

# Considering e-CODEX

*On Agent-Based Modeling for Normative Debates*

Aernout Schmidt

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ON AGENT-BASED MODELING FOR NORMATIVE DEBATES

# CONSIDERING e-CODEX

*Aernout Schmidt*



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## Preface

This document provides the background material of a MOOC that shows experts (*e.g.*, from science, economics, law and the social sciences) how to blend their various specialist opinions on the designs of complex public ICT services into coherent action plans. Normative debates are instrumental in bringing such plans about.

The MOOC is an academic effort for the e-CODEX Consortium and introduces how agent-based modeling (or: tinkering with toy software societies that behave in accordance with the modeler's theories) helps to identify and anchor the different interests at stake. These relate to the footprints of cultural values (*e.g.*, identity, security, wealth, truth) in the normative debate. I will use KEI and e-CODEX as use cases (these are functionally similar interoperability services for professional communication by judicial professionals — one is considered a failure and the other one a success).

An important requirement for blending specialist results is that facts and reasonings are accessible to all. Consequently I will not use technical language in the main text. This approach implies that choices are made to keep the work practicable. All technical and scholarly reasonings are transferred to (and made available in) the endnotes.

The MOOC is a deliverable in a European Large Scale Pilot project (e-CODEX) and assigned by the Dutch Ministry of Justice and Security. During the work on the MOOC I have developed some software. It runs under NetLogo, is open source and available on my GitHub site at <https://github.com/dotlegal/Epiframer>.

Oegstgeest, 24 March 2019, A.S.



# Chapter 1

## Intro

*The introductory Chapter sketches how and why the book came about and introduces a few key concepts. Its closure is the Management Summary*

### A Bit of History

A year and three months after our initial meeting at the Law & Complexity Satellite of the Conference on Complex Adaptive Systems in September 2016 in Amsterdam, Ernst Steigenga<sup>1</sup> charged me with making, as a scientific effort, a MOOC on the complexity of the e-CODEX project and on the reasons that secured its success. I accepted the commission because the design of IT-services for the judiciary has been interesting to me for decennia. Especially because they consistently maintain a remarkable high failure ratio while the technology employed is seldom new or sophisticated.

I have been a professional programmer at various academic institutions from 1969 until 1985<sup>2</sup> before turning to an academic career in law and computer science.<sup>3</sup> My first guess at why governmental IT is so unsuccessful focused on sloppy requirements engineering and –specification. This is a correct diagnosis, but not the whole story. My second guess considered the extreme forms of labour division that accompanied IT services becoming ubiquitous. This in due course caused crippling knowledge asymmetries to flourish between principals of governmental IT-projects and their IT-expert contractors. This

also is correct, but not the whole story either.

By 2012, a Chinese Ph.D. student<sup>4</sup> began discussing complexity theory with me — complexity that results from networks formed by IT services. Such services create communities of users that communicate — communities of interconnected users that provide, consume and process messages. Such communities are complex adaptive social systems.<sup>5</sup> The notions of complexity and networks ignited an epiphany and a third guess emerged: public IT services in action create complex social systems that are difficult to understand and predict, which could explain at least some of the failures mentioned earlier.

In the beginning of 2018 I knew enough about complexity theory to accept Ernst's commission as a challenge. I began to build a trailer and a series of clips for the MOOC. These discuss what e-CODEX is and address the approaches to requirements engineering that I consider useful for validating plans about public IT services. They also explain how agent-based models can simulate the behaviors of the complex systems that the users of e-CODEX create. At that stage, in April 2018, the Dutch KEI project failed and had to live through a reset. My ambition turned to realize both an example toy e-CODEX and an example toy KEI system to analyze the differences. (I used NetLogo as a platform.)<sup>6</sup>

## The Goals of the Effort

Although tinkering with toy versions of KEI and e-CODEX can be entertaining, I do not suggest to invest time in agent-based models for the fun of it. I have a much more ambitious aim: access to a tool that

- helps ***ex ante* verification** of how an artificial proxy of a user-based complex adaptive system will react to planned adaptations of the service that sustains it, and that
- helps to gain **improved understanding** of the risks involved when these adaptations are applied in the real

world

and, because during the project this uncovered itself as an important question for the e-CODEX consortium and I consider it a useful use case, a tool that

- helps to understand **why the user volumes of e-CODEX lag behind expectations**

and, finally,

- a framework that the MOOC (and this book) can **inform an academic audience** about, also as a guide for replication purposes when required.

In April 2018 I began with designing the framework (I called it *Epiframer*) that can stage different models of public IT services for verification runs — and ran head-on into trouble.

## Some Core Concepts

In the effort to make *Epiframer* a framework for staging several different models of public IT services I found that the reduction of baffling amounts of potential parameters<sup>7</sup> was in order and posed a serious problem. It is well known that parameter selection in research situations equals the specification of assumptions that will influence the model's behaviors and that such is often done implicitly. From a scientific perspective the issue is important and cannot be avoided.<sup>8</sup> Being explicit about assumptions is the best we can do, claims De Marchi (2005), who further suggests to combine results gained by empirical, mathematical, computational and qualitative methods as a useful approach in the social sciences.

My problem was not only how to be explicit about my assumptions, but also how to select relevant parameters at all. I decided to adopt five theories for guidance: (i) my own conception of institutional fate, (ii) Mary Douglas' conception of normative debates, (iii) John Holland's ECHO (with its two-tier approach to modeling complex adaptive systems for understanding them), (iv) Mary Douglas' neo-Durkheimian classification of cultures into four cultural styles (further: nDT) and

(v) Scott de Marchi's conception of a methodological commons in the social sciences.

Below I introduce them summarily to gain access to the building blocks that allow me to compile the whole thing later on.

### One: Institutional Fate

Institutions are weird. We recognize them in collections of connected agents that, as a collection, have agency themselves. Like the EU has agency and its member states have agency and their governments, parliaments, executives and judiciaries have agency, just like even small enterprises, cooperations and foundations have. These examples have in common that their agency is recognized in most legal systems.

Generally such agency is looked at through the filter of as-if.<sup>9</sup> But a less artificial approach has been adopted too, based on the observation that the formation of institutions, their dynamics and the behaviors of their constituents show interesting regularities.<sup>10</sup> Scholars from wildly diverging disciplines (like legal theory, economics, anthropology and complexity theory) who adopt this approach generally accept that, in order to gain individual agency, it seems a social institution's fate to gather a constituency, gain identity, sovereignty over a domain, some shared beliefs, one or more functions, some rules (or laws), some policies (or habits) and some norms (or moralities). And that their constituents tend to divide in elites, work forces and publics and adopt communication channels (networks and languages). Somehow such are the main 'natural' characteristics of established social institutions, while loss of such characteristics indicate institutional trouble.

Thus one of my assumptions is that the complex adaptive social systems that emerge with the use of public IT services are institutions. Another one is that the fate of social institutions is partly natural and partly the subject of ongoing normative debates.

## Two: Normative Debates

Normative debates resemble political debates but are not identical. In the context of agent-based simulation it is a practical (empirical) mechanism, not a philosophical fling. ‘Normative’ does not equal ‘political.’ The normative debate sports respect for the whole institution it serves and for various knowledge types concurrently, and evades (or attempts to ignore) social pressures when working towards its results. The political debate sports local-interest based rhetorics that, when considered effective, will freely wield fact-free Big Stories. Douglas (1992) coined the normative debate as important. She values it for the community (institution) concerned and for its odds to survive

She saw a risk in conflating the economic debate with the normative debate:

“Behind it [the economic debate] lies the community engaged in its normative debate and the laws, conventions, and social values to which the normative debate gives rise.” (p. 127)

The normative debate is an informal thing that nurses coherence to remain between a dynamic community’s ethos and its formal regulation. Douglas stipulates that the economic debate is an organic part of normative debates, but not the only one. The law and the moral values and the communication infrastructures that are nursed in a community are organic parts too.

It is my contention that normative debates rest on what is considered to be *true*, but lead to what is considered *right*. They contribute to any form of institutional decision making, be it legislative (e.g., in parliaments), scientific (e.g., with peer review), economic (e.g., yes/no rush the bank) or social (e.g., by joining/leaving/fighting/supporting a community’s mission) and that in such debates the dynamics in four different values (solidarity, order, wealth, independence) are concurrently evaluated. I follow Douglas in her conviction that this inclusive normative debate is essential for a community’s fitness. I

will require that four disciplinary methods and four different values (“currencies”) are combined in academic normative debates on agent-based models of complex adaptive social systems.<sup>11</sup> And I will allow that both individual and institutional agents take part in several, diverse normative debates and thus have to take these institutions’ cultures (or thought styles) seriously. (Although this may sound rather complex — and it is, that is why we need computational tools and all these explanatory materials — this approach to normative debates nevertheless allows to reduce the size of the modeler’s parameter space enormously).

It is — in the face of overambitious expectations on artificial intelligence that are floating around (Kurzweil comes to mind) — useful to mention that the tool that we will be using (*Epiframer*) does support decision making by responsible agents in normative debates by informing them on certain aspects. There is no way that it can make such decisions by itself, unless we adapt our socio-religious-political arrangements to allow it to do so. This is not an option easily acceptable to a legal theorist.

### Three: ECHO and Its Two-Tier Approach

ECHO is a conceptual framework for designing agent-based models that serve to investigate complex adaptive systems like e-CODEX is. John Holland, who was a founding father of genetic programming, squarely faced the difficulties involved in researching complex adaptive systems and invented — at least conceptually — an agent-based model to do so and named it ECHO. I mention a few of its assumptions:

- The toy world is populated by agents of diverse types (distinguished with *tags* and *conditionals*).
- In the machinery of any toy world agents *spend* resources in transactions with other agents that *provide* resources.
- Agent behavior is sensitive to *if ... then ...* rules that can trigger other *if ... then ...* rules in other agents.

- Spending and acquiring resources are explicitly modeled for agent types in situated transactions.

Although ECHO seems to never have gained a broad following in applications, I have adopted its assumptions explicitly as constraints for designing with *Epiframe*.

Some of the intricacies in modeling complex adaptive systems are related to the assumption that agent behaviors are situated in environments (like jurisdictions) that, in turn, are agents themselves, be it of a different order and living in environments of different orders (like, for a member state, the EU, NATO and UN).<sup>12</sup> Holland suggests to at least consider two of these levels (better: orders) and suggests to name them tier1 and tier2 respectively — again an enormous reduction of modeling options.

#### Four: nDT (neo-Durkheimian Theory)

When we accept cultural influences to have forces that work on behavioral choices, we again need to find manners to reduce the amount of modeling options. In 1893 Durkheim was looking for a scientific basis for sociology as a new discipline, thinking in terms of social facts and corporations with characteristics that influence individual behavioral choices. He focused on specific organizational forms and the moralities (solidarities) that serve to guide their constituents towards holding the organization together (or revolt). He distinguished two solidarities: one he labeled *mechanic* (physically mediated) and one he labeled *organic* (culturally mediated). Mechanic solidarity leads to egalitarian organizational forms; organic solidarity tallies with the (often hierachal) functional diversities and interdependencies that come with the division of labor. Thus, Durkheim's mechanic and organic solidarities relate to his historic interpretation of how (*i*) *collectives* (enclaves) transformed the world into supporting the emergence of (*ii*) *hierarchies* (jurisdictions) and how these, in turn, transformed the world into supporting the waxing and waning organizational forms of (*iii*) *markets* (populated by enterprises etc.). For modeling purposes we fur-

ther turn to how Douglas adapted Durkheim's analysis into what is now known as *group × grid* analysis, identifying four quadrants of which three tally with Durkheim's three forms as just mentioned. Durkheim submitted that the different organizational forms are seldomly pure — better not, even. They tend to pervert when getting too close to their pure states. For instance, enclaves may turn into hail states, hierarchies into police states and successful enterprises into power-abusing monopolies. I take this as another reason for adopting a cost-benefit reasoning approach in normative debates that evaluates four currencies concurrently.

## Five: A Methodological Commons?

De Marchi (2005) discusses three different modeling approaches in the social sciences: empirical, mathematical (also named: formal or game-theory) and computational. All three are subject to some form of what I call the endemic parameter-selection risk. His suggestion is that the combination of methods and approaches may help, especially when out-of sample material is used for testing. I will follow his lead here. But there is more. The three methods mentioned are rather recent to the social sciences. In 1969, when I first came eye to eye with them, a fourth method was still popular, yet coming under siege. Lets call it qualitative and acknowledge it to be quite acceptable to legal scholarship. As de Marchi illustrates, the three empirical modeling methods emerged as a reaction to the deficiencies of qualitative methods, which can, ironically, be expressed in terms of assumption picking too.

So agent-based modeling is one of a quartet. It can do what statistics and game theory can not: show *ex ante* how a complex adaptive *computational* system, as a proxy for a complex adaptive *social* system, will react to internal and external adaptations. In turn, statistical learning based on empirical observations can do what computational and mathematical modeling can not: establish (*ex post*) what the (for instance initial or final) empirical state of a system is. We can use it to cali-

brate/falsify applied agent-based and/or mathematical models. And, again in turn, mathematical modeling like game theory can do what computational and statistical models can not: create consistent mathematical systems that can *ex ante* advise on what strategic choices are optimal within the set of predefined states, strategies and payoff values. And finally, qualitative modeling can do *on the fly* what computational, empirical and mathematical modeling cannot: combine *their* results in sense-making theories.

This is what the normative debate aims to do when considering the vitality of a complex adaptive social system. In summary, all four methods have to negotiate the endemic parameter-selection risk, but do so in different manners and incompletely. My additional assumption is that normative debates on institutional fates can and ought be open to the four methods *concurrently* and treat them as *complementary*.

## Back to the Future

So in nDT, social systems (institutions) can be usefully distinguished along two axes into four quadrants with incompatible organizational forms and incompatible organizational solidarities (or moralities). I adopt all this and assume that part of these forms and solidarities are, for agents, hereditary in a physical sense (and modeled with tags), and part of them are transferable by culture (and modeled with conditionals). These are the elements of the anthropological instrumentation that I will use in the framework. Douglas's distinction in quadrants has influence on what values are considered in *Epiframer*:

- Our artificial society has a very limited sets of tags and conditionals. These can urge an agent to select strategies for maximizing a limited set of values: *group identity, security, wealth* and/or *independence*.
- We all tend to be member of communities **and** to be subject in a jurisdiction **and** to be operating on markets **and**

to be (at least in thought) free, creative and connected autonomous individuals. So are agents that are modeled with *Epiframer*.

- In artificial societies that are modeled in our *Epiframer* framework, behavioral choices always relate to a foursome of resource values concurrently. With any behavioral choice I thus assume that an agent in our artificial society takes into account what foursome of gains and/or losses are involved – qua group identity, security, wealth **and** independence.

These considerations show how I adopted important assumptions from nDT and made them operational in *Epiframer*.

In the middle of 2018, I was back on track and happily working away on *Epiframer*, and by September I was ready to discuss its application to the KEI-project disaster at the Conference on Complex Systems in Thessaloniki. When digesting the reactions I decided to adapt the setup of the MOOC and to focus on providing background material in a book (this book) and to add to the existing clips an epilogue episode that summarizes the results.

## The MOOC and its Condition

The MOOC project started in January 2018. Like most investigations into governmental IT projects I began with studying the technology. In April a set of videos was completed on e-CODEX’s architecture, mechanisms and methods. Agent-based modeling became my instrument of choice to investigate e-CODEX because I frame e-CODEX as an adaptive, networked complex of users, service providers and member-state jurisdictions. So in April I was ready to turn to the issues that governance of complexes like e-CODEX evoke. At that very moment something odd happened.

The Dutch judiciary had been working on the huge, ambitious and complex KEI project to transform its operations in one sweep — from a paper-based legal practice into a digitized

one. The sweep was planned for May 2018. In April the project was withdrawn for a ‘reset.’ The withdrawal was interpreted by the general public as yet another disaster with an over-ambitious and complex governmental IT project. Subsequent commentaries showed that, within the judiciary, factions pro and factions con had formed and that these had been drifting apart unchecked, hardening their opinions towards concealed shouting matches between deaf contestants.

The first thing that I thought when I heard about the KEI disaster was, naturally, that it provided an interesting use case for calibrating whatever knowledge the MOOC could and would bring to bear. By June 2018 I was ready to build an agent-based model to investigate how the KEI project could have happened. Actually building the model for investigating a complex IT-related situation would deliver a proof of concept for the MOOC. It did — which led to peer-reviewed contributions to an international conference in Thessaloniki (September 2018) and a political-science oriented journal in January 2019.<sup>13</sup>

On reflection, I have misgivings of a practical nature. The MOOC provides access to knowledge and thought styles that are essential for handling complex, IT-related public services well. But the same material is too intensive for my intended audience: the civil servants that are responsible for such services. This preferred target audience may not have the time nor the ambition to jump the hurdles that I had to construct in order to scientifically ground the videos and the first five Chapters of the book. For this audience I provide the next Section, which is plain, short, in natural language and without references.

## Management Summary

My modeling efforts have taught me that the e-CODEX project can usefully be linked to three unfolding stages: young e-CODEX (while the service machinery is being designed and built), adolescent e-CODEX (while the machinery is there, but organiza-

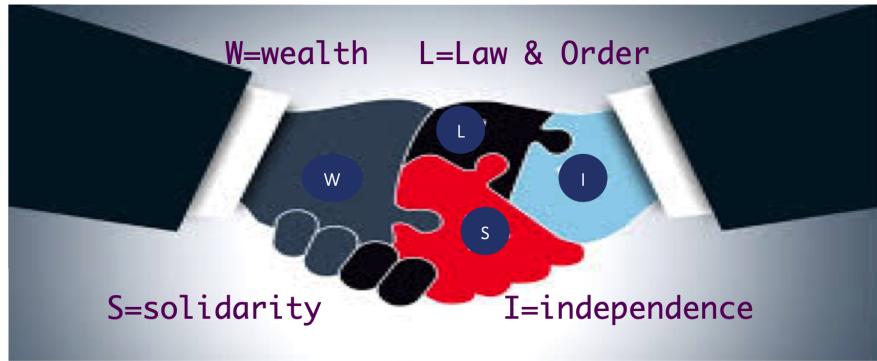
tional embedding is not yet established) and mature e-CODEX (when organizational embedding is established, policies are decided upon and a self supporting business model is implemented).

Like biological phenotypes do need their DNA and the environment to unfold into actual beings, *young e-CODEX* does need a blueprint with an implementation crew to unfold into an actual service. This stage has been successfully realized between 2010 and 2016. It has benefitted from a focus on available technology and from fine management of- and cooperation between working-package implementation teams. Young e-CODEX could only succeed because of the uncommon coherent and cooperative attitudes and behaviors of team members allocated per member state to different working packages.

*Adolescence* is the stage between youth and maturity. Here the adolescent rambles around to find the niche where it can settle. This is where e-CODEX is at the moment of writing and this is where I came in with my modeling. (I actually produced a working agent-based model which I will discuss later.) e-CODEX was at the time working towards an identity within the European Union. It still is. It is looking for an organizational anchor — to offer a stable service repertoire to stable user communities under stable business conditions. I consider these four functions (organization, service repertoire, user communities and business conditions) indicative for e-CODEX's path towards maturity.

So there I was, at the very spot where my results could be useful. What did the agent-based oracle I created tell? How did it handle the endless diversities to be modeled?

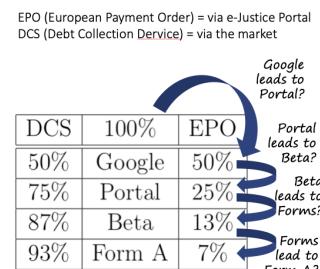
Agent-based modeling implies generalization. I generalize with four prototypes — adding three to the obligatory *homo economicus*: the community man, the civil servant and the user/consumer. They prefer different values: the community man craves for solidarity the civil servant for law and order, the homo economicus for wealth and the consumer for independence. They look for them in different organizational structures: communities, hierarchies, markets, networks.



Like the agents in my model, we all have multiple roles concurrently: part community man, part civil servant, part entrepreneur and part consumer – never only one. But we tend to pick one to identify ourselves with. In my model, in each and every transaction by each and every agent four values are concurrently transferred and recorded. And the social fabric of institutions must accommodate all four roles concurrently in its constituency, when they are aiming for a wide support.

e-CODEX is an institution with users, service providers and member-state judiciaries as its constituent agents. All of these have life cycles with three stages: youth, adolescence and maturity. Adolescence is the time for experimentation and rambling around to find the niche where to settle. This is the stage where e-CODEX is in since 2016, as it then emerged from its infancy with the successful deliverance of the interoperability platform.

