Law

How Neighbors Settle Disputes

Robert C. Ellickson

Informal rules can end up **hindering or completely excluding co-existing formal norms** that interplay with them.



Computational Social Sciences

Maria Xenitidou
Bruce Edmonds
Editors

The Complexity of Social Norms

PSYCHOMETRIKA—VOL. 72, NO. 2, 263–268
JUNE 2009
DOI: 10.1007/s11336-006-1560-6

DESCRIPTIVE SOCIAL NORMS AS UNDERAPPRECIATED SOURCES OF SOCIAL CONTROL

ROBERT B. CIALDINI
ARIZONA STATE UNIVERSITY

Bickeloh and van der Heijden's results regarding compliance with insurance regulations—that is, enforcement activities of a regulatory agency were relatively independent of compliance—are consistent with findings from other domains (e.g., tax adherence), where personal factors and informal social controls have been shown to play a more significant role. However, the specific form of informal social control involved here—descriptive social norms—is an underappreciated source of normative behavior. Descriptive social norms, which involve perceptions not of what others approve but of what others actually do, are particularly compelling because they are based on what people see others doing. Thus, tax adherence is often underappreciated by governed and governs alike. The consequences of this relative lack of recognition are discussed within the arena of compliance with pro-environmental regulations and rules.

Key words: social norms, social control, noncompliance.

Although I am not expert on the topic, I found myself persuaded by Bickeloh and van der Heijden's (DOI: 10.1007/s11336-005-1495-y) conclusions regarding the advantages of mixture-IRR approaches to the analysis of randomized response data. On a topic about which I do have some expertise (compliance), I also found myself persuaded—this time because their compliance-related results fit well with a longstanding literature on factors that spur people to act in concert with regulations, norms, and standards (Cialdini, 2000).

Bickeloh and van der Heijden's findings indicate that adherence to insurance regulations was much better predicted by features of: (1) the belief systems of the affected individuals; and (2) the perceived belief systems of these individuals' friends and family than by the enforcement activities of a regulatory agency. This relative lack of impact of governing regulatory agency controls (compared to that of personal or social considerations) is consistent with findings in other areas of compliance research on the importance of social norms (e.g., Cialdini, 2000). That is, although regulatory enforcement efforts can make a difference in compliance with a rule, the difference is often dwarfed by the influence of personal and social network factors. This is the case for a pair of reasons. First, strong formal control efforts tend to produce feelings of resentment and reactance (Brehm & Brehm, 1981; Burgos, Alvaro, Grandjean, & Vouloudakis, 2002), leading to attempts to evade the agency's strictures. Second, when formal regulatory controls are strong, individuals tend to believe that, if it is necessary to invoke stringent regulations, those regulations must exist to oppose individual preferences that "make like me" hold. These psychological mechanisms may account for the finding that, after government officials publicly increase the penalties for tax cheating, tax fraud goes up not down (Kahan, 1997).

Requests for reprints should be sent to Robert B. Cialdini, Department of Psychology, Arizona State University, Tempe, AZ 85287-1104, USA. E-mail: Robert.Cialdini@asu.edu.

© 2006 The Psychometric Society

263

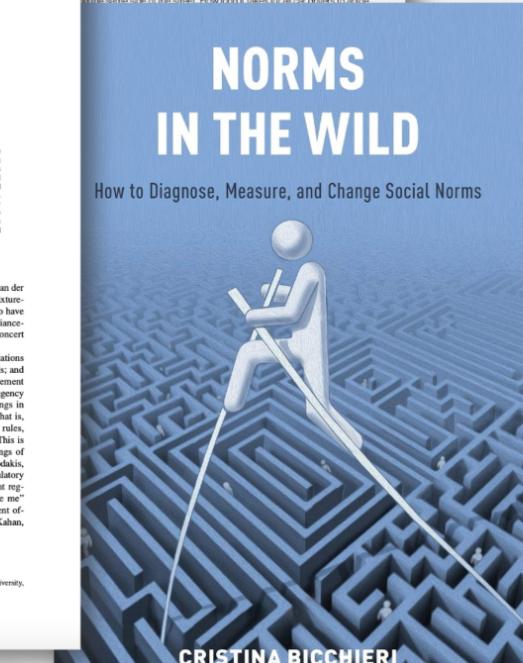
ORIGINAL RESEARCH
published: 10 March 2010
doi: 10.3389/fpsyg.2010.00002

Can Lawlike Rules Emerge without the Intervention of Legislators?