Back to the main question — what did the agent-based oracle I created predict? Let me show what an SME-based first-time user may experience while collecting a trans-member-state debt with e-CODEX's EPO (European Payment Order) service.



Creditors can activate e-CODEX's EPO via the e-Justice Portal. The alternative is a professional debt collecting service (DCS). So the EPO/DCS ration is indicative of e-CODEX's market share.

**Step 1:** Google. DCSs galore. 50% doesn't find the Portal.

**Step 2.** Half of those that arrived at the Portal select the beta version. Rest drops out.

**Step 3.** Again half drop out at seeing the number of forms shown.

**Step 4.** And again half drop out on finding out that forms must be filled in in the language of the judiciary to be addressed.

My simple simulation run leads to the suggestion that the size of the e-CODEX EPO user community is in the order of 7% of its potential size.

Is this a Farce? Does this lead us into the new wildernesses that are populated by fake news and fake science? Not necessarily so. A simulation run does not breed facts. It breeds hypotheses that can be falsified in principle.

Are there relevant observations? Statistics are available on the EPO practice in Germany on incoming requests during 2018. They show the actual percentage to be a stunning 6.6%.

We have a result. Simulation helps find causal interpretations. The simulated quality-assessments of the EPO service could not be falsified and are sufficiently low to account for the causes of all of e-CODEX's problems that I was asked to investigate.

Information services like the e-Justice Portal tend to fail unless they succeed in providing intoxicating quality and ease of access, and added value to all four types of constituent agents -- like Wikipedia does, for instance. The e-Justice Portal does not, and EPO access to e-CODEX is through the e-Justice Portal.

Another result may be that a simple simulation can help to show agents with civil-servant mentalities what the problems are in the presumably dominant user mentalities of the EPO target audience (SMEs).

We can reason even further with these results. When I attempted to design a simulation model of e-CODEX's operations in its adolescent stage I found endemic risks that tend to gain weight with time.

1. e-CODEX's reputation co-depends on various front-end services it does not have influence on (like the e-Justice Portal) and

2. I find hierarchy nor licensing authority in the e-CODEX organization.

Having no hierarchical structure at all is a risk when deals have to be struck – (e.g. for opening up windows of opportunity or for handling reputation-damage issues on base-line quality of services, to be licensed to use e-CODEX.) Qua governance, the preparation of a hierarchical structure with a well-identified mandate (and effective procedures for nursing it) is overdue.

For promoting organizational maturity further a few policy/licensing decisions are in order:

- one concerns the distinction between infrastructural services and application services and what this means for e-CODEX's scope for action – and
- one concerns the attitudes to be struck on issues of access and public-private cooperation – e.g., on how to handle implementation of clearing-house functionalities and the like.

This concludes my summary of the condition of the MOOC on e-CODEX. Its deliverables are threefold:

**1. The videoclips.** At the moment of reporting (February 2019) we have 17 video clips. Their content is focused on techniques for requirements engineering of complex public IT-based services while taking into account their characteristics of complex adaptive systems. The video materials are:

- Episode 0 — Trailer to the MOOC on e-CODEX 7'45"
- Episode 1.1 — Technical Perspective (TP): Intro 5'32"
- Episode 1.2 — TP: e-CODEX as Mainstream IT 7'47"
- Episode 1.3 — TP: Framing Tools for Requirements Engineering 5'41"
- Episode 1.4 — TP: From Dream to Proposal 4'46"
- Episode 1.5 — TP: Working Packages and Building Blocks 7'16"
- Episode 1.6 — TP: High-level Communication between WPs 8'25"
- Episode 1.7 — TP: Putting It All Together 14'08"
- Episode 1.8 — TP: Discussion 8'39"
- Episode 2.1 — Complexity-theory Perspective (CP): Intro 11'57"

Episode 2.2 — CP: Agents and Patterns of interaction 8'38"  
Episode 2.3 — CP: Diversity: Roles and Rules 9'31"  
Episode 2.4 — CP: ECHO-ing 7'48"  
Episode 2.5 — CP: Looking for Parameters 10'33"  
Episode 2.6 — CP: Consultation 9'55"  
Episode 2.7 — CP: A Building-block approach 9'58  
Episode 17 — Epilogue 9'36"

They total 2 hours, 27 minutes and 55 seconds. They are not expected to be very useful without classroom/teacher support.

**2. The simulation platform *Epiframer*.** At the moment of reporting (March 2019) we have two models (KEI and e-CODEX) in two instances of *Epiframer* available in NetLogo source code. The two models can be used by anyone. Epiframer is not yet fit to be adapted for new models without some support of its author.

**3. The (this) book.** At the moment of reporting (March 2019) we have this book available as background material. I will keep the deliverables available in a repository at <https://github.com/dotlegal> (in updated form when opportune).

## Chapter 2

# e-CODEX and its Condition

*The second Chapter introduces e-CODEX as a complex adaptive system with three evolutionary stadia: young e-CODEX for building the service machinery, mature e-CODEX for an established operational public service and adolescent e-CODEX in between. Currently, e-CODEX is in its adolescence.*

## e-CODEX as an Institution

As mentioned, e-CODEX is not only an institution, but also a complex adaptive social system. As an institution, e-CODEX is at risk when it loses one or more of its institutional characteristics. The amounts and frequencies of use is such a characteristic. For us the concept of an institution is important because it helps to frame agents as belonging to institutional types and because it helps to discuss institutional viability. In our current discourse we will encounter the EC, e-CODEX and the e-CODEX consortium as institutions. We will also use legislative, executive and judicial agencies as institutional types, just as enterprises, cooperations, foundations and civilians. Institutions are also important for us because they influence the behaviors of their constituents, just like the behaviors of their constituents influence the institutions. These top-down and bottom-up influences are important indicators for an institution's condition.

## The Birth of e-CODEX

In 2010, the EU had 28 member states with 28 jurisdictions and 24 official languages, and it sported a single market with four freedoms: to move goods, capital, services, and labour. When top-down and bottom-up influencing are important for the EU's condition it is reasonable to consider quality of and access to a digital communication infrastructure of the essence.<sup>14</sup> In 2007 the EC began working at a web portal on legal matters for the EU citizen. The e-Justice Portal was launched in 2010 with rather high expectations. In the same year the EC launched a call for large-scale pilots on infrastructural digital communication services between professional judicial officers. The e-CODEX project was conceived by a consortium of nine different member states that were willing to invest. e-CODEX became an institution when the proposal was rewarded. At that moment, e-CODEX was born. Thereafter I feel free to say things like "e-CODEX did this, opposed that, liked such and decided to join in ... etc." This illustrates how institutions will be characters in our story.

## An Ecosystem to Fit Into

Young e-CODEX started out ... like the grub that prepares a chamber for the winged thing it never has seen but is to be.<sup>15</sup>

Its first leg was half paid for by EC and half by the nine main beneficiary member states and aimed to prepare an infrastructural service. Its second leg (adolescent e-CODEX) was funded in a similar manner and aimed to fit the service instrument now available into the communication ecosystem for laymen and professionals in EU judiciaries as it existed (or was growing into existence).

In the first leg, young e-CODEX is a networked development team of working-package realization groups. In the second leg, adolescent e-CODEX is a networked service for EU judiciaries, institutionally connecting its governance, maintenance, deployment and users to the operational communication ecosystem for cross member-state judiciary communication.

## e-CODEX as a Service

Figure 1 shows the architecture of the e-CODEX interoperability layer as designed and built by young e-CODEX. It shows single national points of access (SPAs), which connect through e-CODEX gateways. Architecturally speaking, the e-CODEX service offers gateway-mediated cross legal system communication. (Gateways translate what is on/in a message's envelope into e-Delivery Platform language and back again).

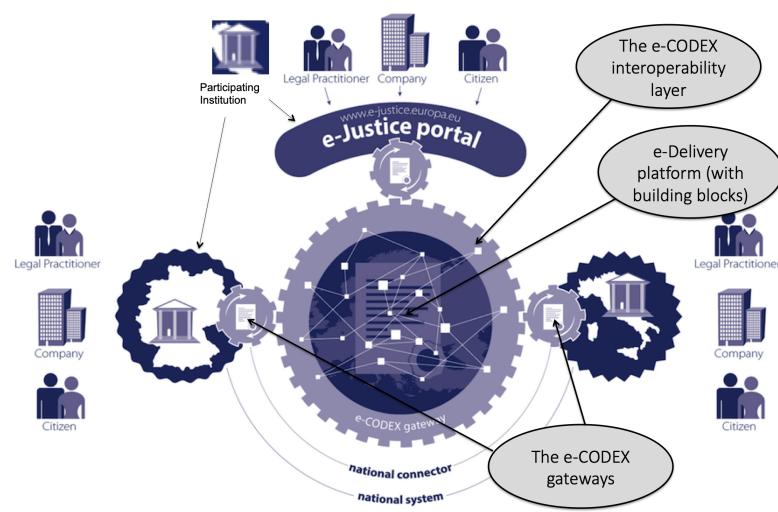


Figure 1: Interoperability layer architecture

In leg one of its existence, e-CODEX is a project team, designing and building an interoperability layer, not only for cross member state communication between legal professionals and, in special cases, for cross member state communication between citizens (and other private institutions) and legal professionals. Thus young e-CODEX consists of a network of diverse agents that together create and aim to create functions. What are these?

### Young e-CODEX's Functions

Young e-CODEX aims to create functions that will give mature e-CODEX reasonable odds to survive. The main idea is that these functions will help mature e-CODEX to contribute

positively to the EU inter-judiciary communication ecosystem's usefulness and use.

In this context I suggest to look at four basic functions that have been instrumental to the evolution of the web (standards that connect all types of users for all types of uses, from chat to e-commerce, from browsing the web to search it, from automated translations to geographical filtering) and adopt their functionalities to be basic options that e-CODEX can support and maintain. These are ping, e-mail, e-form and app functionalities made useful to the legal professionals (judges, lawyers, prosecutioners, paralegals, plaintiffs, defendants etc.) in their situated contexts (litigation, prosecution, execution, contract formation, enforcement, etc.).

The pitfalls are well known: different official languages, different legal systems, different material legal rules on legitimate communication instruments for communications within and between the judiciaries, different internal organizational forms of judiciaries (for instance concerning the separation of powers) and, last but not least, different levels of sensitivity to where the limits between cross-national cooperation and federalization are to be located and maintained. Young e-CODEX had to make architectural choices that would optimally support mature e-CODEX to gain and keep user support and governmental blessing.

One important architectural choice was to assume that member states would organize single points, responsible for member-state internal pre- and post processing of between member-state communications. These are the single-points-of-access (SPA) functions that e-CODEX expects to be there when it has reached maturity. The SPA function is essential for continuity, especially when things change in member states internally.

Another important architectural choice results form the assumption that cross member state judiciary communication can be standardized up to a level that warrants the creation and maintenance of gateway functions that provide some material interconnectivity between judiciaries - for instance by providing translations between the ways that the European Payment Or-

der (further EPO) are handled in different member states. The e-CODEX gateway functions aim to remove obstacles against access to cross member state justice for civilians and SMEs. This is, of course, easier said than done. Translations can become outdated any moment. And how the market for legal professionals (especially for the upcoming sector of paralegals and ‘smart’ legal services) will respond to what might be interpreted as competition by public institutions is uncertain.

Finally, an important architectural choice has been on governance by a consortium that represents participating and funding member states or member-state institutions. This prepared young e-CODEX to realize that cross member-state judicial communication may need transnational agreements, like what has become known as the Circle of Trust - for creating legal legitimacy where existing legal arrangements did not suffice for the other functions offered by young e-CODEX. Governance practices that work for young e-CODEX may be useful for mature e-CODEX, but may also turn into obstacles.

I have identified three functions that are created by young e-CODEX’s agents: on SPAs, standardization (gateways), and governance. Let us now look at the agents that perform them.

## Young e-CODEX’s Agents

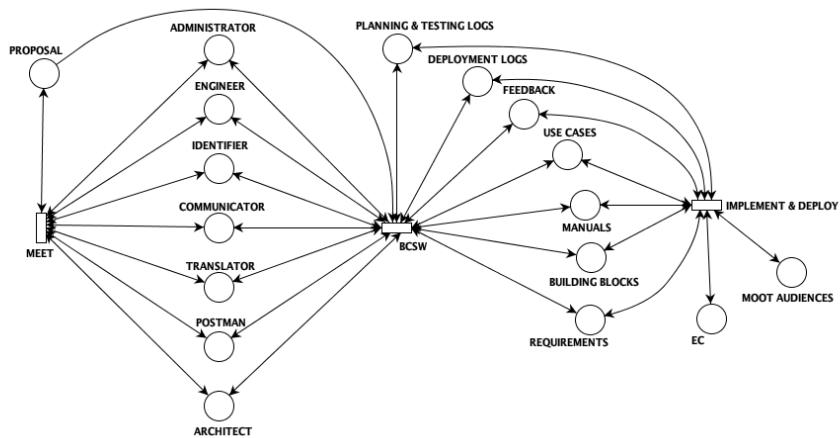


Figure 2: The Young e-CODEX Communication Network

Young e-CODEX personifies a network of agents that work to realize the Large-Scale Pilot proposal that was accepted and

that created e-CODEX's agency in 2010. Who are its agents? The proposal has seven working packages. The working packages were adopted by (and allocated to) representatives of co-funding member-state governments that formed the e-CODEX consortium. I adopt a link with the vernacular and link working packages with member-state evoking nicknames that refer to their main tasks. Germany becomes Ludwig Administrator; Romania: Sergiu Communicator; France: Claude Implementer; Estonia: Arvo Identifier; Austria: Wolfgang Postman; The Netherlands: Reinbert Translator and Italy: Giovanni Architect.

These are young e-CODEX's constituent agents. They form a network around three communication functions: informal internal communication (meet), formal internal communication (logs and versions [BSCW] and informal external communication to generate feedback (named implement & deploy). The last function creates a link between young e-CODEX and the external world. Out there two agents are important enough to deserve special status, as long-term relations: EC as project funder and principal, and selected partners as mock audiences (emulating mature e-CODEX audiences) to provide feedback on and agreements for the service functions that young e-CODEX is working on.

In summary, young e-CODEX has working-package related functional agents and two long-term external relations with the project funder and principal and with mock audiences for testing.

## Communication-Patterns and Risks

Young e-CODEX aims to provide an infrastructural service for digital communication with and between judicial officers. This means that there are risks to domesticate. Two of these are unavoidable when using intermediary services: the risks of unwanted information extraction to and of unwanted information infusion by outsiders (see also Figure 3 with the most simple pattern of mediated communication).

These risks have to be faced by participants and need to be domesticated in requirements that are agreed upon. The Circle of Trust created by young e-CODEX is an example. The risk to young e-CODEX is that such agreements cannot be concluded.

Another risk is in the combination of semantic ambitions and national legal systems adapting. This risk is identical to the risk related to standardization as mentioned earlier.

Another risk is in the selection of semantically rather specific communication patterns to serve. The risk lies in excluding access to the service that does not fit in the pattern supported. Like when a focus on the European Payment Order (and communication patterns for similarly standardized procedures) would exclude access to solicitors who in completely different cases feel a demand to use e-CODEX for quality cross-border professional communication.

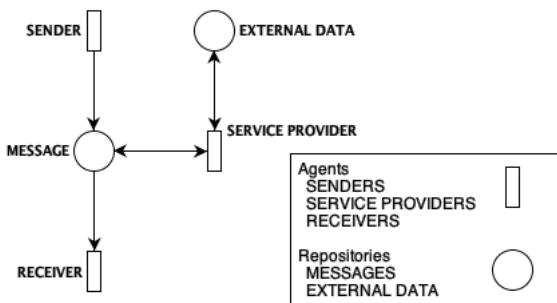


Figure 3: Basic mediated-communication pattern

I mentioned three communication patterns (for mediated communication, for semantic ambitious servicing and for dedicated standardized procedures) and the related risks (concluding circle-of-trust like agreements, national legal system volatility and excluding access) they carry with them. How these risks will be faced is partly dependent on young e-CODEX's environment.

## Young e-CODEX's Environment

Young e-CODEX's environment can be looked at through different filters. One is *jurisdictional* and considers relationships

with member state legislator, executive and judicial agencies. Another one is *economic* and considers relationships with the common market and project-funding authorities. Yet another one is *relational* and considers which sibling projects and services can be of use to e-CODEX (and *vice versa*) to form coalitions with. Beside e-CODEX and e-Justice I mention the following projects in this category (with their catch phrases): e-SENS (moving services forward), EPSOS (making healthcare better), PEPPOL (making procurement better), SPOCS (making business easier) and STORK (secure identities across borders). It is clear that these projects could be of use to each other. Thus external relations of young e-CODEX are multiple and complex. Of the *network* problems this generates I mentioned three: agreement formation, volatility in partners and access limitations. Analogous problems have emerged in the 1980s, when commercial computing became more and more ubiquitous. These risks have, in computer-program design, been somewhat domesticated by ‘object orientation.’ That leads to libraries of standardized programming building blocks that can be activated, combined and recombined through standardized interfaces. Of course such basic building blocks can be combined in configurations with wider semantic ambitions, like the explosion of apps availability shows. Even how to make apps can be standardized. In the commercial mobile market Apple and Google have become dominant and both provide platforms to make Apps to run on their system software (for iOS or for android). It is not clear whether (and if so, how) the public-service environment will evolve and support mature e-CODEX to survive. At the moment, public-service environments in the EU are generally conceived in a top-down manner. Thus it is not yet clear either how and where one or more useful nurseries for cross-member state digital public services (and their development platforms) will emerge (or be designed).

## Young e-CODEX's Result

By 2016 young e-CODEX was ready to transform into maturity. It had delivered a working digital interoperability service for communication between member state judiciaries, complete with documentation and guides for maintenance, deployment and governance. The service is called e-CODEX. I name the institution that carries e-CODEX either young or adolescent e-CODEX.

The reason why I dived into the current MOOC-making process is because the delivery of e-CODEX by young e-CODEX marks an exceptional success when considering the last three decennia of continuous governmental IT failures that have bothered the Netherlands. I wanted to find out how young e-CODEX did succeed where many Dutch projects failed. For instance in April 2018 the ambitious, comprehensive, mandatory, “cold turkey” transition of Dutch judiciary operations from paper-based to digital was “reset” (and withdrawn), two months before it was planned to go live. The project was called “KEI.”<sup>16</sup> It sports an interoperability platform too, be it at an internal member state level. Because a few of KEI’s procedural arrangements were considered a success during pilot projects, they have been implemented notwithstanding the overall withdrawal. One of these successes, the arrangement around digital supervision of bankruptcy administration becomes our target use case for the next Chapter.

When looking for analogies, it occurred to me that the (adolescent) processes that mark the transition of public IT projects from their young to their mature states make all the difference.

## e-CODEX and Its Condition

The coming of age of young e-CODEX takes longer than expected. When the year turns to 2019 e-CODEX has not yet settled as a naturally self-supporting public institution. We know that young e-CODEX and mature e-CODEX (and everything in-between) are one and the same complex adaptive

social system, in different phases of its life cycle. I know that the adolescence phase requires enormous amounts of energy, hard work and inventive thinking and that all of that is invested by or on behalf of the Consortium. The question I focus on here is whether complexity theory can identify strategies that help.

Establishing a trusted, effective and mature communication infrastructure between member-state jurisdictions (which young e-CODEX has prepared the operational conditions for) is too important an opportunity to let pass by in a laissez-faire state of mind.

## Chapter 3

# Consulting a Toy World (KEI)

*The third Chapter shows an example of what an agent-based model of an e-CODEX like system looks and feels like, and how its output can be read. I use Epiframer as a modeling platform and KEI as a use case. The Chapter's closure discusses what we can gain from using agent-based models of KEI and e-CODEX.*

## Translating KEI Into a Toy World

I selected the KEI bankruptcy administration supervision as a use case because adoption of the service is less complete than hoped for and because a similar phenomenon has been observed in the transition of young into mature e-CODEX. I want to find out whether complexity theory and its agent-based modeling can help understand and bend these phenomena. Representatives in the e-CODEX Consortium<sup>17</sup> recognized the complexity<sup>18</sup> involved and initiated a project to find out why the e-CODEX service is under-used. The current Chapter is largely based on information gained while participating in the latter project.