Klaus G. Troitzsch*

Refined, Koblenz, Germany

The paper shows that in an artificial society lawlike rules emerge "as a result of individual action but without being designed by any individual agents" (Mayek, 1944, p. 268) and discusses earlier literature on the topic. The first example that this paper uses is an artificial society of car drivers moving between their homes and their working places on streets with two lanes crossing each other at right angles. Car drivers start using the left or right lane of the street alternately and continue to do the same side of the street until there has been informed by an oncoming car. In this occasion, one of them decides to change a side of the street, taking into account which side of the street is used by the majority. This very simple behavior usually results in a society-wide applied to the same side of the street. How long it takes for all car drivers to switch



A widely investigated topic
in social sciences...

AI Comm
DOI 10.3233/AI-130032
IOS Press

Corinna Elsenbroich · Nigel Gilbert

Modelling Norms

SIMULATING NORMATIVE BEHAVIOUR AND NORM FORMATION PROCESSES

KEYWORDS
Norm innovation, Social simulation, Normative agents, Traffic scenario, Emergence, Emergence.

ABSTRACT
This paper describes the design of an agent model for simulating normative behaviour and norm formation processes. The model is based on a scientific theory of norm innovation provided by the FP6 project EMIL (Möller et al. 2006). The Local Interaction Model (LIM) is the conversion of the theoretical framework towards a software implementation that can be applied for multiple simulation scenarios. A simple traffic scenario – where the traffic participants have to follow rules to avoid collision incidents – serves as sample application.

INTRODUCTION
This paper focuses on the design and implementation of an agent-based simulation approach which describes the process of norm innovation, illustrated by a simple traffic scenario. It is part of the FP6 project EMIL (Möller et al. 2006). The Local Interaction Model (LIM) is the dynamics of norm innovation as an example of simulating emergent properties in complex social systems within the EU "Complex Systems" (no. 033841). The model design is based on a scientific theory of norm innovation provided by the FP6 project EMIL (Andrighetto et al. 2007a). Using this theoretical framework, an agent-based norm innovation model is designed and implemented, which can be embedded in multiple simulation scenarios. A simple traffic scenario, where the traffic participants have to follow rules to avoid collision incidents – serves as a sample application. Dynamic simulations of norm innovation and norm innovation approach is supported by implementing the model using the agent-based traffic simulation tool TRASS (Loetzmann 2008).

THEORETICAL FRAMEWORK
The EMIL project especially focusses on understanding and modeling norm innovation processes in social systems, which can be seen here as a special case of complex systems, composed of many different interacting intelligent autonomous agents. In general,

AI COMMUNICATIONS, Vol. 23, No. 1, March 2010, pp. 29–46
ISSN: 0924-6305 (print), ISSN: 1573-0623 (electronic)
© 2010 IOS Press. All rights reserved.
doi:10.3233/AI-130032

Julia Andrighetto^{a,*}, Daniela Villaron^b and Rosaria Conte^b
^a IARSS, Institute of Cognitive Science and Technologies, CNR, Rome, Italy
^b Artificial Intelligence Research Institute (I3A), Spanish National Research Council, Spain

Abstract. Internalization is a study in social behavioral sciences and moral philosophy since long; of late, the debate was rearranged within the rationality approach to the study of cooperation and compliance since internalization is a less costly and more reliable enforcement system than social control. But how does it work? So far, poor attention was paid to the mental underpinnings of internalization. This paper advocates a rich cognitive model of different types, degrees and factors of internalization. In order to validate the model, we have conducted experiments adapted as existing agent architecture, EMIL-A, providing it with internalization capabilities, turning it into EMIL-A. Experiments have proven satisfactory results with respect to the maintenance of cooperation in a proof-of-concept simulation.

Keywords: Rich cognitive modeling, norms, internalization, agent architecture, autonomous agents, agent based social simulation

1. Introduction
The problem social scientists still revolve around is how to explain systematic positive heuristics, particularly positive behavior toward one's own culture and toward existing norms, especially since self-regarding agents are much better-off than other-regarding agents at within-group competition. Since Durkheim, the key question has been the source of the mechanism of internalization of norms [30,32,34,39,43]. One plausible explanation of voluntary non-self-interested compliance with social norms may have been internalized. Internalization occurs when

internalization predicts children's later well-being and even their social behavior [1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25].