I acknowledge that the agent-based simulation approach employs old-hat AI technology. I will show that such instrumentation is sufficient for investigating the behaviors of many complex adaptive social systems. My aim is to understand causalities not to advise what should be done nor to predict the fu-

ture.<sup>19</sup>

## Terminology

A toy *world* consists of *agents* that communicate along networks and that can choose different channels. Data bases (or *repositories*) are agents too. I want to show how our intuitions on why an agent chooses a *channel* will work out in a toy world. So the artificial KEI society has a world and several *classes* of agents (*individuals*, *institutions*, *registries*, *links*). Each has *brands*. *Individuals* can be *judges* (we have 8), *bankrupts* (20), *trustees* (8), *creditors* (80) and *civilians* (908). *Institutions* are a *government*, the *council*, *courts*, the *bar*, *parliament*, the *KEI-team*, *IT-firms*, *consultancy firms* and the *press*. *Registries* are registries of *traffic data* and of *messages* (messages can be laws, norms, contracts, track records, ... any information).

Agents are located on *patches* (or plots). Agents can connect directly (as neighbors) or via links. Trustees are linked to bankrupts, judges and creditors. The links between judges and trustees support the full set of communication channels (*letters*, *e-mails*, *e-forms*), the remaining links support letters and e-mails only. Figure 5 shows a screenshot of the KEI bankruptcy-supervision toy world in action. I want to emulate how agents will choose channels in the KEI bankruptcy administration subsystem.

In the machinery of this toy world agents spend *resources* in *transactions* with other agents that provide resources (and vice versa). Agents handle communications via specific channels, which are chosen by the *sender*. In our artificial society all transactions revolve around communication-channel selection. *Strategies* (or channels) available are letters, e-mails and e-forms/apps.

Spending and acquiring resources are explicitly modeled for *agent types* in communication *patterns*. Agent types relate to two sorts of characteristics, *tags* which, like chromosomes, produce (physical) phenotypes and *conditionals* which produce, like cultures, (immaterial) convictions. As far as resource-related

processes concern the dynamics in jurisdictions, cultures, markets and disciplines, they are modeled as such (as pseudo evolutionary mechanisms).<sup>20</sup>

Our artificial society has a very limited sets of tags and conditionals.<sup>21</sup> These can urge an agent to select strategies for maximizing *solidarity*, *order*, *wealth* and/or *independence*. In our artificial society, behavioral choices always relate to a foursome of resource values concurrently. We all tend, after all, to be member of communities *and* to be subject in a jurisdiction *and* to be operating on markets *and* to be free creative and autonomous agents. So with any behavioral choice I assume that an agent in our artificial society takes into account what foursome of gains and/or losses are involved – qua solidarity, order, wealth *and* independence.<sup>22</sup>

## KEI Patterns, -Nodes and -Cycles

I use patterns to model regularities. Patterns are there, I claim, when agents and registries can be substituted in a stable communication structure. We have seen an example in Figure 3.<sup>23</sup> The main communication pattern I use for the artificial bankruptcy administration is in Figure 4

and works as follows: (i) judge appoints trustee; (ii) trustee calls creditors to register; (iii) creditors request registration; (iv) trustee decides on registration; (v) trustee calls for comments on plan; (vi) creditors comment (judge) on plan; (vii) trustee calls for the supervising judge's support; (viii) judge gives decision. In Figure 4, the links with service providers and big data repositories as made explicit in Figure 3 remain implicit as I consider them to be ubiquitous. Together I collect these eight patterns into a larger pattern (the nodes network in *Epiframer*) that dictates what happens when during an ar-

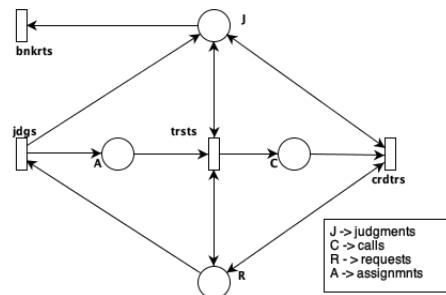


Figure 4: KEI's Pattern

tificial bankruptcy administration process, thus defining a KEI bankruptcy-administration *cycle*.

## Formalizing Theories

How does an artificial sender agent choose a channel and what resources will sender and receiver gain/lose by it? The nodes network that has been prepared will identify the pattern, the sender and the receiver. The model needs to relate them to individual tags, resource-scores, resource reservoirs and track records. For this, it requires a *theory*. Providing it is the work of the researcher that uses the agent-based model as instrument.

At the moment, I impersonate the modeler. I address the issue of how agents choose in a rule-based, algorithmic manner. For this I need further modeling assumptions. They are in the table 1. It relates agent-types with behavioral options (or strategies). In our artificial world we have four agent types. [aa] has a dominant predisposition to nurse order, [ab] to nurse solidarity (in-group social harmony), [ba] to nurse wealth and [bb] to nurse independence. For each of the behavioral options (channel choices) per pattern, I have modeled the resources for the sender agent, differentiating these in accordance to the sender-type's tag.

<i>pattern (i): tags × strategies</i>	letter	e-mail	<i>e-form</i>
solidarity loving [ab]	n	p	?
order loving [aa]	p	p	?
wealth loving [ba]	u	n	u
independence loving [bb]	p	p	u

Table 1: An Example Theory for Pattern *i*

Table 1 reflects the following for pattern (*i*), a judge appointing a trustee:

- for an [aa] (order loving) judge letters and e-mails are preferred (p) and it is unclear (?) what *e-forms* will bring

since they have been introduced recently and their efficacies, as part of the KEI project being reset recently, are dicey;

- for an [ab] (solidarity loving) judge a letter will be indifferent (n), e-mails will tally with what most of his colleagues will be inclined to do (and thus be preferred) and *e-forms* are again unknown;
- for a [ba] (wealth loving) judge letters are old-fashioned (unfavored (u)), email is indifferent and forms are preferred when good and unfavored when unduly demanding. Considering empirical evidence I model *e-forms* as unpreferred for the time being;
- for a [bb] (independence loving) judge free format messaging will be preferred (letter, e-mail) and *e-forms* will be unpreferred.

Table 1 shows the structure that *Epiframe* offers for the specification of values that guide the behavioral choices of agents, per type (for each of the eight communication patterns identified earlier). The full specification of *my* theory is in Table 2. I present it as a condensed table (with all patterns included) and will call it *the Matrix* for further reference.<sup>24</sup>

Why these four individual types? And how do the four individual predispositions relate to institutional types? These issues are discussed in Chapter 4. And how numerical coding of values is handled in this endnote.<sup>25</sup>

A reminder why agent-based modeling is considered useful: not because it shows artificial intelligence where we have to decide ourselves and neither because it solves intractable problems in magical ways, but because it can algorithmically produce images of how our social theories would work out if they were to be made operational. This is useful because these images cannot be provided by statistics or game theory and our imagination most of the time does not have sufficient computing power to do so qualitatively with any accuracy.

tag	[a b]	[a a]	[b a]	[b b]
loving	solidarity	order	wealth	independence
strtg	l e f	l e f	l e f	l e f
0 jdg-trst	n p ?	p p ?	u n u	p p u
1 trst-prs	p p u	p p u	u p u	p p u
2 crdtr-trst	n n u	p p u	u n u	p p u
3 trst-crdtr	n p ?	p p ?	u n u	p p u
4 trst-crdtr	n p ?	p p u	u n u	p p u
5 crdtr-trst	n n u	p ? u	u n u	p p u
6 trst-jdg	n p u	p ? u	u p u	p p u
7 jdg-trst	n p ?	p p ?	u n u	p p u

Table 2: *The Matrix for modeling KEI*

## Setting Up a Simulation Run

I set up the artificial society’s world and its agents. Each agent got randomly assigned a tag (defining its type) and a value table resulting from processing a theory provided by whom operates the model. Setup will then assign 8 judge-roles to individuals in a part of the world that is made ready for them, 8 trustee-roles to individuals in another similarly prepared part of the world, 20 bankrupt-roles with each 4 creditors. Setup is completed by translating patterns into a network that can guide how agents meet and communicate – marking who will be the sender (and has to choose the communication channel) and who will be the recipient.

After setup, time starts ticking.<sup>26</sup>

In general terms the left-hand square is the fantasy world with bankrupts (blue, sad faces), creditors (white, faceless), trustees (yellow, glad) and judges (red, neutral). There are links between bankrupts and creditors, bankrupts and trustees and trustees and judges. Only the latter are open to the KEI service. Top right in the “world” are the current distributions of types over judges and trustees. In the middle band of Figure 5 we see the graphs representing the developments in channel choices (I and II) and those that represent incremental developments in

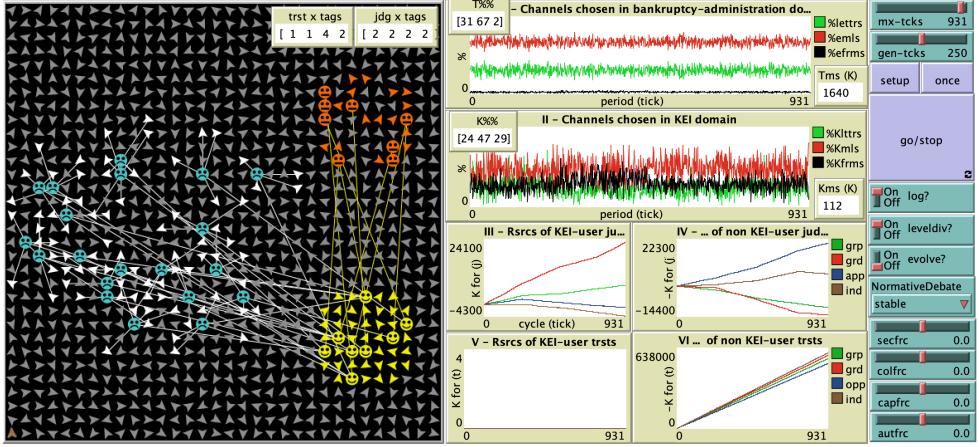


Figure 5: A screenshot reporting on a fantasy KEI system

resource acquisition (III - VI). The six graphs in Figure 5 all map their x-scores in ticks. Consequently, these graphs make the dynamics of their y-scores visible over ticks.

The right-hand side of Figure 5 is devoted to buttons and parameters that can be set for each run.

## Reading a Simulation Run

Graph I (the top graph in Figure 6) gives channel choices in the overall bankruptcy administration domain as modeled in our fantasy KEI system. It is apparent that under the current parameter settings and theory approximations the percentage of *e-form* channel choices is low. Actually amounting to 1% of over 1.047 K messages sent. This shows how tiny a fraction of the overall messaging in the bankruptcy supervision domain is served by KEI.

Of course we can focus on the subset of messages that are allowed to use the KEI service (those between judges and trustees). In Graph II we see the percentage of KEI *e-form* choices within that subset reach 2 % of over 71 K messages that could have used the KEI service. That the use of KEI's *e-forms* is so low, is the result of our modeling the channel choice as optional (and not mandatory) and our modeling the qualities of the *e-forms* as rather low based on personal inspection of the forms

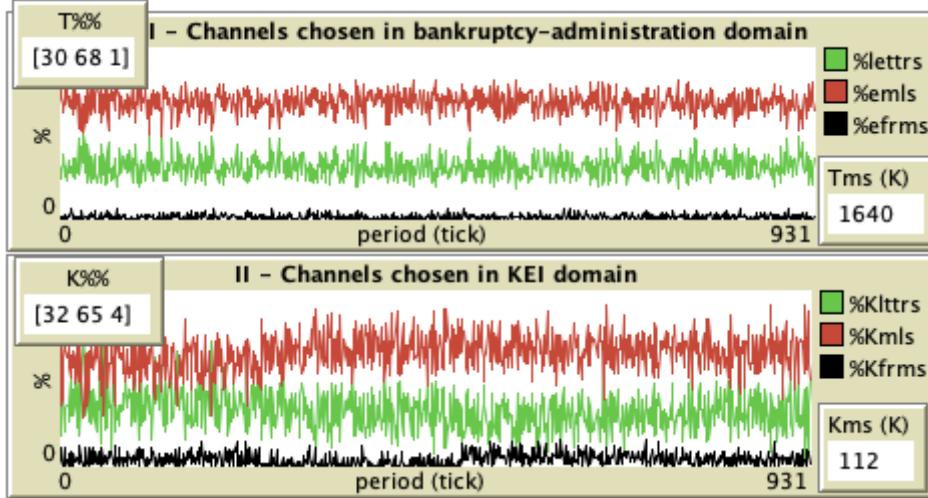


Figure 6: Reading Graphs I and II

involved.

An interesting phenomenon every now and then occurred during the exploration phase: often periods do occur with KEI channel choices dropping to zero. This is a result of the small numbers of active judges and trustees. In such small numbers, the distribution of tags may vary wildly from the standard.<sup>27</sup>

## Turning to Resources

The Graphs numbered III - VI are on resource accumulation per tick. Resources are directly derived from the theory.<sup>28</sup>

Graph III shows the dynamics in resource accumulation of judges that use the KEI service. For these, [ab] and [aa] resources steadily rise, while [ba] and [bb] resources steadily drop. I would be inclined to interpret this as an indication that using the KEI service is welcome to [aa] and [ab] type judges while it is unwelcome to [ba] and [bb] type judges. It seems worthwhile to investigate further whether this can usefully be interpreted as a trend that will guide the distribution of types over judges to get skewed in the long run and as how this trend would fit in current ideas on the separation of powers.

Graph IV shows the dynamics in resource accumulation of judges that use the KEI service. For these, [aa], [ab] and [bb]

resources steadily rise, while [ba] resources steadily drop. Similar investigation options are inviting for who is interested in the state of the separation of powers.

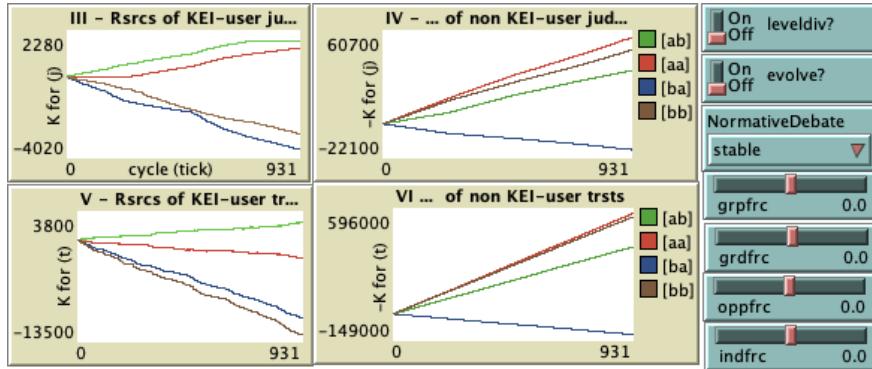


Figure 7: Reading Graphs III - IV: resources in KEI context

Graphs V and VI shows the dynamics in resource accumulation of trustees that use the KEI service and those that do not. The trends are analogous to those in Graphs III-IV with the exception of the [aa] type trustees, who seem to suffer in comparison with [aa] type judges.

For these, [ab] and [aa] resources steadily rise, while [ba] and [bb] resources steadily drop. I would be inclined to interpret this as an indication that using the KEI service is welcome to [aa] and [ab] type judges while it is unwelcome to [ba] and [bb] type judges. It seems worth while to investigate further whether this can usefully be interpreted as a trend that will guide the distribution of types over judges to get skewed in the long run and as how his trend would fit in current ideas on the separation of powers.

Graph IV shows the dynamics in resource accumulation of judges that use the KEI service. For these, [aa], [ab] and [bb] resources steadily rise, while [ba] resources steadily drop. Similar investigation options as for Graph III are inviting for whom are interested in the state of the separation of powers.

## What Can We Gain for the Normative Debate?

In 1969 I was a law student at Utrecht University, on my way to graduate in 1972. I was sorely in need of financial support and accepted the first job on offer that would have me. This happened to be computer programmer at the Faculty of the Social Sciences' Center for Data Analysis. These are the time and the place and the social context of my first steps into the worlds of mathematical and computational modeling for the social sciences. I was new to the subject – naturally so since in 1969 there was no formal education in computer programming nor in computational modeling. The Center that employed me was brand new.

I quickly realized that I had to develop two quite separate strategies for social survival. One was to acknowledge to social scientists that legal scholars are not scientists at all (which is easy) and the other was to acknowledge to legal scholars that social scientists are unable to produce useful knowledge with mathematical models (which was also, at the time, easy).

Fifty years on, these strategies are still useful in meetings of hard-core social scientists and hard-core legal theorists respectively. Why? What keeps them apart? And what can we expect from mathematical and computational modeling in a social system that accepts the rule of law?

This is a deep question, especially for whom have been part of the initial surge of statistic models in the social sciences. It requires a book on its own. Scott de Marchi published one in 2005.<sup>29</sup> I repeat here what I already summarized in Chapter 1:

De Marchi (2005) discusses three different modeling approaches in the social sciences: empirical, mathematical (also named: formal or game-theory) and computational. All three are subject to some form of what I call the endemic parameter selection risk. His suggestion is that the combination of methods and approaches may help, especially when out-of sample material is used for testing. I will follow his

lead here. But there is more. The three methods mentioned are rather recent to the social sciences. In 1969, when I first came eye to eye with them, a fourth method was still popular, yet coming under siege. Lets call it qualitative and acknowledge it to be quite acceptable to legal scholarship. As de Marchi illustrates, the three empirical modeling methods emerged as a reaction to the deficiencies of qualitative methods, which deficiencies can, ironically, be expressed in terms of assumption picking too.

In summary, all four methods have to negotiate the endemic parameter-selection risk, but do so in different manners and incompletely. My assumption is that normative debates on institutional fates can and ought be open to the four methods *concurrently* and treat them as *complementary*.

It follows that all four methods have to handle the endemic parameter-selection risk and all four methods can help improve our understanding of complex adaptive social systems. How did these methods specialize? And how can we fruitfully re-integrate their results?

- Empirical methods work by optimally fitting linear models with concurrently observed values of dependent and several independent variables (e.g., linear regression). Useful for its potential to falsify supposed causal interpretations of agent-based and mathematical models and risky for suggesting causality through correlation. For the agent-based modeler the method is also very useful for establishing (initial) system-states' feasibility.
- Mathematical/game theoretical methods are formal models that represent formal games and deliver advise for optimal solutions — within the constraints of the formal system (the domain and the rules of the game) — when choosing a move. For the agent-based modeler the

method is very useful for establishing quality building blocks that can be interconnected and form systems.

- Computational/agent-based simulation methods work in the manner described, connecting system states (registries) with a multitude of algorithmic operations (objects, agents) via loops and generations in order to emulate the behaviors of a social system. It is very useful for generating hypotheses that can be falsified with empirical methods.
- Qualitative methods work with theories that, like nDT, rest on human capabilities to comprehend, qualify and reason consistently, connecting observations with qualifications for individual sense making.

So agent-based modeling is one of a quartet. It can do what statistics and game theory can not: show *ex ante* how a complex adaptive *computational* system, as a proxy for a complex adaptive *social* system, will react to internal and external adaptations.

In turn, statistical learning based on empirical observations can do what computational and mathematical modeling can not: establish (*ex post*) what the (for instance initial or final) empirical state of a system is. We can use it to calibrate/falsify applied agent-based and/or mathematical models.

And, again in turn, mathematical modeling like game theory can do what computational and statistical models can not: create consistent mathematical systems that can *ex ante* advise on what strategic choices are optimal within the set of predefined states, strategies and payoff values.

And finally, qualitative modeling can do *on the fly* what computational, empirical and mathematical modeling cannot: combine *their* results in sense-making theories. This is what the normative debate aims to do when considering the vitality of a complex adaptive social system.<sup>30</sup>

That is what we can expect to contribute and to gain.

## Chapter 4

# *Epiframer: Requirements & Interpretations*

*I zoom in on how to model e-CODEX in Epiframer. I keep mentioning the assumptions I instantiate on the fly and how I suggest to interpret their results. Although the Chapter is designed for all, its subject matter is technical or theoretical or both — consequently a heavy use is made of endnotes.*

## e-CODEX, ECHO & *Epiframer*

**e-CODEX** is — as described in Chapter 2 — an infrastructural public service, designed and built in a European large-scale pilot, supporting professional communications with and between member-state judiciaries.

**ECHO**<sup>31</sup> is a conceptual framework for designing agent-based models that serve to investigate complex adaptive social systems by emulating them in toy worlds. ECHO requires<sup>32</sup> (*i*) that the toy world is populated by *agents* of diverse types, (*ii*) that agent types relate to two characteristics: (*ii.a*) *tags* which, like chromosomes, produce (physical) phenotypes and (*ii.b*) *conditionals* which, like cultures, produce (immaterial) convictions. Agents have (*iii*) *life cycles* and have (*iv*) *reproductive fitnesses*. In the machinery of any toy world, agents (*v*) *spend resources* in transactions with other agents that (*vi*) *pro-*

*vide resources.* Moreover, in ECHO agent behavior is sensitive to (*vii*) *if ... then ...* rules. Conditionals and tags can be modeled as triggers for firing such rules in a stochastic manner. Spending and acquiring resources are, like the dynamics in track records and resource reservoirs, explicitly modeled for agent types in patterns. (*viii*) *Patterns* are structures of recurring communication sequences. Thus, in ECHO agents can accrue, process, publish and exchange (*ix*) *information* like on track records, resource stock, reproductive fitness, etc.<sup>33</sup>

***Epiframer*** is a semi-generic platform that I designed and built to run and study models of complex adaptive social systems with, models that have been expressed under ECHO requirements. These requirements have already been partly interpreted (see italics above). Most of these concepts were straightforward to implement and can be traced back directly in the source code<sup>34</sup> if required. But how the internal and external behaviors of an agent-based model that is built with *Epiframer* can be interpreted anthropologically needs further attention.

## Institutional Form and Human Nature

When we accept that cultural forces work on individual behavioral choices and that the reverse holds too, we accept yet another requirement for modeling: make the regularities used to model human and institutional behaviors explicit. Doing so requires generalization.<sup>35</sup> In *Epiframer* I wanted something more sophisticated than what is *bon ton* in economics, yet not very much more sophisticated, considering what economists can do already with their *homo economicus*.

In neo-classical economics there is no distinction between institutional and human nature,<sup>36</sup> and human nature is universally of the individually welfare-maximizing kind. These generalizations are too far off what can be observed everywhere around us<sup>37</sup> to be acceptable as assumptions for *Epiframer*. I think great progress can be made when the distinction between

individuals and institutions is taken seriously and when three extra facets of human nature are allowed in, besides the currency optimizing kind. But what will these additional facets be? And where will they find foundation?

## Mechanic and Organic Solidarities

When we accept that cultural influences have forces that work on behavioral choices, we need to reduce the amount of options when we wish to model them. In 1893 Durkheim<sup>38</sup> felt a similar urge, looking for a scientific foundation for sociology as a new discipline, thinking in terms of social facts and corporations with characteristics that influence individual behavioral choices. He focused on specific organizational forms and the individual moralities (solidarities) that serve to guide constituents towards holding the organization together (or revolt). He distinguished two solidarities: one he labeled *mechanic* (in my interpretation: physically mediated) and one he labeled *organic* (in my interpretation: culturally mediated).

In groups dominated by mechanic solidarity, organizational forms tend towards egalitarianism; in groups dominated by organic solidarity, organizational forms tend towards the hierarchies that tally with the specialisms, functional diversities and interdependencies that come with the division of labor, Durkheim submits.<sup>39</sup> Actually, Durkheim's story follows from a historic interpretation of how, over human history since hunter-gatherer times, *enclaves* transformed the world into supporting the emergence of *hierarchies* and how these, in turn, transformed the world into supporting the waxing and waning organizational forms of (*iii*) *markets*. Durkheim's two solidarities and three institutional forms come a long way in answering our search for well-founded generalizations, but we need more. That is what Mary Douglas may have felt too.

## *Group × Grid* and neo-Durkheimian Theory (nDT)

Mary Douglas (and others) turned Durkheim's analysis (the two solidarities and the three organizational forms) into a full

fledged neo-Durkheimian framework with her *group*  $\times$  *grid* axes and complementary institutional interpretations. I will further also refer to it as neo-Durkheimian Theory or ‘nDT.’<sup>40</sup> It has the potential to answer the questions on institutional forms and human nature satisfactorily. There is a problem, however: nDT presents itself in the (ample) literature as a moving target. When I take a step back after considering a part of this literature I must conclude that although I join the enthusiasm in the nDT community for the group-grid frame I find it difficult to adopt all of the terminology that has become mainstream. Consequently, I have harvested yet another nDT interpretation from the existing literary cornucopia.

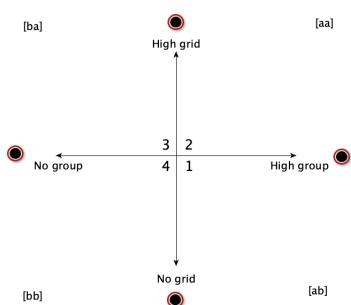


Figure 8: nDT’s bare-bone framework (adapted)

modeling with *Epiframer*.

- *No group*  $\Leftrightarrow$  *High group* is the *x*-axis. In nDT it is named *group* and represents the pressure from the group on its members *to integrate into the group and its norms & values*.
- *No grid*  $\Leftrightarrow$  *High grid* is the *y*-axis. In nDT it is named *grid* and represents the pressure from the institution on its constituents *to honor the classifications that regulate and order the institution*.
- The *group*  $\times$  *grid* framework in Figure 8 consequently represents the forces that the 4 institutional forms exert

Based on a survey of application oriented publications in the nDT community,<sup>41</sup> I made a selection and a few adaptations. They are made with my parameter-space reduction goals in mind and they must also be fit to guide the non-specialist modeler. In Figures 8 and 9 I have summarized what I will harvest from nDT for agent-based

on their constituent agents.

- The big black dots (that are located where the axes end) represent virtual attractors, pulling agents concurrently towards the extremes (high group, high grid, no group, no grid). In the origin these forces countervail each other.
- The square-bracketed labels ([ab] [aa] [ba] [bb]) represent tags (for individual agents) and conditionals (for institutional agents). They are labels for four quadrants, each dominated by two forces: [ab] = high group, no grid; [aa] = high group, high grid; [ba] no group, high grid; [bb] = no group, no grid.

Up to this level of theoretical detail I guess there are few diverging readings of the nDT framework. Diverging readings emerge when the bare-bone framework of Figure 8 is dressed up with further interpretations. These are different for who have different aims. The aims of many nDTheorists is to widen the circle of universal interpretations of the framework as much as can be done usefully.

My aim is almost the reverse. I want to domesticate, in a well-founded manner, the number of institutional types that can be usefully modeled in *Epiframer*. To have a small number of tags and conditionals (identical, but at different orders of aggregation) that modelers can interpret for their particular agent-based model. To this end, I find the bare-bone framework satisfactory.

For modeling with *Epiframer*, the bare-bone nDT framework is endowed with axiomatic and/or ontological powers. It can dress it up with further, more practical interpretations that get the status of heuristics that guide modeling and that suggest

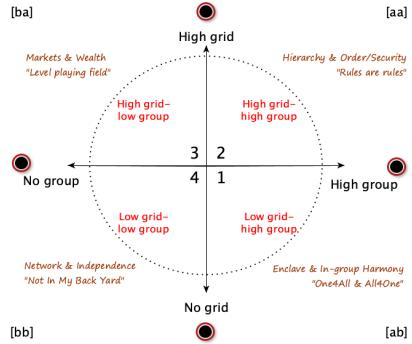


Figure 9: My interpretation of nDT's bare-bone framework

causal relationships when calibrating the simulation results. So *Epiframer* users dress up the bare-bone framework with their often situation-dependent theories, in order to model useful toy complex situations. The beginning of my dressing-up for agent-based modeling of complex social systems is in Figure 9 and Table 3.

### Bare-bone nDT for Building Theories With

The bare-bone interpretation is summarized in the first line of Table 3, with the quadrants and the tags. The representation of tags equals the representation of conditionals because agents can be institutions, and when they are, their tags are the conditionals for their constituent agents. So the format of tags equals the format of conditionals. In their bare-bone interpretations they refer to this: [ab] = high group, no grid; [aa] = high group, high grid; [ba] no group, high grid; [bb] = no group, no grid – where ‘group’ relates to *pressure to integrate into the group and its norms & values* and ‘grid’ relates to pressure to *honor the classifications that regulate and order the institution*.

Quadrant // tag=conditional	1 // [ba]	2 // [aa]	3 // [ab]	4 // [bb]
Institutional forms	Enclave	Hierarchy	Market	Network
Values	In-group harmony	Security	Wealth	Independence
Solidarities	Conform	Comply	Be a knave	Be true to yourself
Legal protection	Right to associate	Constitution	Competition law	Bill of (human) rights
Thought styles	“all4one & one4all”	“rules are rules”	“level playing field”	“not in my back yard”
Individual thought styles	loves in-group harmony	loves security and order	loves the price mechanism	loves independence
Example institution	party, household	government, a firm	stock exchange, eBay	Hyde park, Internet
Example individual	priest, devotee	employee, CEO	stock owner, trader	blogger, vlogger

Table 3: My Brand of nDT (interpretations)

Institutional forms are summarized in the second line of Table 3. Institutional forms are related to quadrants: [ab] — group-nogrid leads to enclaves, [aa] — group-grid leads to hierarchies, [ba] — nogroup-grid leads to markets and [bb] — nogroup-nogrid leads to networks.

What Table 3 further shows is how the bare-bone framework supports to fill in a whole range of distinct institutional

characteristics that follow the distinctions in quadrants. Each tag (or each group-grid quadrant) naturally sports its proper institutional form, institutional value, institutional solidarity, institutional thought style and individual thought style. They have been instantiated with my interpretations in Table 3.

There is an important heuristic that can be linked to these characteristics. It relates to the idea that purity of institutional form is not an asset, but a danger. This is visualized in Figure 9 with the circle. This suggests that there is an area where all four forces are sufficiently present to allow for a healthy blend, while the mixtures in the areas outside the circle are too pure to be healthy.<sup>42</sup> In Table 4 we find this heuristic backed up in linguistic forms and connotations. I mention ‘bigot’, ‘bureaucrat,’ ‘monopolist’ and ‘free rider’ as purity related, badly reputed *individual* examples — and ‘sect’, ‘police state’, ‘monopoly’ and ‘Freenet’,<sup>43</sup> as purity related, badly reputed institutional examples. Now what can I further do with these building blocks for modeling complex adaptive systems with *Epiframer*, when turning the focus on adolescent e-CODEX while keeping an eye on the bonds between algorithms, representations in toy worlds and observations of real-world situations concurrently?

Mixed	Pure
Individual	
Community man	Bigot
Civil Servant	Bureaucrat
Entrepreneur	Monopolist
Consumer	Free rider
Institutional	
Enclave	Sect
Jurisdiction	Police state
Market	Monopoly
Network	Internet

Table 4: Purity and Danger

## Modeling & Running e-CODEX in *Epiframer*

### The World, the System

I show how I modeled an operational toy version of e-CODEX’s European Payment Order service (EPO). I use *Epiframer* to generate a replica of adolescent e-CODEX. Figure 10 will be my point of departure.

Adolescent e-CODEX lives in a European world with 28 member states (MS) with a European Commission (EC) and 45 European Agencies. Each MS has a judiciary with courts and a Council. e-CODEX is managed by a Consortium. The e-CODEX service for the EPO is provided by a single provider (the e-Justice Portal). Considering the ambition to grow I reserved places for other private and public service providers, but these are not yet operational. I further have places for courts and legal professionals as both institutional and individual users with public and private roles.

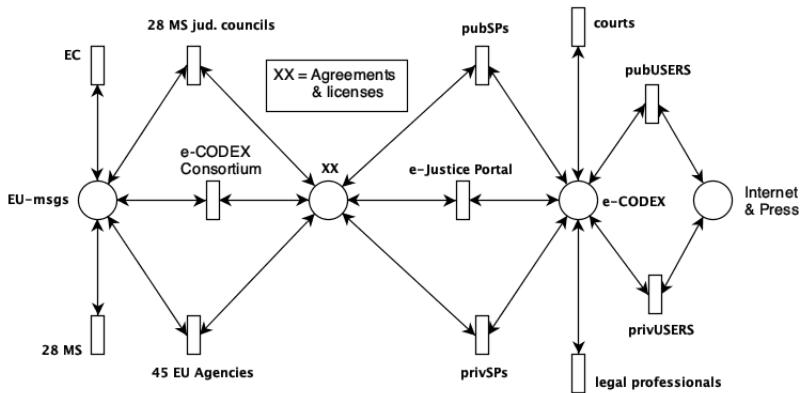


Figure 10: Looking for e-CODEX Patterns

Figure 10 shows e-CODEX as a repository, a place for receiving and delivering messages. The interoperability layer is internal to the repository. The market size is determined by the number of agents that can use e-CODEX for communication. Who can do this depends on the capabilities of the service, the demand for these and the licenses and agreements that allow to provide and use them. These licenses and agreements are also in the Figure as a repository.

During its adolescence, e-CODEX has the technology available. Because its main funders are the European Commission (EC) and the member states (MS), a separate repository is modeled for their messages and directives. We have several institutional agents available: 28 Councils of the Judiciary, 45

EC Agencies, one public service provider (the e-Justice Portal), courts and public users and unknown numbers of private (commercial) service providers, private legal professionals and private (commercial) users. The picture is made complete with the e-CODEX Consortium as an agent, and with the repository that represents the communications that are mediated through internet or the press. The last repository is available to all agents — I left out the links to prevent cluttering the Figure. For the same reason I omitted that each link in figure 10 contains the pattern of Figure 3 (with its potential link to big data collections).

The complex adaptive system that I want to investigate is formed around the EPO service provided by the e-Justice Portal and mediated by e-CODEX. Figure 10 gives an abstraction of the system in action. The abstraction is necessary because entering each individual instance of an agent in the picture would make it completely inaccessible through their sheer numbers. After all, the potential number of individual users runs up towards millions.

## Perspectives and Cases

The use cases that I find interesting can be ordered by employing two perspectives — one that follows the users of the service (the user perspective) and one that follows the stakeholders in the service (the stakeholder perspective).

An instance of a user-perspective use case is initiated by a private creditor that wants to recover a debt that a debtor in a MS does not pay. I sketched a relevant use case in the Management Summary in Chapter 1. I will call this the cross-border debt-collection case (the CBDC case). Its mean processing time is estimated in weeks.

An instance of the stakeholder-perspective use case is initiated by a member of the Consortium with plans for an e-CODEX maintenance effort (*eCM*) — e.g., for renewed funding and/or innovations of the service and its exploitation. The *eCM* plan would be distributed to the members of the Consor-

tium, the relevant partners in the EC, the partners in the MS, the partner Agencies and the organizations that represent the professional users. These communications would lead to feedback that is processed by the Consortium towards a blueprint for the *eCM* plan's realization. I will call this the *eCM* pattern. Its estimated processing time is in seasons.

I will now model the combined CBDC and *eCM* cases for the EPO service with e-CODEX interoperability.

## Cross-border Debt Collection (CBDC)

Creditors can activate e-CODEX's EPO via the e-Justice Portal. The alternative is a professional debt collecting service (DCS). So the Portal/DCS ratio is indicative of e-CODEX's EPO market share. I chose to model a standard CBDC case in four steps or patterns, based on my own experimentations – imagining myself to represent a Dutch SME with a € 25.000 French unpaid credit claim. The patterns are: 1. get information on European cross-member-state debt collection are via Internet; 2. decide on which version of the e-Justice Portal to use (regular or beta); 3. decide beforehand on filling in the forms or not; 4. decide on finishing Form A or not.

### Pattern 1: Get information

The first patterns concerns getting information via the Internet (Google, YouTube, Linked In, Twitter) on cross-border debt collection in Europe.

I begin with Google. I guess that not many SME representatives know the EPO by name, so I Google “How to collect a European debt” (without the quotes). I got an overwhelming number of DCSs offering their services. The Portal did not come up in a useful place. When I attempted “European Payment Order” the problem vanished and the European e-Justice Portal came up on top (Figure 11). But one can hardly expect

how to collect a european debt

**Debt Collection Europe | In your debtor's language | bierensgroup.com**  
[www.bierensgroup.com/international](https://www.bierensgroup.com/international) ▾  
Lawyers from twenty of Europe's Largest Economies. Customised Debt Recovery. 60+ Years Of Experience. Tailor-Made Advice. Highlights: Over 60 Years Of Experience, International Staff Available.

**Debt Collection in Europe. As Simple As It Should Be - Oddcoll**  
<https://oddcoll.com/debt-collection-europe/> ▾ [Vertaal deze pagina](#)  
Use a debt collector (collection agency or law firm) located in the same country as your debtor! 1 – Debt collectors need national authorization (in the debtor's country) to carry out debt collection activities. 2 – Every country has differences in legislation, business practices, cultures, language etc.

**Cross-border debt recovery - European Account Preservation Order ...**  
[https://europa.eu/euregion/business/\\_debt\\_index\\_en.htm](https://europa.eu/euregion/business/_debt_index_en.htm) ▾ [Vertaal deze pagina](#)  
8 nov. 2018 - The procedure is known as the European Account Preservation Order (EAPO) and its aim is to make EU debt recovery quicker and easier.

**Debt Collection Europe | Debt Recovery Collections in Europe**  
<https://www.collectionseurope.com/> ▾ [Vertaal deze pagina](#)  
Debt Collection Europe ✓ In-house European Debt Recovery Lawyers ✓ Knowledge of Local Country ✓ No Win No Fee ✓ Call us today: +44 (0)20 3808 5878.

european payment order

**European e-Justice Portal - "Order for payment" procedures**  
[https://e-justice.europa.eu/content\\_order\\_for\\_payment\\_procedures...](https://e-justice.europa.eu/content_order_for_payment_procedures...) ▾ [Vertaal deze pagina](#)  
18 jan. 2019 - Information on the European Payment Order procedure.

**European e-Justice Portal - European payment order**  
[https://e-justice.europa.eu/content\\_european\\_payment\\_order-353...](https://e-justice.europa.eu/content_european_payment_order-353...) ▾ [Vertaal deze pagina](#)  
Regulation (EC) No 1896/2006 of the European Parliament and of the Council of 12 December 2006 creating a European order for payment procedure allows ...

**"Order for payment" procedures - European e-Justice Portal**  
[https://e-justice.europa.eu/content\\_order\\_for\\_payment\\_procedures...](https://e-justice.europa.eu/content_order_for_payment_procedures...) ▾ [Vertaal deze pagina](#)  
18 jan. 2019 - Standard forms have been drawn up for the European Payment Order and are available here in all languages. This link will also provide more ...

Figure 11: Googling for info

incidental users to know that the European Payment Order exists and to search for it under its proper name.

Showing 46,611 results

**Tom Grims** • 2nd  
European Credit Control I (Inter)nationale Incasso I (Inter)national Debiteurenbehe...  
Amsterdam Area, Netherlands  
Summary: ...Payment Order, the Small Claims Procedure or the European Account Preservation Order. Contact us via ...  
[Connect](#)

**Ekatерина Паннебаккер** • 2nd  
Assistant professor at Leiden University  
The Hague Area, Netherlands  
Skill: European Law  
[Connect](#)

**Bartosz Sujecki** • 2nd  
Partner (advocaat/rechtsanwalt) at Bavelaar advocaten & Rechtsanwälte  
Amsterdam Area, Netherlands  
Part. Visiting Professor at University of Wroclawski  
[Connect](#)

**Christopher Gillett** @CJGillett • 19 Sep 2018  
Replying to @MarionJamie  
You too, huh? I'm onto the ISM legal department. Or there's a European Payment Order.

**Green Leaper** @FragrantFrog • Jan 31  
Replying to @TheEuroReturns @jed099x and 2 others  
If McCanns still owe the money then it begs the question as to why Amaral hasn't applied for a European Payment Order via the court. Portugal wasn't even on the Stripe a/c pending list at the time & confirmed back in 2015 no monies could be paid to a Portuguese bank account....

**e-CODEX** @eCODEX\_EU • 10 Jun 2014  
Greek-Austrian European Payment Order pilot services successfully launched! Greek EPO Pilot will soon be expanded to other e-CODEX countries

Figure 12: Linked In and Twitter

Of course there are more services available on internet that provide information. It is useful to search LinkedIn, Twitter and YouTube with EPO's proper name, because such searches will bring to attention the messages, tweets and clips that do link the proper name with messages that point to the concept. When searching LinkedIn with "European payment order" the first page presented has two DCSs and one legal scholar. LinkedIn does not lead to the Portal. When doing the same trick on Twitter, I got a list with hardly useful personal stories with cross-Europe payment problems. The tweets do mention the EPO with its proper name though (Figure 12). Whoever follows this up with Google will get there.