Despite these important contributions, however, the community's scientific definition and understanding of the process of norm internalization is still fragmentary and insufficient.

The main purpose of this paper is to argue for the necessity of a rich cognitive model of norm internalization in order to (a) provide a unified view of the phenomenon, accounting for the features it shares with related phenomena (e.g., robust conformity as in automatic rule following); (b) identify the features that help to distinguish them from autonomy; (c) model the process of norm internalization.



MINDING NORMS

Mechanisms and dynamics of social order in agent societies

edited by
ROSLIA CONTE
GIULIA ANDRIGHETTO
MARCO CAMPENNÌ

A new slant came from **CSS research approaches** and, in particular, **ABM** ability to enlighten the **dynamics underlying informal norms emergence** and interplay with other kinds of rules.



COLLECTIVE ACTION

Social norms as solutions

Policies may influence large-scale behavioral change

By Karine Nyborg, John M. Anderies, Astrid Dannenberg, Therese Lin, Maja Schlüter, W. Neil Adger, Kenneth J. Arrow, Scott Barrett, Stephen Chapin III, Anne-Sophie Crépin, Gretchen Daily, Paul Ehrlich, Carl Folke, Nils Kautsky, Simon A. Levin, Ole Jacob Madsen, Stephen Polasky, Ma Walker, Elke U. Weber, James Wilen, Anastasios Xepapadeas, Aart de

Climate change, biodiversity loss, antibiotic resistance, and other global challenges pose major collective action problems: A group benefits from a certain action, but no individual has sufficient incentive to act alone. Formal institutions, e.g., laws and treaties, have helped address issues like ozone depletion, lead pollution, and acid rain. However, formal institutions are not always able to enforce collectively desirable outcomes. In such cases, informal institutions, such as social norms, can be important. If conditions are right, policy can support social norm changes, helping address even global problems. To judge when this is realistic, and what role policy can play, we discuss three crucial questions: Is a tipping point likely to exist, such that vicious cycles of socially damaging behavior can potentially be turned into virtuous ones? Can policy create tipping points where none exist? Can policy push the system past the tipping point?

In small groups, social norms can facilitate

See supplemental materials for author affiliations. Email: karine.nyborg@econ.uio.no

42 7 OCTOBER 2016 • VOL 35 #4 ISSUE 6305

to understanding social norm changes (6). Here, we try to integrate these views.

IS THERE A TIPPING POINT?

For vicious and virtuous behavioral cycles to arise, people must be more willing to choose a behavior the more widespread it is. This situation arises when a critical mass of individuals

“...a potentially powerful role of policy is to provide reasons for people to change their expectations.”

30% in a year (14). Pioneers may invent a better (nonconformist) practice or perform new behavior just to deviate from the crowd (anticonformist). If others recognize an individual benefit of this behavior (5), a local cluster of adopters may emerge. The more socially infectious this group is and the more visible and easy to copy the new behavior, the faster and more widely the behavior spreads (14). Role models are critical in this process. The tipping point occurs when sufficient positive social feedback emerges, causing the new behavior to become cool and ultimately normal.

The concept of social disciplines [e.g., psychology (4)] and that cross-disciplinary common social norm as a predictor within a group's understanding of accepted through social interaction (7). We focus on patterns that are widely perceived to do. Social feedback is reinforcing and thus strengthens the behavior.

When norms do change abruptly, developed a thorough tipping points—and the in crossing them—the

information on what others do can affect behavior via direct messaging; metrics, such as fuel-efficiency labels; or other feedback (5, 15). Before the tipping point is reached, however, awareness of others' nonadoption tends to work against change. For example, telling students that a majority of their peers drink more alcohol than they do may increase drinking (15). The potential impact of policy is also observed in negative examples. If not compatible with local social norms, legal and institutional measures may turn virtuous cycles into vicious ones (1).

What benefits for policy and rule making?

exploring how informal rules spread, stabilize, and replace formal ones could help institutional authorities issue rules able to **neutralize**, as necessary, the impact of social norms **or**, in other cases, to **use them as an effectiveness booster**.

5.