Finally I consulted YouTube in this pattern, again with the "European payment order" search question. The first three re-

sults were relevant: one two years old, seen by 120 viewers; one 4 months old, provided by the e-CODEX project and seen 413 times; one a year old and seen 62 times. None of the clips explain directly and simply what a user should do to make the procedure work smoothly (Figure 13).

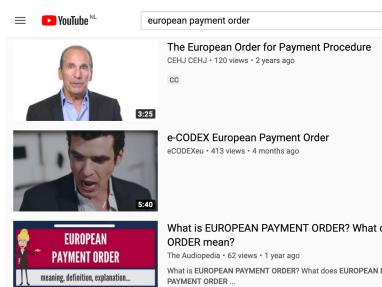


Figure 13: YouTube

feeling that the prototypical community man will stand unfavorable towards abandoning and neutral towards both continuing Portal and hiring a DCS; that the prototypical civil servant prefers to continue his search for information until he has found the Portal and is loath to abandon or hire; that the prototypical entrepreneur prefers to hire while being unfavorable to both continue and abandon; that the prototypical consumer prefers to continue and is unpredictable on abandoning and hiring. I summarized this in Table 5.

tag	[a b]	[a a]	[b a]	[b b]
strategy	c a h	c a h	c a h	c a h
1. Internet	n u n	p u u	u u p	n ? ?

Table 5: *The Matrix for CBDC pattern 1*

## Pattern 2. Undecided at the Portal

Those who get at the Portal need to decide what to do next. The Portal covers 28 MS jurisdictions. In Figure 14 I present two versions of the home page, one for whom selected the Dutch and one for whom selected the English language/jurisdiction. The translation seems OK. Still, there is a serious difference

between both pages. The CBDC service works with forms. In the English page they can be found with the label “European Payment Ord...” in the second of the four columns. In the Dutch page, however, the same reference is to be found with the label “Forms for an E...”<sup>44</sup> (See Figure 14.) No wonder that I did not succeed in finding the European Payment Order on the Dutch site when I tried to. No meaning can be read directly from this label.



Figure 14: Undecided at the Portal on Beta

The home page of the Portal is unsettling to many of its users for several reasons. First, it carries too much information. In current internet culture no one expects its users to need over two minutes to get a grasp of which link to choose next. And that is what the current design will require from a newbie user (which is the type of user the EPO service is targeting). Another reason is that references like “Forms for an E...” do not carry any information that can guide the decision to choose it or not. Such links are unsettling, time consuming and make customers lose confidence. Apparently the EC (who claims to be responsible for the Portal) is aware of this issue and working on a new version. It advertises it at the top of the page in the big yellow banner with the announcement of a Beta version being available. This may be considered dicey, as Beta versions do not yet have an operational status that the provider has taken full responsibility for.

Again, I have to propose a kick-off theory for *Epiframer* to run with. The choice is whether or not to continue Portal, abandon all-together or hire a commercial DCS. Since there is no

reason to expect that new reasons have emerged to adapt the attitudes to Patterns 1, I add a copy of pattern 1 the Matrix for CBDC.

### Pattern 3. Undecided at the Beta Version

Those who get to the Beta version have again to decide what to do next. They will have a Figure 15-like page to work with.

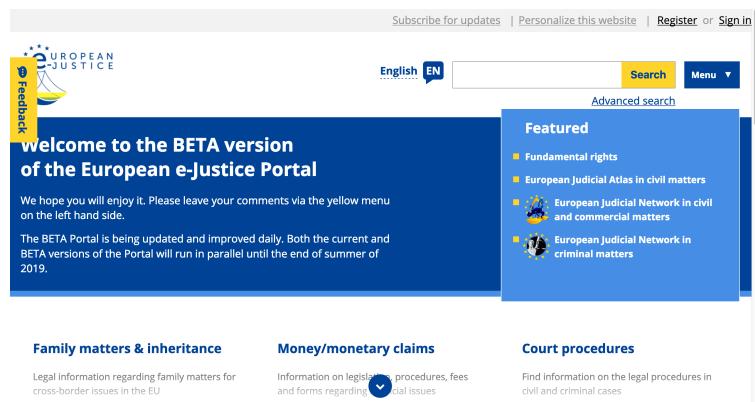


Figure 15: Undecided in Portal at Beta (0)

It is a stunning improvement. The contents are grasped within seconds. It will be immediately clear to anyone with a European debt-collection problem that he will need to choose the link to money/monetary claims. When he does so, he gets what is in Figure 16.

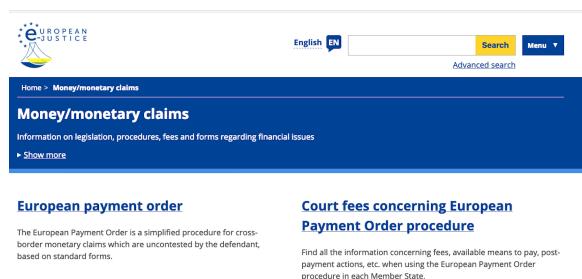


Figure 16: Undecided in Portal at Beta (1)

The users are now for the first time at a site that explicitly mentions the EPO in relation to an EU debt-collection service. Not only that, it also suggests that the service implies a court

fee that has to be negotiated. A user may choose to look that up first, which produces Figure 17.

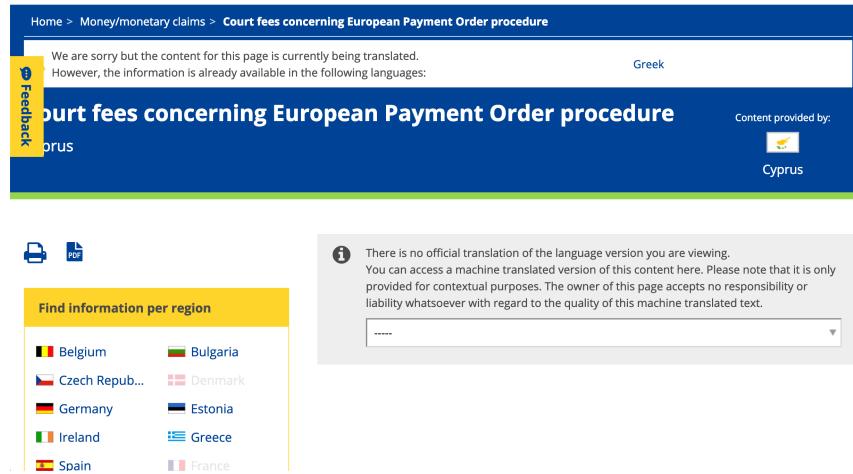


Figure 17: Undecided in Portal at Beta (2)

Again a few issues will further challenge the user's confidence. Some of the flags that indicate the country of the debtor are transparent, presumably indicating that there is no information there. And the page is dominated by a disclaimer, telling the user that available info is not official, and has been translated automatically.

**Figure 18: Un**  
**at Beta (3)**

Standard  
[here](#) in a  
issue a E

To start t  
nature a  
correctly

If the user does not despair and returns to the main track of the EPO service he will soon find the page shown in Figure 18. This page will finally have a link (rather unobtrusively, a ‘here’ link) to the forms that are at the heart of the EPO service. Once selected a page will appear with a listing of 7 forms (Figure 19).

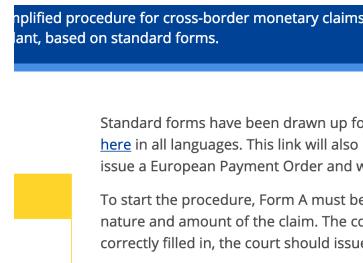


Figure 18: Undecided in Portal at Beta (3)

[Practice Guide for the application of the Regulation on the European Order for Payment](#) PDF  
(5809 Kb)

For additional information, please go to our page on the [European Payment Order](#).

You can complete these forms online by clicking one of the links below.

**Form A - Application for a European order for payment**

- [Complete the form online](#)
- [Download the blank form in English \(change language\)](#)
- [Email the blank form in English \(change language\)](#)

**Form B - Request to the claimant to complete and/or rectify an application for a European order for payment**

**Form C - Proposal to the claimant to modify an application for a European order for payment**

**Form D - Decision to reject the application for a European order for payment**

**Form E - European order for payment**

**Form F - Opposition to a European order for payment**

**Form G - Declaration of enforceability**

If you already have a form saved, please use the "Load draft" button.

**Load Draft**

Figure 19: Undecided in Portal at Beta (4)

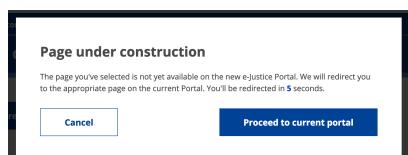


Figure 20: Undecided in Portal at Beta (5)

If the user is not dissuaded by its sheer size, he may consider to press the yellow button with Form A (already done in Figure 19), which will open a drop-down list with three options: to complete the

form online, to download a blank form or to email a blank form. On March 12 2019, when I chose the 'complete the form online' option I got Figure 20.

Again, I have to propose a kick-off theory for *Epiframer* to run with on the third pattern. The choice remains whether or not to continue Portal, abandon all-together or hire a commer-

cial DCS. Since there is no reason to expect that new reasons have emerged to adapt the attitudes to Patterns 1, 2 or 3, I add a copy to use for pattern 3 in *the Matrix* for CBDC.

#### Pattern 4. Finish Form A?

Those that decide to fill in Form A will look at the form and find guidelines for filling in the application form. There, the first message is that the form must be filled in in the language of the court that must be addressed.

GUIDELINES FOR FILLING IN THE APPLICATION FORM

**Important information**

This form must be filled in in the language or one of the languages accepted by the court to be seized.

Figure 21: Undecided at Form A

Again, I have to propose a kick-off theory for *Epiframer* to run with on the fourth pattern. The choice remains whether or not to continue Portal, abandon all-together or hire a commercial DCS. Since there is no reason to expect that new reasons have emerged to adapt the attitudes to Patterns 1 - 3, I add a copy for pattern 4 in *the Matrix* for CBDC.

tag	[a b]	[a a]	[b a]	[b b]
strategy	c a h	c a h	c a h	c a h
1. Internet	n u n	p u u	u u p	n ??
2. Beta?	n u n	p u u	u u p	n ??
3. Forms?	n u n	p u u	u u p	n ??
4. Form A?	n u n	p u u	u u p	n ??

Table 6: *The Matrix for CBDC*

#### The CBDC Simulation Result

I guess that — when at each pattern half of the users abandon the service offered by the Portal — my simple simulation run will lead to the suggestion that the size of the EPO user

community that uses e-CODEX is in the order of 7% of its potential size.

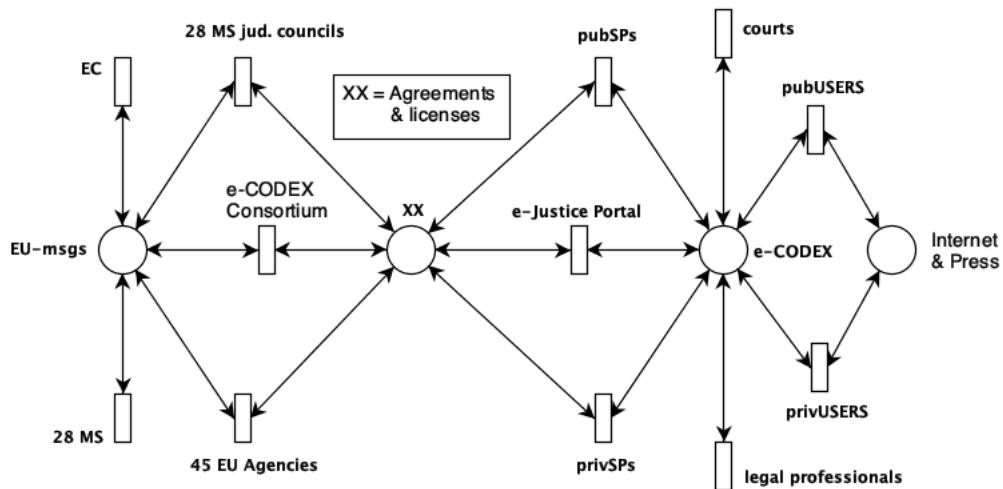
Is this a Farce?

Does this lead us into the new wildernesses that are populated by fake news and fake science?

Not necessarily so. A simulation run does not breed facts. It breeds hypotheses that can be falsified in principle. Are there relevant observations? Statistics are available on the EPO practice in Germany on incoming requests during 2018. They show the actual percentage to be a stunning 6.6%.

Our first result has been gained by simulating how e-CODEX came to be a marginal service, compared to commercial services. We have a result that provides causal interpretations for why the situation is as it is. The quality-assessments of the four patterns in the Portal's EPO service are sufficiently low to account for the causes of all of e-CODEX's problems that I was asked to investigate.

I can try to link the four CBDC patterns discussed with Figure 10 (reproduced below).



**Pattern 1 has private users consult internet and the press.** What is offered on internet is contributed to by each of the agents in the Figure (I left the links out because this is common knowledge). What is important to consider is what

a user may expect from which agents to support his access to the EPO service. I conclude that the e-CODEX consortium (as provider of the interoperability layer) and the e-Justice Portal (as the EPO service provider that is mediated by the interoperability layer) are mainly responsible for visibility and access information via internet (social media included) and that user experiences as reported in social media can also help, but are in fact so infrequent that they cannot be trusted to provide much relief here.

**Pattern 2 has private users consult the e-CODEX repository for material provided by the e-Justice Portal.** The quality of the Portal pages is below par. I guess this is the responsibility of the EC (as it claims responsibility for the Portal)

**Pattern 3 has private users consult the e-CODEX repository for material provided by the Beta version of the e-Justice Portal.** The quality of the Beta Portal pages is an improvement. But especially where the service gets closer to providing content for different jurisdictions the quality of service wanes. I guess this is still the responsibility of the EC (as it claims responsibility for the Portal)

**Pattern 4 has private users consult the e-CODEX repository for filling in Form A as provided by the e-Justice Portal.** The quality of the Portal's service for filling in the Form is, so I guess, a shared responsibility of the EC and the e-CODEX Consortium. It is my impression that Form A gets so close to the gateway functionality of e-CODEX, that it must coordinate with the EC to provide adequate interfacing operability.

With these results we can formulate a pressing issue to be addressed by the e-CODEX Maintenance function.

## e-CODEX Maintenance (*eCM*)?

When we considered the life cycle of e-CODEX in terms of youth, adolescence and maturity stages, we established that during its youth and adolescence, e-CODEX has adopted several functions that need be distinguished. First of all, e-CODEX is an interoperability layer for communication between different member-state legal practices. To this end an architecture has been chosen that anticipates on a single backbone that is accessible through single points of access at the member-state level and through the e-Justice Portal at EU level. The service's functionality depends on the willingness in each member state to interface local procedures through their single point of access with the e-CODEX interface as provided in the e-CODEX gateway that is connected to their single point of access. This architecture makes sense. But when we look at how the EPO service is made available to the public (via the e-Justice Portal), it is not yet the case that single points of access that are accessible to potential EPO users are available in all member states, and neither are the semantic interfaces (between local and e-CODEX's sides of the gateway).

Information services like the EPO, the e-Justice Portal and e-CODEX are condemned to a marginal existence unless they succeed in providing intoxicating quality and ease of access, and added value to all participating agents -- like Wikipedia does, for instance. As discussed before, the e-Justice Portal does not — and operational EPO access for non-professionals to e-CODEX is through the e-Justice Portal. This is the situation that the Consortium faces with its next *eCM* move.

I sniff a design problem here, where someone must formulate a dream before anything can be done in a serious design/consult/commit/implement/deploy/evaluate cycle.

It is my claim that such cycles can be simulated in a useful manner. So what can the *eCM* dream be? We have working software that is under-used. The architecture of e-CODEX leads to a complex dream about mature e-CODEX as the central element in a streamlined mainstream communication sys-

tem for member-state judiciaries, their legal professionals and laymen litigants. The dream spans multiple jurisdictions. There is no hierarchy in the network of member-state judiciaries. This implies that making the dream come true requires a service to have such quality that all the participating agents that are necessary *volunteer* to participate. The question is what the e-CODEX Consortium has to do (and is able to do) to realize this. This is a suitable subject for a multidisciplinary, normative debate.



## Chapter 5

# The Normative Debate

*The Chapter prepares for a normative debate on the results thus far and argues why we need such.*

## Intro

We now have a framework available (*Epiframer*) for running agent-based models of e-CODEX. It is able to concurrently process four prototypical valuations of single (trans)actions. Prototypical values are in virtual currencies — *as-if* promoted by prototypical individuals, exhaustively represented by four types: the community man, the civil servant, the entrepreneur (or *homo economicus*) and the consumer.

I introduced and illustrated how the framework can be used for modeling and simulating complex systems around communication services with two situations: (i) KEI and (ii) e-CODEX’s EPO as seen from the user perspective.

When considering the e-CODEX EPO results, a natural question emerges. What options does e-CODEX have, to improve its user experience? For the e-CODEX Consortium (as institutionally responsible for the e-CODEX service) improvement of the user experience will be *the* issue. For me (as external professional and responsible for well-founded recommendations) a change in modeling perspective is — no longer the user experience is focal, but the e-CODEX Consortium’s. I will frame the issue in a design question: *what should the next e-CODEX service upgrade look like?*

This is an *eCM* issue that is decided upon in an e-CODEX Consortium perspective and that will make impressions in the user-experience perspective.<sup>45</sup>

## The Sensitive Entrepreneur: Initial Design

### The Initial State

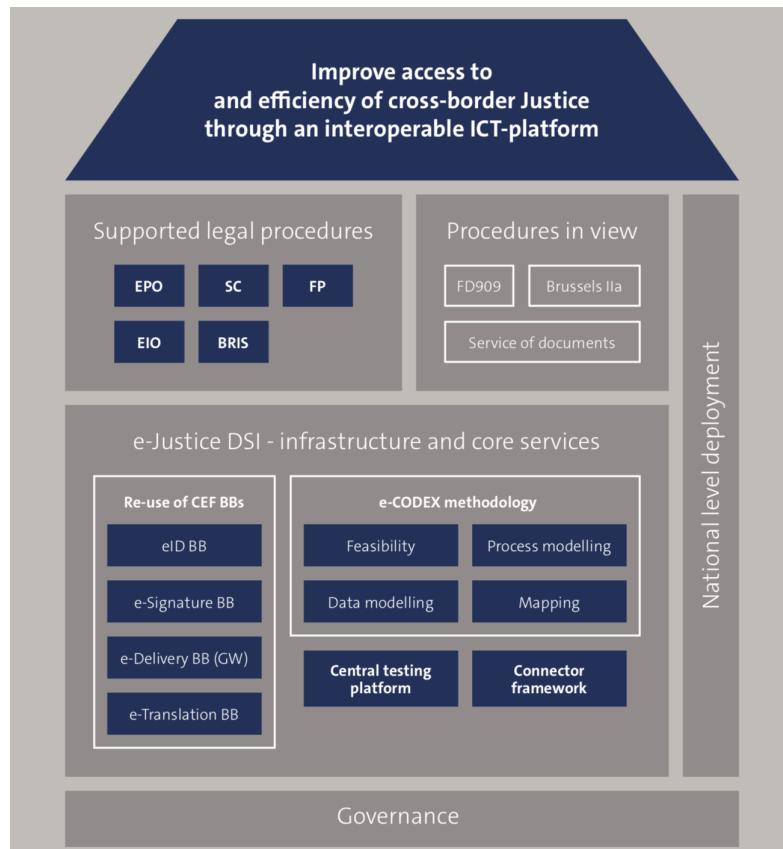


Figure 22: e-CODEX (end 2018)

We have e-CODEX as a service with an architecture based on a complex dream about functioning as the central element in a streamlined mainstream communication system for member-state judiciaries, their legal professionals and laymen litigants.

I have focused on the EPO service as offered to layman litigants (the user perspective), but in reality, in its adolescence, e-CODEX is the main stakeholder in the operational interconnectivity platform that can and does operate in different contexts for different more specialized networks of which EPO is one (see Figure 22). I focus on the e-CODEX EPO service which is built upon the e-CODEX interoperability layer itself with its e-Id, e-Delivery and e-Translation supporting modules.<sup>46</sup> I call the interoperability layer itself (as purely infrastructural element) e-CodexIL. e-CODEX EPO is e-CodexIL, extended with the EPO application.

## Organizational Issues

Most revealing in this representation of the state of the art anno December 2018 is that e-CodexIL is not in the picture as a separate service at all. This observation gives a handle for describing the December 2018 state of the art in terms of four basic organizational functions. The *organization* is currently delivered by a proxy, based on contract and agreements: by the e-CODEX Consortium. The operational *service repertoire* consists of five services. These can be distinguished in services that target individual civilians as users (*open* services like EPO and SC) and services that target institutional users (*closed* services like EIO, BRIS and FP, but also the testing platform and the connection framework). Open services are — qua *user communities* — accessed through the e-Justice Platform. Access to closed services is negotiated ad hoc with representatives of the Consortium. Access policies and requirements are not published — perhaps not even available. Policies and requirements for remuneration of the use of e-CODEX services are not published either (the fees required during the EPO service are court fees, not e-CODEX fees). This prevents a clear picture of the *business conditions* that can help shape and sustain mature e-CODEX.

We have e-CodexIL as an operational interoperability service with an architecture based on a complex dream about

functioning as the central element in a streamlined mainstream communication system for member-state judiciaries, their legal professionals and laymen litigants. When I focus on the open EPO service for layman litigants, I need additional, semantically oriented parts.

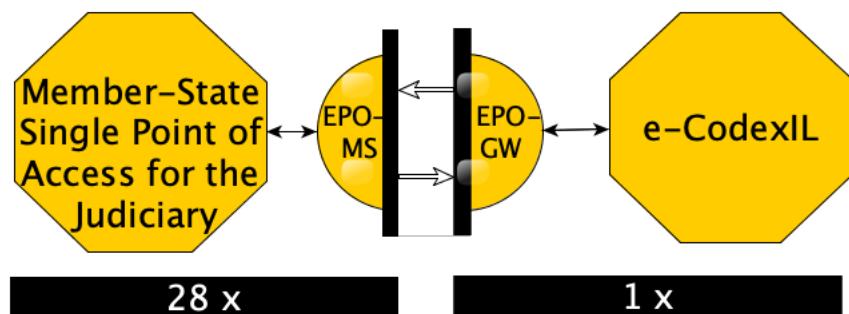


Figure 23: Gateway structure

These parts are in the gateways (Figure 23). For the EPO service I call them EPO-MS and EPO-GW. To use e-Codex-IL for an EPO service, there is one EPO-GW part required, that can process each and every member state's EPO-MS information. Such informations have taken the form of Forms in the current situation (as described in Chapter 4).

When I look for candidate patterns to work with, I consider the following. e-CodexIL + EPO-GW complete the side of the EPO service that the e-CODEX Consortium is responsible for. This part is operational. For the open services it has been made available to the e-Justice Portal and for the closed services to the dedicated service providers. When I consider the EPO (as an open service) from the e-CODEX Consortium's stakeholder perspective, the EC has taken command over the MS-sides of the EPO service in a manner that prevents e-CODEX from becoming what it wants to be. So what are the strategic options for the Consortium when it wants to push e-CodexIL towards becoming a central service for the EU judiciaries' EPO communications?

A few caveats come to mind when considering this question:

1. **Use.** Select gateway-services that are useful to all member-state judiciaries — such is necessary because the member-state judiciaries will be responsible for the semantics of the service at their side of the gateway to e-CodexIL which only will happen at an acceptable level when these judiciaries experience added value from the service;
2. **Width.** Design for semantic support at a level that is acceptable to all four institutional forms/individual types (communities/community men, hierarchies/civil servants, markets/entrepreneurs, networks/consumers) — such is important because only then the service can gain a substantive audience;
3. **Autonomy.** Look for an organizational format in which the Consortium is free to contract, to protect and to innovate — such is important because these are necessary conditions for creating a stable setting for a stable operational organizational form.

Ideally, we need an e-CODEX CEO that has the power to regulate user conditions, to negotiate service-provision licensing, outsourcing and offshoring conditions with the EC and with targeted clearinghouse service providers, European Agencies and commercial partners — issues that may currently be difficult to decide upon. Ideally, we also need agents to participate in the debate that represent all these parties. For the current Chapter we make do with four imagined specialists—an anthropologist, a legal theorist, an economist and a computer scientist — that are consulted, as a team, by the, equally imaginary e-CODEX CEO.

## Requirements

When I look at the results of the simulation with the user perspective one thing sticks out as problematic: quality of service. For any voluntary EPO service to be successful with its users it must provide added value of high quality. To do so requires

to bridge the gap between user and provider perspectives. The e-CODEX upgrade goal then becomes to turn it into a service that provides added value of high quality to its users.

How? and To which users? Making cross member-state justice quicker with information-technology support is the overarching idea behind the e-CODEX enterprise. It is generally understood that communication in networks can make exchanges quick and effective when standards are used that are semantically stable and well understood by all, like *communication standards* used in the web, for secure communication (HTTPS), e-mail (SMTP) and presentation formats (HTML) — and, when things need more semantic guidance for focused applications, *application standards* that are used successfully in web-shops, social media and Apps.

So the How? question is answered with the requirement that *the improved service must have stable communication and application standards that are understood by all targeted users.*

## Meeting Requirements

So which users to target?

Creating and maintaining a stable standard that is also understood by all targeted users for the cross member-state exchange of *legal* knowledge is a challenge.

One reason is that legal knowledge itself is *local* to member state jurisdictions and closely coupled with local languages.

Another reason is that such knowledge is neither stable nor identically understood by all.

These conditions have led to specializations in the legal EPO field — both at the level of laymen (negotiating local legal cultures) and professionals (legal specialists).

Both laymen and professionals can in principle be targeted by the improved e-CODEX EPO service. Rather a lot of candidate brands of users/agents come to mind. To mention a few: creditors, debtors, DBCs, lawyers, judges, courts, Councils for the Judiciary, content providers, service moderators, service providers, the EC, member-state single points of access, the

e-CODEX interoperability layer itself and finally: standardization authorities (legislators and the e-CODEX Consortium included).

Together, these potential e-CODEX EPO service audiences make an unruly collection and their communication patterns form thickets that support complex behavior.

How then can we make the two requirements (stable standards & understandable to all) meet? I suggest to look at four functions that have been instrumental to the evolution of the web (standards that connect all types of users for all types of uses, from chat to e-commerce, from browsing the web to search it, from automated translations to geographical filtering). These functions are ping, e-mail, e-form and app respectively.

**Ping (EPO ping).** The most simple standard would be for the secure “are you able to receive my signal?” communication (without further content).<sup>47</sup> Of course this type of digital service is elementary to all communications that have an enforcement aspect. Communications in the EPO context have such an aspect (also between creditors in member state A and judges in member state B). The “ping” function requires a standard that is stable and that is understood by all. Currently, the real-world ping function is embedded in (often idiosyncratic) member-state legal practices that delegate it to real-world semi-public services that accompany the authenticated physical delivery of legal communications. In e-CODEX the id/signature/delivery building blocks, together with the connector framework are ready to provide the functionality required for creating *by agreement* the “circle(s) of trust” required for realizing the ping (and thus: e-mail, e-Form and App) function. The ping function is essential to a good working e-CODEX EPO service, yet by no means a simple thing to realize. I did not find a trace of it in the e-Justice Portal’s EPO support.

**Secure e-mail (EPO e-mail).** Also in the early 1980s the SMTP protocol for e-mail emerged. Like paper-mail letters it

supports the communication of free-form messages. Secure e-mail support between identified legal professionals is a first requirement for the one-on-one functional transition from paper-based legal practice to digital. Like in the physical world, secure e-mail is realized by special modes of transport and delivery. Until this very day (December 2018) secure paper mail is an essential communication function in legal practices — for instance between professionals. Again I did not find a trace of it in the e-Justice Portal's EPO support. Again I assume that the id/signature/delivery building blocks, together with the connector framework are ready to provide the functionality required for creating *by agreement* the “circle(s) of trust” required.

**Secure e-forms (EPO e-forms).** In the mid 1990s web-shops emerged, and with them the possibilities of form-based communications with their strictly formatted patterns.<sup>48</sup> This approach to communication has become very popular with (also governmental) administrations because the exchanges can easily be steered. E-forms carry with them local application standards of variable quality. The approach has become a source of irritation (and satire — Little Brittain's *Computer says no* comes to mind) for many, especially when users experience to be fenced in in one-sided information exchanges that are not calibrated to their frames of mind nor their interests. The approach is in administration indeed very sensitive to being designed with the administrator's and not the user's interests in mind. This may be one of the reasons why my simulation reported low user support for the e-Justice Portal's EPO service. This EPO service is entirely e-form supported. As the

**Apps (EPO apps).** Apps is short for mobile apps. These emerged *en masse* around 2010 with smart phones and the related development and distribution platforms. Apps are commercial in the sense that users are not obliged to use them, but choose to use them for their functionality. At the same time, apps live in the data economy that is fed by the exceptions to default personal data protections that their users award their

providers with, feeding and exploiting Big Data collections by using their apps. In apps, a natural equilibrium seems to emerge between requirements to use stable standards and to remain understandable to all. The mechanism behind this is related to the price mechanism. The e-Justice Portal's EPO support has no apps.

## Towards an eCM Matrix

How then can we use these four functions (ping, e-mail, e-forms, apps) to make the two requirements (stable standards & understandable to all) meet for an improved e-CODEX support of the EPO service?

Let me repeat the question. How then can the e-CODEX Consortium use/combine these four functions (ping, e-mail, e-forms, apps) in order to make the two requirements (stable standards & understandable to all) meet for an improved e-CODEX support of the EPO service? The answer concerns behaviors that have values for whom are confronted with them.

Actually I use a simple cycle to describe any requirements engineering process – that is to describe any process that tries to realize an IT-supported service by defining behavioral constraints and options. In this cycle I consider 5 agent types:

- (i) that of the *sensitive entrepreneur* (who presents an initial plan to based on a dream about an improved service),
- (ii) that of the *CEO* (who decides on the e-CODEX current and future policies, currently the EC, the (representatives of) member states and the Consortium combined),
- (iii) that of professional *IT service providers* (for building and operational deployment — her an EU agency could become involved),
- (iv) that of *professionals involved* (like DCSs, judges, bailiffs, lawyers, legal content providers and publishers),
- (v) that of the audience or *end users* (most SMEs)

When I attempt to model the situation, I will be looking for a *Matrix* in the usual manner, with patterns, tags, strategies and values like I suggested in Table 7 (and as earlier, analogically, in Tables 2, 5 and 6).

sender tag	[ab]	[aa]	[ba]	[bb]
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	?????	?????	?????	?????
2. CEO (EC, MSs & e-CODEX Consortium)	?????	?????	?????	?????
3. IT Service providers (build, deploy)	?????	?????	?????	?????
4. Professionals involved (DCSs, Legal)	?????	?????	?????	?????
5. End users (SMEs)	?????	?????	?????	?????

Table 7: *The preliminary eCM Matrix*

Let me explain a few of my choices.

**At pattern 1** I imagine a sensitive entrepreneur communicate a plan to improve a service — the *eCM* plan. I named the agent sensitive entrepreneur because he provides the initial plan for the upgrade of the e-CODEX service, based on the observed reluctance in the target audience to use the service as-is. The values of his plan (his combination of strategies) are sensitive to his tag. When sender is a prototypical community man it depends on the community he is in, so I do not know.

When sender is a prototypical civil servant it depends on available rules and policies, so I guess that the plan remains close to the existing chosen strategies — the plan remains focused on the use of the eID, eSignature and eDelivery building blocks, combined with an improved e-form interface for the e-CODEX EPO service. All senders are free to choose from these, so it seems. How they choose is yet unknown.

When sender is a prototypical entrepreneur it depends on where direct financial losses (infrastructural investments) can be minimized and indirect financial gains (reduced legal transaction costs in the whole of the EU) can be maximized — anno

2019 I guess such can be hoped for by choosing an approach that combines ping, e-mail, e-form and app services. How is still unknown.

When sender is a prototypical consumer it depends on what networked, existing building blocks can be recombined comfortably, without making too much of an impression on the legal practices involved — I guess these conditions depend on combining ping, e-mail, e-form and app services. How is still unknown.

**At Pattern 2** I imagine the e-CODEX CEO function to provide its judgment on the plan, based on agreements with member-state representatives and existing policies and political climates.

**At Pattern 3** I imagine IT service providers to be the senders, conveying their tender — these are enterprises like those that are currently employed to provide the service in its current state.

**At Pattern 4** I imagine professionals involved to send in their (lobbying) reactions to the plans — these will not only be the DCSs and legal professional that have their businesses settled in current practice, but also the small army of paralegals that may be required for keeping the e-PORTAL services correct and up to date.

**At Pattern 5** I imagine the end users (who can vote with their feet) will give such feedback. We know their reactions to the pre-*eCM* phase. We also know that they will be sensitive to transaction costs and other quality indicators. How this will work out with what combinations of ping, e-mail, e-form and app services is still unknown.

In Table 7 I have provided a *preliminary eCM Matrix*, showing the patterns, the tags and the strategies, and instantiated the

cells with estimated values — all are the values for ‘unknown.’ The Consortium will require more than this.

## Modeling as Translation

I am working with a modeling apparatus that has proven useful for modeling the e-CODEX EPO service with its substantial numbers of cases per period. I am using the same modeling approach for the *EPO eCM* cycle. Here, numbers of cases are limited. *eCM* models are sequential and have a duration in the order of two years. Such modeling requires qualitative reasoning and sensitivity to analogies. Empirics are more useful to support individual acquisition of modeling skills than for to predict what the outcomes of a particular modeling activity will be. In this, I like to think of agent-based modeling of complex adaptive social systems as translation. As an explanation I insert a few tweets by Emily Wilson (March 20, 2019 — @EminlyRCWilson) that seem to the point even when you would instantiate ‘translation’ with ‘agent-based modeling’:

“[...] here are 2 things I know about translation, from my experiences of years of doing it and thinking about it and reading about it.

1. It’s interpretative. You can have a more or less responsible interpretation, as with writing history, or lit. crit, or journalism, or science; you can be sloppy, ill-informed, muddled, make mistakes, ignore things, etc. But there’s not a single right answer.
2. Form matters; style matters; register matters. Translators can choose to ignore those things, e.g. to render verse in prose or stacked prose, or to make a fluent original clunky. These choices can be valid. But ideally, we shouldn’t make them without thinking. Sometimes I think these things are so blindingly obvious that they aren’t even worth saying; sometimes not [...]

3. #3 on this 2-item list is that doing it well is extremely difficult, and doing it perfectly, impossible. Translations are always very different from their source, no matter how responsible. Difference means both loss and gain [...]”

But there is an important difference. In our culture translation of literary works is considered an individual thing. Agent based modeling of the complex social system attracted by the *eCM* process is not. One would want the result to be well informed and to tally with the goals of the process' principal.

## The Specialists

The Consortium will want to instigate a normative debate on the issue and consult the opinions of multiple specialists. This is dicey, when we realize how difficult multi-disciplinary debates are. Still, this is what a normative debate on a complex situation will boil down to when disciplinary specialists are invited first to give and later to combine their opinions into a single shared recommendation.

The normative debate resembles a political debate but is not identical to it. In the context of agent-based simulation it is a practical (empirical) mechanism, not a philosophical narrative.<sup>49</sup> Normative is not political. The *normative* debate sports respect for knowledge and evades (or attempts to ignore) social pressures. The *political* debate sports interest-based rhetorics that, when considered effective, will freely wield fact-free Big Stories.

Not completely unlike 80 years ago, anno 2019 normative debates seem to be losing part of their authority in the Western world. The peer-review mechanisms that aim to protect the reputations of normative debates against erosion have failed too often in recent decennia — just like self-serving specialist political opinions tend to undermine them. These mishaps are likely to occur especially when the public craves to know what isn't known yet (or cannot be known at all). In my agent-

based modeling I am aware of these risks (just like the reader should be — *agent based simulation does not generate facts, only hypotheses*).

The trick I use to handle the issue is by providing the preliminary *eCM* Matrix to specialists that have been educated about the prototypical institutional forms and ask their opinion on the column that matches their specialization. Such leads to an anthropologist (or sociologist) for the [ab] (community man) perspective, a legal theorist for the [aa] (public servant) perspective, an economist for the [ba] (entrepreneur) perspective and an IT/network scientist for the [bb] (user) perspective. Each of these specialists is asked to provide their informed estimates of the values in ‘their’ column of *the eCM Matrix*.

The normative debate works subsequently towards recombinining these opinions into a single recommendation. But it begins with the four specialist opinions on separate columns in *the eCM Matrix*.

### Specialist 1: the Anthropologist

I assume the role of the anthropologist myself (after all this is a simulated example) and focus on the part of *the Matrix* that is in my domain. As an anthropologist I am keenly aware of the forceful influences that the cultural climate exerts.<sup>50</sup> To keep things simple I consider two cultural climates at work in the environment where the updated e-CODEX service aims to survive. One is a federalist attitude towards the EU, one is a national-independence guarding attitude towards the EU.

*The question for the anthropologist is to find values for the strategic choices per pattern for senders t, in their roles, kin to the prototypical community man — and in an environment that is dominated by a federalist attitude to the EU.*

After some deliberations I came up with my estimates of the first column of *the eCM Matrix* in Table 8.

The Contents of Table 8 are *estimates*. First I decide on the role of the social scientist that I am going to play. I choose to look at the differences that can be expected between two

different communities. One is pro Europe and welcomes further cooperation in the direction of an EU federation. The other one is more nationalist and disapproves of further EU integration. In a pro-EU climate there is a preference for cooperation on infrastructural services. I consider the secure *ping* and *e-mail* strategies to be such.

sender tag [ba]: federalist — anti federalist	pro	anti
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur (eCM plan)	p p u p	u u u u
2. CEO (EC, MSs & e-CODEX Consortium)	p p p u	u u u u
3. IT Service providers (build, deploy)	p p p p	p p p p
4. Professionals involved (DCSs, Legal)	p p u u	p p u u
5. End users (SMEs)	p p u p	p p u p

Table 8: *The anthropologist's Column in the eCM Matrix in a pro and a contra EU community*

So the sensitive entrepreneur (a member of the e-CODEX Consortium) and the CEO (EC etc.) consider the development of such services to be in their domain. The *e-form* and *app* strategies are less self evident an infrastructural service. When looking at the distinction I made between e-CodexIL and its application services, the *e-forms* and *apps* can be interpreted as not naturally belonging to the communication infrastructure. There are arguments against a restrictive interpretation in the fact that the EU has created specific regulatory frameworks for such applications. Yet even in a federalist climate this need not convince everyone as the market has provided different support services on its own steam. In the model I assume that the EC will want the *e-forms* approach continued towards more success while ignoring the *apps* as viable alternatives, while the sensitive entrepreneur will want to forget about the *e-forms* approach and sets his hopes on the *apps* approach.

In an anti-federalist climate I doubt that an e-CODEX Consortium will have much support from a CEO that is sensitive to

the political climate of the times. Both sensitive entrepreneur and EC will be chilled from claiming the *ping* and *e-form* services to be infrastructural necessities in the light of available services.

This will be different for the service providers, for the professionals involved and for the users/consumers. The service providers will see profit in any possibility for a job and prefer all strategies to be realized in any political climate. The professionals would profit from the availability of the *ping* and *e-mail* services and will thus support their development, yet they will experience the application services as false competition and be against them – in both climatic options. The end users will in any climate welcome any effective support, so they will welcome all strategic services except e-forms (based on its recent track record). I further assume that the arguments for patterns 3-5 are working for every column in our model.

### Specialist 2: the Legal Theorist

I assume the role of the legal theorist myself (after all this is a simulated example) and focus on the part of *the Matrix* that is in my domain (I even have been formally educated in the law). This is the column for the specialist on hierarchical organization. As a legal theorist<sup>51</sup> I am keenly aware of the forceful influences that moral climates exerts. In this, I consider two brands: one is celebrating *equity and individual fairness* and the other is *formal and ritualistic*. To keep things simple I consider these two regulatory climates can be at work in the environment where the updated e-CODEX service aims to survive.

*The question for the legal theorist is to find values for the strategic choices per pattern for senders that are, in their roles, kin to the prototypical civil servant.*

After some deliberations I came up with two estimations of the second column of *the eCM Matrix*. They are in Table 9.

Again, the Contents of Table 9 are *estimates*. First I decide on the role of the legal theorist that I am going to play. I

sender tag [aa]: laisser aller — control	equity	ritual
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur (eCM plan)	ppnn	pppu
2. CEO (EC, MSs & e-CODEX Consortium)	ppnn	pppu
3. IT Service providers (build, deploy)	pppp	pppp
4. Professionals involved (DCSs, Legal)	ppuu	ppuu
5. End users (SMEs)	ppup	ppup

Table 9: *The Legal Theorist's Column in the eCM Matrix in a control and a laisser-aller climate*

choose to look at the differences that can be expected between two moral climates in the jurisdiction. One prefers its judiciary to focus on equity and cares for the independence of individual judges and one is prefers its judiciary to behave ritualistically as the '*bouche de la loi*', which assumes the law to be clear and easy to apply. In such a climate, e-forms will be favorite.