Fiddling with norms conflict simulation

Exploring
the clash between formal and informal norms
in the **railway maintenance**

About the scenario

Rail Accident Report

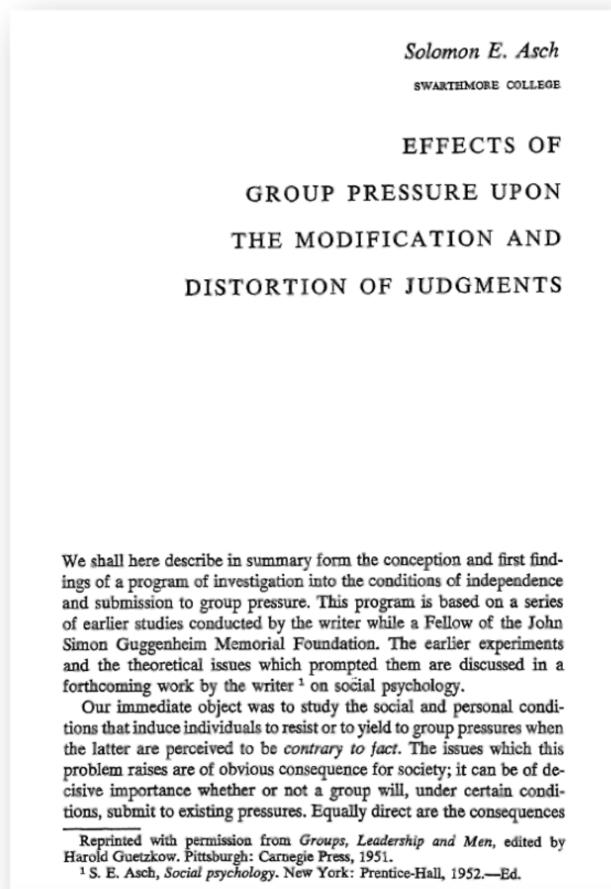


Class investigation into accidents and near misses involving trains and track workers outside possessions

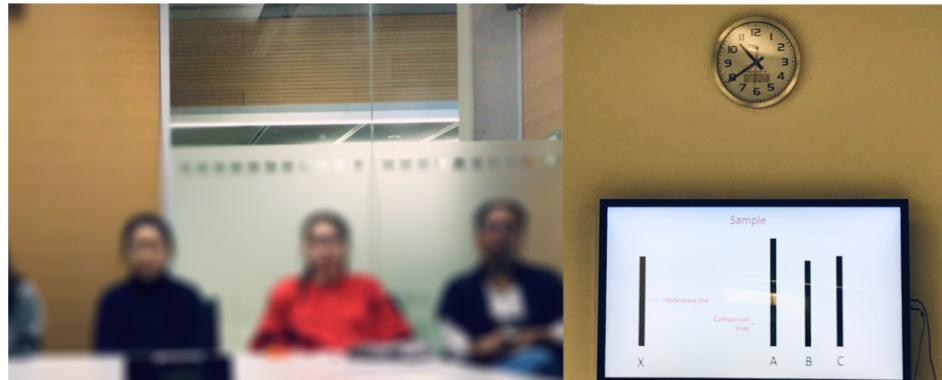
Report 07/2017
April 2017

The *innovation of railway systems* has re-designed **maintenance interventions**, making them increasingly precise, **specialized, and standardized**. However, this has accentuated the **tendency of maintenance technicians to deviate** from operational protocols and to rely on informal unverified rules, increasing the opportunities for hazards or accidents to occur.

Our research integrates behavioural experiments and ABM to explore the phenomenon and, specifically, the role played by **conformism** with regard to maintenance informal norms spread.