This is exactly what I tried to express in Table 9. In a moral climate that favors equity the *ping* and *e-mail* strategies will be preferred by the sensitive entrepreneur and the CEO alike. They will be neutral towards *e-forms* and *apps*, depending on the necessity to spend individual legal attention to the case at hand.

In a moral climate that favors judges to remain close to the written text of the laws, the e-form strategy will be popular. Apps will be unpreferred because they carry the risk of opening up the legal practice to too much detail and diversity in its processing.

### Specialist 3: the Economist

I assume the role of the economist myself (after all this is a simulated example) and focus on the part of *the Matrix* that is in my domain. This is the column for the specialist on wealth. As an economist,<sup>52</sup> considering the volatility in attitudes in Europe and member states towards economic main streams, an eco-political attitude favoring neoclassical economics may be swept away by an attitude favoring new institutional and or

behavioral economics (and back again) any moment. These are the two economist climates I will consider. I tag a neoclassical climate as *free* and a new-institutional climate as *curbed*.

*The question for the economist thus is to find values for the strategic choices per pattern for senders that are, in their roles, kin to the prototypical entrepreneur.*

After some deliberations I came up with two estimations of the third column of *the eCM Matrix* — one for a *new institutional* economic climate and one for a *neoclassic* one. They are in Table 10.

sender tag [ba]: new institutional — neoclassical	curbed	free
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	p p n n	n n n n
2. CEO (EC, MSs & e-CODEX Consortium)	p p n n	u u u u
3. IT Service providers (build, deploy)	p p p p	p p p p
4. Professionals involved (DCSs, Legal)	p p u u	p p u u
5. End users (SMEs)	p p u p	p p u p

Table 10: *The Economist’s Column in the eCM Matrix in a neoclassic and a new-institutional/behavioral climate*

Again, the Contents of Table 10 are *estimates*. First I decide on the role of the economist that I am going to play. I choose to look at the differences that can be expected between two eco-political climates in the EU economy. One prefers its economic policies to focus on the free market and one prefers its economic policies to also address issues of wealth distribution. I will tag the options with ‘*free*’ and ‘*curbed*’ respectively.

When operating in a predominant new-institutional/behavioral climate, senders in pattern 1 and 2 will be positive towards regulation by law or contract of the *ping* and *e-mail* strategies and positive towards regulation by contract for the *e-forms* and *apps* strategies.

When operating in a predominant neoclassic climate, senders in pattern 1 and 2 will be positive towards regulation by contract of all services.

## Specialist 4: the Network/Computer Scientist

I assume the role of the network/computer scientist myself (after all this is a simulated example) and focus on the part of *the Matrix* that is in my domain. This is the column for the specialist on creating functions for users and consumers. As a network/computer scientist, considering the volatility in network-computer science attitudes in the world I juxtapose two of these in my modeling: the *AI-inspired* and the *System-Inspired* climates for applied computer science.

*The question for the scientist is to find values for the strategic choices per pattern for senders that are, in their roles, kin to the prototypical technology provider.*

After some deliberations I came up with two estimations of the fourth column of *the eCM Matrix* — one for an *AI-inspired* network-research climate and one for a *System-inspired* network-research climate. They are in Table 11.

sender tag [bb]: AI inspired — System inspired	AI	System
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	p p p p	p p n n
2. CEO (EC, MSs & e-CODEX Consortium)	p p p p	p p n n
3. IT Service providers (build, deploy)	p p p p	p p p p
4. Professionals involved (DCSs, Legal)	p p u u	p p u u
5. End users (SMEs)	p p u p	p p u p

Table 11: *The Network/Computer Scientist's Column in the eCM Matrix in a neoclassic and a new-institutional/behavioral climate*

Again, the Contents of Table 11 are *estimates*. First I decide on the role of the scientist that I am going to play. I choose to look at the differences that can be expected between two climates for applied computer science in the EU. One prefers its services to take over human tasks as much as possible, even beyond where the human can no longer control how services decide to serve. The other one prefers its services to stop where

its user no longer understands (and can agree or disagree with) how behaviors are guided. I will tag the options with ‘*AI*’ and ‘*System*’ respectively.

When operating in a predominant *AI-inspired* climate, senders in pattern 1 and 2 will be positive towards the possibilities of AI-based services for all four strategies. *Ping* and *e-mail* strategies can be improved with AI technology and the same will be expected for the *e-form* and *app* strategies. Attempts with automatic translations of legal stuff in an EPO context may be viewed upon with high expectations.

When operating in a predominant *system-inspired* climate, senders in patterns 1 and 2 will have less expectations for IT solutions of *e-forms* and *apps* in a context where the exchanges between member state legal practices get semantically more demanding than the *ping* and *e-mail* services. In the model the other strategies provide neutral resources because IT applications are evolving fast.

## Recombining Specialist Opinions

An unusual corollary of the generalizations over the nDT prototypes as accommodated by *Epiframe* is that a difficulty emerges when one wants to compute values exchanged during transactions. The four different prototypes nurse different values that are either impossible or difficult to replace. And by most individuals and in most institutions, all four values are recognized as important, concurrently. This is the main issue for a normative debate.

I decided to not solve this “problem” by modeling it away and allowed my toy world to emulate this approach. Consequently I model resource exchanges of all four currencies concurrently in each and every transaction.

In tier1 of the agent-based model of e-CODX I focused on the transactions between the user and the service. These are many and completed in short spans of time.

In tier2 of the model I focus on the first *eCM* process, on

the first major upgrade of the EPO service, which I present as a few transactions between many players that only occur once every two years. Earlier, I selected 5 patterns to model this. Let me revisit them for considering their weights in the normative debate.

## Revisiting the *eCM Matrix*

Earlier I introduced the eCM Matrix as a structure with no other content than question marks.

sender tag	[ab]	[aa]	[ba]	[bb]
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	?????	?????	?????	?????
2. CEO (EC, MSs & e-CODEX Consortium)	?????	?????	?????	?????
3. IT Service providers (build, deploy)	?????	?????	?????	?????
4. Professionals involved (DCSs, Legal)	?????	?????	?????	?????
5. End users (SMEs)	?????	?????	?????	?????

Table 12: *The preliminary eCM Matrix*

Since, I have suggested ways to replace the question marks with resource values for the senders (in the respective patterns) as estimated by specialists. I modeled these specialists too. Each of them is in one of two positions that represent one side in the current social/political/economic/technologic climate they find themselves in. We get a lot of possible scholarly climates this way.<sup>53</sup> All of these I can instantiate in the Matrix, based on what has been done thus far. I show two combinations to illustrate their use in Tables 13 and 14.

### The ‘current climate’

Climatic configuration of what I see as brands in disciplinary convictions<sup>54</sup> form the environment for the normative debate on

the *eCM* project. I chose a configuration where the community-related climate is pro EU-federalization rather than nationalistic, the legal-practice related climate is more strict law-text based than equity based, the economical climate is more sensitive to wealth-distribution issues than the neoclassical option and the climate for innovative services is more AI-inspired than systemic oriented. The result is in Table 13.

specialist tags respectively: [ab] [aa] [ba] [bb]	soc	law	eco	science
specialist environments: [pro] [ritual] [curbed] [AI]	pro	ritual	curbed	AI
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	ppup	pppu	ppnn	pppp
2. CEO (EC, MSs & e-CODEX Consortium)	pppu	pppu	ppnn	pppp
3. IT Service providers (build, deploy)	pppp	pppp	pppp	pppp
4. Professionals involved (DCSs, Legal)	ppuu	ppuu	ppuu	ppuu
5. End users (SMEs)	ppup	ppup	ppup	ppup

Table 13: *The Combined Columns in the eCM Matrix in a pro federalist — regulate by law — new institutional — AI-inspired EU Community*

Table 13 combines resource estimates by four specialists for all four values involved, for senders in the five patterns. The table invites several readings, per line and per column. I give a few example readings.

**Per line per strategy.** For pattern 1 this suggests that the *ping* and *e-mail* strategies will be preferred [p p p p] in all four values (say, identity, security, wealth and independence) and that resource values for the *e-form* strategy are mixed which indicates that the sensitive entrepreneur's peers vote against pursuing the *e-form* path [u p n p]. In the current climate configuration the estimated resources for the *app* strategy are mixed too, but differently [p u n p] which tells us that upgrading with *apps* may be legally dubious —for instance because in the legal climate such might be interpreted as an infringement on

an existing policy on decent competition between publicly and privately funded services. All in all, the four specialists agree on advising to focus on ping and e-mail, and only opt for apps when the legal reservations can be met effectively.

**Per column per strategy.** For column 1 (the social scientist's view on the community-man aspect) the *ping* and *e-form* strategies are profitable for all senders ([p p p p p], twice). The *e-form* and the *app* strategies are, as European e-CODEX EPO services less attractive in several patterns (1, 2, 4, 5). Only pattern 3, where the commercial IT providers have the initiative, all possible jobs are welcome.

The idea behind the use of such *Matrices* for normative debates follows when I have illustrated how climate dynamics can be handled.

### The 'future climate'

specialist tags respectively: [ab] [aa] [ba] [bb]	soc	law	eco	science
specialist environments: [anti] [equity] [free] [system]	anti	equity	free	system
strategies (ping/email/form/app)	p/e/f/a	p/e/f/a	p/e/f/a	p/e/f/a
1. Sensitive entrepreneur ( <i>eCM</i> plan)	uuuu	ppnn	nnnn	ppnn
2. CEO (EC, MSs & e-CODEX Consortium)	uuuu	ppnn	uuuu	ppnn
3. IT Service providers (build, deploy)	pppp	pppp	pppp	pppp
4. Professionals involved (DCSs, Legal)	ppuu	ppuu	ppuu	ppuu
5. End users (SMEs)	ppup	ppup	ppup	ppup

Table 14: *The Combined Columns in the eCM Matrix in a pro nationalist — regulate by contract — neoclassic — System-inspired EU Community*

Climatic configurations of brands in disciplinary convictions form the environment for the normative debates on the *eCM* project. I choose another configuration for considering a possible future climate where the community-related climate is anti

EU-federalization rather than pro, the legal-practice related climate is equity-based rather than strict, law-text oriented, the economical climate is more sensitive to economic growth than to wealth-distribution issues and the climate for innovative services is more systemic-oriented than AI-inspired. The result is in Table 14.

Table 14 again combines resource estimates by four different specialists for all four different values involved, for senders in the five patterns. I again give a few example readings.

**Per line per strategy.** For pattern 1 this suggests that the *ping* and *e-mail* strategies will be unacceptable in the EU communities with nationalistic orientation because it may be considered likely that such services are dangerous to national independence when in the hands of the EC. When these communities are dominant in the political scene, the civil servants and institutions will be sensitive to the sentiment and stop to frame the initiative as a public service or stop the thing all-together. The economic climate does not help either as the investments in public e-CODEX services may be interpreted to create unfavorable market externalities.

**Per column per strategy.** For column 1 (the social scientist's view on the community-man aspect) the *ping* and *e-form* strategies are profitable for all commercial senders in the model ([u u p p p], twice). So in the future climatic configuration private parties may behave inconsistent with it and prefer the infrastructural communication service to be provided by the government, while the same climatic configuration prevents the member-state judiciaries to trust the service when provided by the EC. A quandary.

So let me now finish the Chapter.

## What Did We Gain for the Normative Debate?

Let me, for once, quote myself from this very book when discussing what we can gain with agent-based modeling for the normative debate.

Agent-based modeling is one of a quartet. It can do what statistics and game theory can not: show *ex ante* how a complex adaptive *computational* system, as a proxy for a complex adaptive *social* system, will react to internal and external adaptations.

I have shown that this can be applied in several conditions, conditions that John Holland considered appropriate for Tier1 and Tier2 models of one and the same system. Modeling was constrained by assumptions derived from the five theories mentioned in the introductory Chapter. These assumptions mainly found expression in how to combine and relate resource values to tags, patterns and strategies in *Matrices*.

I did use tier1 modeling twice, for understanding user behaviors of services by KEI and by e-CODEX. I used an approach to model artificial-agent behaviors in toy communication systems for understanding unsatisfactory situations post hoc. For e-CODEX EPO an opportunity to empirically falsify it did not do so.

I did also use tier2 modeling twice,<sup>55</sup> for understanding how the institutional players in these systems did (or could) make their deliberate behavioral choices.

There is a severe distinction with the tier2 models discussed: the numbers of cases are low and their duration long. The modeling exercise provides techniques to make opinions and assumptions and hypotheses visible and available for debate, even for supportive computation. Unlike many who (like me) have limited energy for processing heaps of computations, collections of tier2 *Matrices* (which can show explosive numbers when additional climate configurations are taken into account) can be computationally processed in any way one may consider useful for the debate.

Such is useful for authentic normative debates in modern times.

## Chapter 6

# Finale

In January 2018 I started on a project under Ernst Steigenga's supervision that we named 'MOOC on e-CODEX.' We wanted to learn from something complex like the e-CODEX project. How could it turn into a success where almost all complex governmental IT projects run into trouble (in the Netherlands, for instance)? At the time, e-CODEX had been completed for 2 years and operated as a European IT instrument with an interoperability-layer function between member-state judiciaries. One problem was emerging, however. It concerned limited user volumes.

Like most investigations into governmental IT projects I began with studying the technology and by making video materials on the requirements for and the architectures of e-CODEX as a service that has to be designed and built. An extra set of videos was made and dedicated to introduce a few tools for the more holistic modeling approaches as guided by complexity theory. One important aspect was the discussion of agent-based modeling as an instrument that can help to understand complex services and situations.

In April this video material was completed. I considered the MOOC on e-CODEX project ready for its next phase, which was planned to be on how different specialisms could cooperate on debating actions to be taken in order to improve e-CODEX's fitness to survive in its environment. In that very month something very odd happened. The Dutch judiciary had been working on a huge, ambitious and complex IT project to transform

its operations in one sweep from a paper-based legal practice into a digitized legal practice. The sweep was to be realized in May 2018. In April 2018 the project failed and was withdrawn for a ‘reset.’ The project had been named KEI (which is, ironically, a Dutch acronym for Quality and Innovation). It was interpreted as yet another disaster with an ambitious and complex governmental IT project.

The first thing I thought was, naturally, that the KEI project provided an interesting use case for calibrating whatever knowledge the MOOC could and would bring to bear. And the second thing that I thought was that framing projects like the KEI project, as an IT project invites specialists to withdraw in their bubbles. And thus invites them to legitimately ignore the possible contributions that may emanate from their bubbles into the other one, now enclosing the disaster.

By June 2018 I was ready to build an agent-based model to investigate how the KEI project could have happened. Actually building the model for investigating a complex IT-related situation would deliver a proof of concept to the MOOC. It did — and thus provided material for peer reviewed contributions to an international conference in September 2018 and a political-science oriented internet journal in January 2019.

Now that the MOOC project is finished I take a moment to look back, because I see a serious problem with my MOOC. On the one hand I believe it provides access to knowledge and thought styles that are essential for improved handling of complex, IT-related public services. On the other hand I do believe that the material that I have made available (the videos and this book) are too intensive for an audience that is responsible for such services.

Most likely this target audience will not have the time nor the ambition to jump the hurdles that had to be constructed for showing the materials offered to be scientifically grounded. For this audience I provide the remainder of this Chapter, which is in natural language and without footnotes and references.

## Histories Unfolding

Projects, agents — actually most things that I can think of are unfolding and have histories. They all are, like Wendell Holmes Jr. mentioned around 1920 at a dinner speech in Harvard “... like the grub that prepares a chamber for the winged thing it has never seen but is to be ...”

The metaphor is important. It shows our condition as being anchored to volatile physical forms, and as being situated in an environment that can be beneficiary or hostile at will, and as being anchored to a time line that leads into the unknown while it requires us to behave and make choices with bounded rationalities — bounded both by limitations in knowledge *and* by limitations ordained by genetic form.

The metaphor warns us for what another quote by Oliver Wendell Holmes Jr. submits: that “... logical method and form flatter that longing for certainty and for repose which is in every human mind. But certainty generally is illusion, and repose is not the destiny of man ...”

These are forceful statements. They warn against looking at things as fixtures. One way to take heed is by relating projects and agents (and all other things) under scrutiny to a time line and looking for phases that are helpful to understand the issues. Let me first discuss e-CODEX as linked to a generic time line.

## A Generic Time Line

My modeling efforts have taught me that the e-CODEX project can usefully be linked to three unfolding phases:

1. *young* e-CODEX (while the service machinery is being designed and built),
2. *adolescent* e-CODEX (while the machinery is there, but organizational embedding is not yet established) and
3. *mature* e-CODEX (when organizational embedding is established, policies are decided upon and a self supporting

business model is implemented).

These different phases require different organizational settings. Like biological phenotypes do need their DNA with its environment to unfold into actual beings does *young* e-CODEX need a blueprint with an implementation crew to unfold into an actual service. This phase has been realized in the 2010-2016 period successfully. From a design-and development perspective this is not so very spectacular, the functions implemented were not new in a technical sense and those technical services needed for integration were available and well documented. Moreover, funding was taken care of by the EC, together with the member-state governments that backed the project. My assessment is that this phase has benefitted from its focus on available technology and from fine management of- and cooperation between working-package implementation teams. The last observation *is* spectacular. Young e-CODEX could succeed only because of the uncommon coherent and cooperative attitudes and behaviors of team members allocated per member state to different working packages.

*Adolescence* is the phase between youth and maturity, where the adolescent rambles around to find a niche where it can settle. Here are the time and the place and the necessity to experiment. This is the phase where e-CODEX is in at the moment of writing. It is currently working towards an identity within the European Union. It is looking for an organizational anchor — to offer a stable service repertoire to stable user communities under stable business conditions.

The instability of the adolescence phase is where agent-based modeling becomes difficult: too much is fluid and too many choices are open. This is a challenge — not only for e-CODEX, but also for modeling e-CODEX on its way to become a mature social institution. I nevertheless made an agent-based model of adolescent e-CODEX and studied the resulting toy world for behavioral clues. Clues that claim to be useful for the normative debate between the stakeholders who share the responsibility for e-CODEX governance.

## e-CODEX's Institutional Fate

So here we are, at the very spot where my results can be useful. What can I advise the e-CODEX team to do for increasing its odds to survive? What did the agent-based oracle I created tell me?

**The problem.** The goal is to understand why young e-CODEX succeeded and adolescent e-CODEX is struggling to find its feet. The assumption is that e-CODEX-supported European Payment Order user volumes are indicative. The problem to be addressed in the MOOC became: *Can e-CODEX-supported EPO user volumes be improved, and if so, how?*

**The principal's end goal's four elementary functions.** Can finding a solution to the problem contribute to the formation of a mature e-CODEX? To the emergence of an e-CODEX service that has a stable identity within the European Union, that is settled and has a stable *organization* and offers a stable *service repertoire* to stable *user communities* under stable *business conditions*? I accept these four functions (organization, service repertoire, user communities and business conditions) as indicative for e-CODEX's path towards maturity.

**The current state of affairs.** What is the current state of affairs? The current (December 2018) state of affairs of the e-CODEX project is conveniently sketched in a graph by the e-CODEX team that is displayed n Figure 22. It shows a house for e-CODEX. I read it it as a metaphor for the path to mature e-CODEX. It shows that there is much more to e-CODEX than EPO user volume alone. We see applied e-CODEX services, candidate services, building blocks, methods and core services.<sup>56</sup> The latter are the central testing platform and the connector framework. These are — with the e-CODEX interoperability layer itself (lets call it e-CodexIL) — required to make a service operational. Most revealing in this representation of

the state of the art anno December 2018 is that e-CodexIL is not in the picture as a separate service at all.

This gives a handle for describing the December 2018 state of the art in terms of the four functions. The *organization* is currently delivered by a proxy based on contract and agreements: the e-CODEX Consortium. The operational *service repertoire* consists of five services. These can be distinguished in services that target individual civilians as users (open services like EPO and SC) and services that target institutional users (closed services like EIO, BRIS and FP, but also the testing platform and the connection framework). Open services are — qua *user communities* — accessed through the e-Justice Platform. Access to closed services is negotiated ad hoc with representatives of the Consortium. Access policies and requirements are not published — perhaps not even available. Policies and requirements for remuneration of the use of e-CODEX services are not published either (the fees required during the EPO service are court fees, not e-CODEX fees). This prevents a clear picture of the *business conditions* that can help shape and sustain mature e-CODEX.