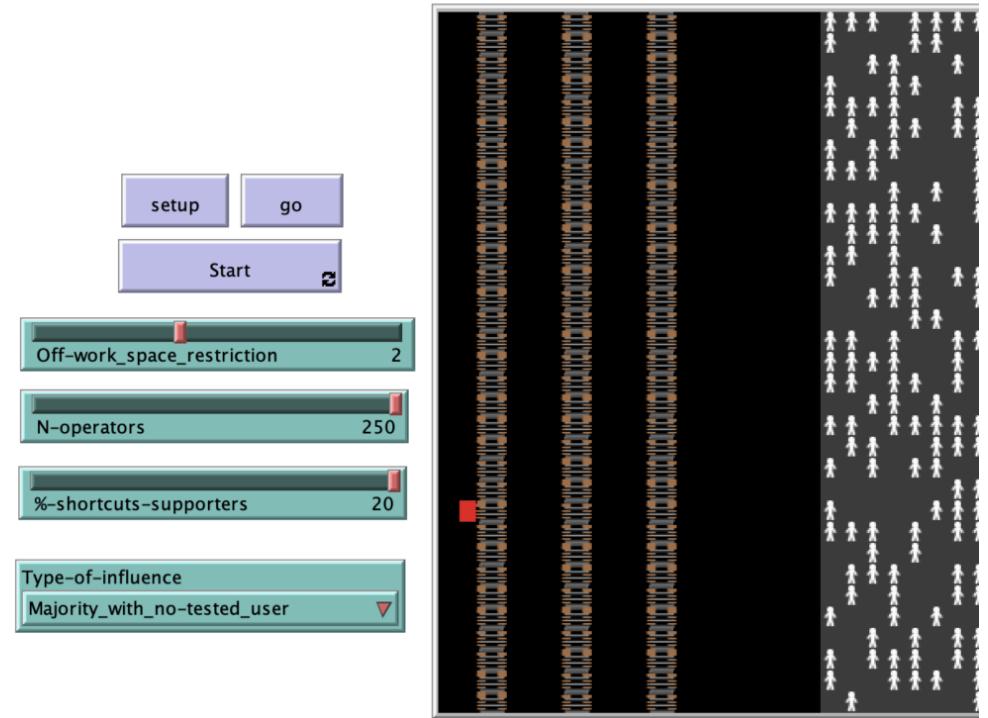


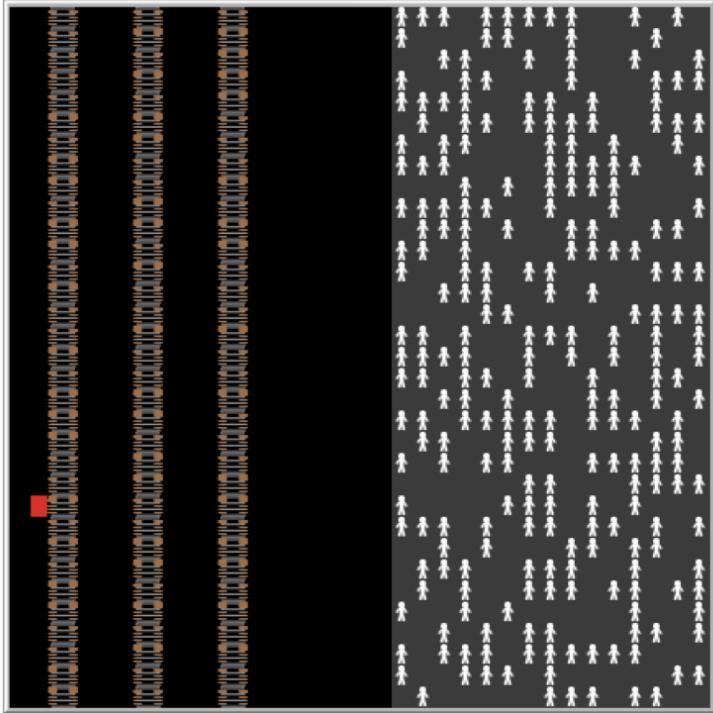
Behavioural experiments, inspired by the Asch model, have been used to understand the impact exerted on **conformism** by two typical conditions of railway maintenance - i.e. time pressure and the habit to share anecdotes about the methods used "to get the job done"



The **agent-based simulation** allowed us to observe how tendencies enlightened by the experiment work in a **collective scenario** (inspired by railway maintenance tasks) where many agents interact with one another led by the same conformist rule.

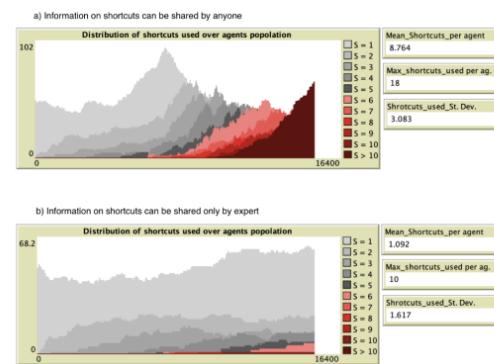
The basic idea was to observe if and **how conformism can impact the spread of informal norms** in the maintenance context, leading staff to share the opinion that such norms work better than formal ones in having the job done.





The simulation, developed using **NetLogo**, involves a population of agents endowed with an equal probability to conform to the majority (based on behavioural experiment) and no specific propensity to use informal norms - except for a few individuals (from 1 to 10 as the user picks).

Each step, a random set of five agents, is called to repair a fault on railway tracks. During the intervention, team members have to decide whether they agree about using informal norms instead of formal ones to solve the problem. If all agree, the group breaches the protocol and uses the informal norm.



We explored the decision-making procedure in combination with alternative information-sharing conditions, able to affect individual preference toward informal norms:

a) any agent can share with their neighborhood stories on informal norms, regardless of experience with using them;

b) agents can share with their neighborhood stories on informal norms only if they have experience with using them;

c) no information-sharing about norms.

6. Final remarks

The experience has raised **issues** and **challenges**...

1

Issues arise on **formal and informal norms clash**, concerning factors affecting social interactions and cognitive mechanisms underlying the emergence of this phenomenon.

It seems worthy to better investigate the impact that **conformism** can exert when *coupled* with **misinformation** (i.e., with the existence of spaces allowing even unreliable information to be shared) on the diffusion of informal norms in contrast with formal prescriptions.

2.

Challenges lie on **the methodological level** and involve the need to nurture interdisciplinary and empirical approaches in the legal field and to acquire a natural "computational mental habit", by becoming familiar with new tools, languages and problem formalization processes.

Law in Turing's Cathedral

Notes on the Algorithmic Turn of the Legal Universe

Nicola Lettieri

TURING'S CATHEDRAL: WONDERS AND PITFALLS OF THE DIGITAL WORLD

We live in an algorithmic world. There is currently no area of our lives that has not been touched by computation, its language and tools. Since when, in the early 1940s, a small group of people led by John von Neumann gathered to turn into reality the vision of a universal computing machine, humankind is experiencing a sort of permanent revolution in which our understanding of the world and our ways of acting on it are steadily transformed by the steps forward we make in processing information. Alan Turing vividly depicts such a condition in one of the founding documents of the quest for artificial intelligence (AI): "in attempting to construct machines . . . we are providing mansions for the souls."¹ Computers and algorithms can be seen as the building blocks of a new, ever-expanding building – a cathedral, to use George Dyson's metaphor² – in which every human activity is going to be shaped by the digital architecture hosting it.

Evidence of this is spread all around us. Algorithms³ are ever more pervasive and responsibilities entrusted to them are increasing as well. Data analytics and machine learning have entered the most diverse fields across industry and research. They are used to make growingly complex decisions that span from selecting investments and making medical diagnoses to detecting crime, and even assigning punishment.

All that glitters is not gold, however: issues arise for a variety of closely linked reasons. One of the most sensitive is undoubtedly the growing complexity of computational tools. The poor understanding we have of the mechanisms that operate within them makes it often difficult to grasp all the consequences of their use.⁴ Algorithms frequently reshape processes in which they are involved in ways that are nearly invisible to their own creators.

¹ A. Turing, Computing Machinery and Intelligence (1950) 99 *Mind* 433.

² See G. Dyson, *Turing's Cathedral: The Origins of the Digital Universe* (Pantheon, 2012).

³ The term used here to point out not only informed information processing, including symbolic and logical reasoning or pattern recognition, but also, in general, algorithmic (computational, quantitative, formal) approaches. In this sense, see P. Michelucci (ed.), *Handbook of Human Computation* (Springer, 2013), Vol. 2.

⁴ Algorithms are vulnerable to a series of risks raising serious questions about the value of the findings and their

"Law must always keep searching for new ways to use algorithms and computation to better understand itself and also to more effectively carry out its ordering function. As a matter of fact, such a goal cannot be fully achieved without ever **more enhanced forms of ratiocination**, they must be achieved through an always deeper understanding of the real world of which law is a part and with which legal systems interact.

[...]

It is something in which lawyers must play an active role, fully accepting the challenge of **learning new languages**, and **adopting new categories** and **perspectives**.

We need to make **computation**
a vehicle for **knowledge**, *not confusion.*

Thank you!