Such was the picture of the state of affairs of adolescent e-CODEX when I began to model it.

## Modeling Generalizations

Modeling toy worlds requires generalization. Actors are agents and agents are either individuals or institutions. Agents have, like humans quite diverse and individual natures. I generalize over individuals and institutions alike in four prototypes — adding three to the obligatory homo economicus: the community man, the consumer and the civil servant. The values that these types prefer are different: the civil servant craves for law and order, the consumer for independence, the community man for solidarity and the homo economicus for wealth. Such prototypical individuals prefer to be part institutions of similar inclinations, which are expressed in organizational forms:

the homo economicus likes markets, the community man likes communities, the consumer likes networks and the civil servant likes hierarchies.

	<b>Values/currencies</b>	<b>Structures</b>	<b>Constituents</b>
<b>community man</b>	solidarity	community	member
<b>civil servant</b>	law and order	hierarchy	subject
<b>homo economicus</b>	wealth	market	entrepreneur
<b>consumer</b>	independence	network	user

Table 15: A few generalizations

I give a summary of these generalizations in Table 8 . They are useful for modeling because they reduce the options. And they are backed by serious theory from anthropology.

**An unusual corollary.** An unusual corollary of the generalizations over these prototypes is that a difficulty emerges when one wants to compute the values exchanged during transactions. The four different prototypes nurse different values that are either impossible or difficult to replace. And by most individuals and in most institutions, all four values are recognized as important, concurrently.

I decided to not solve this “problem” by modeling it away and allowed my toy world to emulate this approach. Consequently I model resource exchanges of all four currencies concurrently in each and every transaction. The organizational forms all need to have a substantial presence in a stable institution’s social fabric and in return help to nurse the institution’s fitness to survive. Reversely, if the value of a public service is below par for members that prefer a specific form, these may jump ship or revolt, which can be risky to the fitness of the whole service. In other words, purity of organizational form is a danger to, not an asset for institutions.

Let me now show the results of my modeling. It may be useful to remind you that I focus on the volumes of e-CODEX-mediated EPO use.

## Cases (the Results)

**On stable user communities.** In my model user communities form with their behavioral choices. Creditors can activate the payment order procedure through the e-Justice Portal or via professional debt collecting services (DCSs). The Portal works via an e-CODEX service. So the ratio of creditors that work directly via the Portal versus the creditors that employ a DCS is indicative.

To model an estimate, I follow the most probable path of a first-time potential user. I assume he does not know the procedure and investigates the web for clues. At the first attempt he will find several DCSs offering their services. Whether he finds a reference to the Portal depends on the search terms used. I guess that half of those that do not use “EPO” or “European Payment Order” remain unconscious of its existence. So 50% potential members for the targeted user community remains.

DCS	100%	EPO
50%	Google	50%
75%	Portal	25
87%	Beta	13%
93%	Form A	7%

Table 16: Form Finding

Those that get to the Portal have to negotiate what the materials that will guide them to the forms that need be filled in. For those that do not try the “new” beta version of the Portal (again 50%), these forms are so difficult to find, that I estimate that another

50 % again turns to the help of a DCS. All of those that do attempt the beta version will get to the forms, I guess. So 13% of all potential users arrive at the forms. These forms are essential for activating the EPO procedure.

It is getting worse. Those that reach the forms and that read the explanations find that these must be filled in in the language required by the judiciary that is addressed. Again I guess that half of those that reach the forms turn away from the EPO and again turn to a DCS or abandon their quest. My simulation run leads to the suggestion that the size of the EPO user community is in the order of 7% of its potential

size. *Statistics available at the e-CODEX team on the EPO practice in Germany on incoming requests during 2018 show the percentage to be a stunning 6.6%.* (No falsification here, I am afraid, not even of my very rough estimates.)

e-CODEX has other user communities too, with closed services. I did not investigate them, but I guess their user volumes will be better, because they are presumably designed and supported by the professionals that use them, co-fund them and that advise on continuing the service, and that can provide feedback on quality to the service providers directly.

*Claim 1.* The quality of the EPO service is sufficiently low to account for the causes of all of e-CODEX's problems that I was asked to investigate. To gain a better supportive audience, sufficient for a stable mature function, the quality and the public profile of the service have to be raised substantially.

My personal doubts on whether the EPO service can be improved sufficiently at all, as a public service, to compete with the services of (networks of) DCSs relate to the independence and volatility of institutions (also of member-state legal systems) and to the difficulties this raises against interoperability services of high semantic ambitions. In my experience such services tend to fail unless they succeed in providing intoxicating quality like Wikipedia. I do not expect an "EPO-Wikipedia-like community" to emerge easily. I would not be surprised when similar ambitions are or have been behind the creation of the e-Justice Portal. Yet its quality is an insult. Probably because the professionals that would be competent to provide quality content on the diverse legal EU systems rather keep it to themselves in order to earn a living with it.

**On a stable organization.** The current organization is based on agreement and participation in the project as it is being continued on its way to maturity under recurrent (new) funding arguments that sufficiently convince the EC and the member states to invest. As far as I know, there is no competent hierarchy. When I would model it, e-CODEX would be a collective

in the hierarchy provided by the EC.

*Claim 2.* A non-existent hierarchical organizational structure is a risk when strategic decisions have to be made urgently. For instance on formulating policies on who may use and deploy the interoperability layer for what services to whom and under which conditions.

It is — I think — advisable to prepare a hierarchical organizational structure in order to have a proxy available when needed.<sup>57</sup>

**On a stable service repertoire.** In its adolescent phase the service repertoire is functionally volatile, and should be so. My findings make the EPO service in its current state more of a liability than an asset to the e-CODEX project. The issue may be of vital importance to the EC, though, as an important funding institution with ambitions. Although important for e-CODEX's maturation, I consider the issue outside the scope of my project.

Qua working towards a stable service repertoire a few policy decisions seem in order. One concerns the division between infrastructural services and application services and the related attitudes to be struck on issues (like public-private cooperation – for instance on clearing-house functionalities) that may trigger suggestions of personal-data protection, state-aid and/or competition regulation infringements. Again I consider these issues outside the scope of my project.

**On stable business conditions.** The current business model is not really stable, as it is largely depending on funding by subsidy. Again, although important for e-CODEX's maturation, I consider these issues outside the scope of my project.

## Closure

I did use tier1 modeling twice, for understanding user behaviors of services by KEI and by e-CODEX. I used an approach

to model artificial-agent behaviors in toy communication systems for understanding unsatisfactory situations post hoc. For e-CODEX EPO, an opportunity to empirically falsify it did not do so.

I did also use tier2 modeling twice,<sup>58</sup> for understanding how the institutional players in these systems did (or could) make their deliberate behavioral choices. There is a severe distinction with the tier2 models discussed: the numbers of cases are low and their duration long. The modeling exercise provides techniques to make opinions and assumptions and hypotheses visible and available for debate, even for supportive computation. Unlike many who (like me) have limited energy for processing heaps of computations, collections of tier2 *Matrices* (which can show explosive numbers when additional climate configurations are taken into account) can be computationally processed in any way one may consider useful for the debate.

And that is why we may need computational support for doing the agent-based modelling. Considering tier2 of e-CODEX (for the normative debate on what target to choose for the current *eCM* effort), there appear 4 specializations, each with 2 ‘mainstream climates’, which results in 16 different possible configurations for the recombination of specialized expertise on a single situation (the *eCM* situation) — and all of these configurations have interpretations. We need computational power to handle them.

Such is, I claim, useful for authentic normative debates on governmental IT services that attract complex adaptive social systems formed by the individuals and institutions that use and deploy them.

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## Notes

<sup>1</sup> The Dutch representative in the e-CODEX Consortium.

<sup>2</sup> 1969-1973 at the Center for Data Analysis of the Social-Sciences Faculty at Utrecht University, 1973-1975 at the Technical Center of the Social-Sciences Faculty at the Municipal University of Amsterdam and 1975-1985 at the Computing Bureau of the Law Faculty at Leiden University.

<sup>3</sup> I gained my LLM in 1972, my Ph.D. in 1987 and initiated eLaw@Leiden in 1985, where I kept various positions until becoming professor emeritus in 2010.

<sup>4</sup> Kunbei Zhang, now associate professor at Chongqing Technology and Business University.

<sup>5</sup> See for instance Zhang & Schmidt (2015), Ruhl (2008).

<sup>6</sup> NetLogo is an open source platform for implementing and running simple agent-based models. It runs on virtually all personal computers and is available at <https://ccl.northwestern.edu/netlogo/>. I made the modeling of toy versions of e-CODEX and KEI a combined effort that I realized in NetLogo.

<sup>7</sup> Parameters are variables whose value settings influence the simulated behaviors.

<sup>8</sup> Nietzsche (1873) has a fascinating discussion of the issue.

<sup>9</sup> See, e.g., Vaihinger (1924/2014), Fuller (1930).

<sup>10</sup> See, e.g., Durkheim (1893), Coase (1937), Douglas (1986), Greif (2006).

<sup>11</sup> Normative debates are thus elitist affairs and cannot, when a democratic perspective is adopted, displace the political debate.

<sup>12</sup> Agent-based modeling of complex adaptive systems often focuses on system dynamics — feed-back loops, critical transitions, resilience and scale-free mechanisms are often mentioned.

<sup>13</sup> Schmidt & Zhang (2019)

<sup>14</sup> “The EU today launched the European e-Justice portal - an electronic one-stop-shop for access to justice throughout the EU. The web site benefits citizens, businesses, lawyers and judges with cross-border legal questions and boosts mutual understanding of different legal systems by contributing to the creation of a single area of justice.” (Published by the UIHJ at [https://www.uihj.com/en/launch-of-the-european-e-justice-portal\\_1019665.html](https://www.uihj.com/en/launch-of-the-european-e-justice-portal_1019665.html))

<sup>15</sup> A turn of phrase ascribed to Oliver Wendell Holmes as used in a dinner speech for the Harvard Law School Association in New York, 15 February 1913.

<sup>16</sup> As a Dutch service for digital communication for justice, across institutional jurisdictions, KEI will need to serve one supreme court, five courts of appeal, eleven courts of first instance, and, in all, several hun-

dreds of municipal, provincial and national agencies with public function and, on top of that, several thousand different legal and paralegal firms and professionals. These have all diverging institutional ideas on, say, security, cooperation, autonomy, efficiency and efficacy and are all organized around public functions like adjudication, legislation, administration, policing and enforcement. KEI's user interfaces and back offices will have to deal with these differences and their dynamics. Although infrastructural communication services with low-level semantic ambitions like HTTP (the web) and SMTP (e-mail) can handle such dynamics quite well, such dealings become more difficult to coherently manage for services with increased semantic ambitions.

One side-effect targeted by the Dutch government (which funds the service's development, maintenance and provision) and by the Council for the judiciary (which manages the judiciary – further: the Council) is that the judiciary will work more efficiently and will be managed more effectively with the digitization of its communication (Boston Consulting Group (2013)). With forms and apps, implementation of semantic ambitions (also for administration and efficiency) becomes within reach. Thus I identify an administrative force that autonomously works towards increasing the service's semantic level.

<sup>17</sup> See Velicogna & Steigenga (2016).

<sup>18</sup> Complexity theory's John Holland designed a framework for understanding complex adaptive systems through agent-based modeling. Complex adaptive systems are systems that involve many diverse, networked components that adapt or learn as they interact. They are at the heart of important contemporary problems (Holland (2006)). All systems that governmental IT services serve are such systems (Ruhl (1996), Zhang & Schmidt (2015)). To see and understand them (KEI and e-CODEX included) requires adequate perspective and tools. Complexity theories provide such (Mitchell (2009), Holland (2014)). John Holland even provided a framework for studying complex adaptive systems (Holland (1995)). He named it ECHO. We use it to study KEI in the domain it serves. We will use this as a guideline for investigating how e-CODEX's condition can be further improved. We will see that such support will demand several types ('currencies') for qualification of added value, *e.g.* financial, protective, social and technologic. I found in the work of a group neo-Durkheimian anthropologists and political scientists (see *e.g.*, Swedlow (2014); Perri 6 & Swedlow (2016)) an adaptive framework that helps us model the artificial worlds that we will study as reality's proxies.

<sup>19</sup> Pace Friedman (1953).

<sup>20</sup> With "evolution" I also refer to non-biological processes that can be modeled in terms of life cycles, reproductive success, variation and fitness.

<sup>21</sup> The reasons for this decision are in the Section on Institutional Form and Human Nature in Chapter 4.

<sup>22</sup> Note on the adoption of the four-value frame. Our (this is a citation from still unpublished work with Kunbei Zhang) roots are in the law discipline. We also and concurrently have roots in different cultures: European and Chinese. These cultures show differences in collective attitudes towards social, legal, economic and individual interests. Despite these differences, Europe and China share a single socio-political universe. When our modeling platform is to serve our cooperative research it needs the capability to respectfully handle cultural differences. We do not find that the powerful assumptions on rationality, preference stability and equilibrium dynamics as widely adopted in neo-classical economics provide sufficient analytic potential for whom it makes sense to differentiate between values like *solidarity*, *order*, *wealth* and/or *independence*. (Kaplow & Shavell (2001) can be read as defending the opposite). To us, the differentiation is essential. We do not think that adopting neo-classical economics as the social theory of everything can deliver it. Although we undoubtably need it for understanding the role of market economics, we do not think that it could with its current assumptions (or anything remotely like them) provide a comprehensive descriptive model that usefully explains the roles of e.g. the law, of communities, of networks of any complex social system's also. We consequently have looked elsewhere for guidance. We need a social-scientific cosmology that does include economics, yet does not strive to reduce human behavior to market behavior alone. We found much in work by Mary Douglas *cum suis* that serves our purpose (Douglas (1978), Douglas & Wildavsky (1982), Wildavsky (1987), Thompson (2018), Douglas (1992), Verweij & Thompson (2006), Ney & Verweij (2015)) and adopt it for the guidance we needed for implementing our brand of Holland's ECHOing framework.

<sup>23</sup> I use simple Petrinets for pattern discovery (agents are Petrinet transformations, registries/registries are Petrinet places, links are Petrinet edges). Like Van Der Aalst (2011) I find them useful for their potential to distinguish actions from states while modeling.

<sup>24</sup> We address the issue of how agents choose. Table 2 relates agent-types with behavioral options in all patterns. Below I report on how I decided on instantiating the *Matrix*, per pattern.

<i>tags × strategies</i>	letter	email	e-form
solidarity loving [ab]	n	p	?
order loving [aa]	p	p	?
wealth loving [ba]	u	n	u
independence loving [bb]	p	p	u

**Patterns 0 & 7.** Here is our kick-off theory on the resource values for a judge who supervises a bankruptcy administration and must communicate an appointment to a trustee. The table reflects the following:

- for an [aa] (public-order loving) judge letters and e-mails are preferred (p) and it is unclear (?) what *e-forms* will bring since they

have been introduced recently and their efficacies, as part of the KEI project being reset recently, are dicey;

- for an [ab] (community in-group harmony loving) judge a letter will be indifferent (n), e-mails will tally with what most of his colleagues will be inclined to do (and thus be preferred) and *e-forms* are again unknown;
- for a [ba] (market efficiency loving) judge letters are old-fashioned (unfavored (u)), email is indifferent and forms are preferred when good and unfavored when unduly demanding - considering empirical evidence I model *e-forms* a unfavored for the time being;
- for a [bb] (independence loving) judge free format messaging will be preferred (letter, e-mail) and *e-forms* will be unpreferred.

<i>tags × strategies</i>	letter	email	<i>e-form</i>
solidarity loving [ab]	p	p	u
order loving [aa]	p	p	u
wealth loving [ba]	u	p	u
independence loving [bb]	p	p	u

**Pattern 1.** Here is our kick-off theory on the resource values for a trustee who has to publish the call for creditor registration in the current bankruptcy procedure. We take it to be a single message tp the press. The table reflects the following:

- for an [aa] (public-order loving) trustee letters and e-mails are preferred (p) and it is unclear what *eform* (when made available by the press) will bring in terms of evidenciary values. Press-initiated *e-forms* are unpreferred;
- for an [ab] (community in-group harmony loving) trustee a the same applies;
- for a [ba] (market efficiency loving) trustee letters are old-fashioned (unfavored (u)) and email is preferred (p). Again press-initiated *e-forms* are unpreferred;
- for a [bb] (independence loving) trustee free format messaging will be preferred (letter, e-mail - p) over *e-forms* (u).

<i>tags × strategies</i>	letter	email	<i>e-form</i>
solidarity loving [ab]	p	p	u
order loving [aa]	n	n	u
wealth loving [ba]	u	n	u
independence loving [bb]	p	p	u

**Patterns 2 & 5.** The Table is our kick-off theory on the resource values for a creditor's messaging to a trustee. The Table reflects the following:

- for an [aa] (public-order loving) creditor letters and e-mails are preferred (p) and it is unclear (and thus unpreferred) what *e-forms* will bring;
- for an [ab] (community in-group harmony loving) creditor letters and emails will be indifferent (n) and *e-forms* are for the moment modeled as unpreferred;
- for a [ba] (market efficiency loving) creditor letters are old-fashioned (unfavored (u)), email is indifferent and forms are preferred when good and unfavored when unduly demanding - considering empirical evidence I model *e-forms* a unfavored for the time being;
- for a [bb] (independence loving) creditor free format messaging will be preferred (letter, e-mail) and *e-forms* will be unpreferred.

<i>tags × strategies</i>	letter	email	<i>e-form</i>
solidarity loving [ab]	p	p	?
order loving [aa]	n	p	?
wealth loving [ba]	u	n	u
independence loving [bb]	p	p	u

**Patterns 3 & 4.** The Table is our kick-off theory on the resource values for a trustee's messaging to a creditor. The table reflects the following:

- for an [aa] (public-order loving) trustee letters and e-mails are preferred (p) and *e-forms* (if available) unpreferred (u);
- for an [ab] (community in-group harmony loving) trustee a the same applies;
- for a [ba] (market efficiency loving) trustee letters are old-fashioned (unfavored (u)) and email is preferred (p). Again *e-forms* (if available) are unpreferred;
- for a [bb] (independence loving) trustee free format messaging will be preferred (letter, e-mail - p) over *e-forms* (u).

<i>tags × strategies</i>	letter	email	<i>e-form</i>
solidarity loving [ab]	p	?	u
order loving [aa]	n	p	u
wealth loving [ba]	u	p	u
independence loving [bb]	p	p	u

**Pattern 6.** The Table is our kick-off theory on the resource values of a trustee who sends a request for commitment to a supervising judge. The table reflects the following:

- for an [aa] (public-order loving) trustee letters are preferred (p), e-mails unclear (?) and *e-forms* are unpreferred as they are as part of the KEI project being reset recently, are dicey;
- for an [ab] (community in-group harmony loving) trustee a letter will be indifferent (n), e-mails will tally with what most of his colleagues will be inclined to do (and thus be preferred) and *e-forms* are again unpreferred;
- for a [ba] (market efficiency loving) trustee letters are old-fashioned (unfavored (u)), email is preferred and forms are preferred when good and unfavored when unduly demanding - considering empirical evidence I model *e-forms* a unfavored for the time being (u);
- for a [bb] (independence loving) trustee free format messaging will be preferred (letter, e-mail) and *e-forms* will be unpreferred.

The contents of these tables are kick-off theories because I do not claim it to be valid as a description of how things work in the real system that our artificial system mimics – what I do claim is that it is an initial formulation of the machinery that works in our artificial world and that we can manipulate in a manner that allows us to reason about falsifying or adapting it based on comparison and interpretation of empirical observations in the artificial and the real world. And that such will enhance our understanding.

<sup>25</sup> For implementing value-processing based choice algorithms we need to convert the codes used for modeling resource values into numerical values. They are in the Table with code conversion rules:

?	(don't know)	random 3 - 1
m	(mandatory)	2
p	(preferred)	random 2 + 1
n	(neutral)	0
u	(unfavored)	random 2 - 2
f	(forbidden)	-2

For KEI we adopt a simple table with converted code values. Application of these rules to Table 1 leads to a numerical version:

	letter	email	<i>e-form</i>
security/order	1   2	1   2	-1   0   1
equality/collective	0	1   2	-1   0   1
capability/efficiency	-2   -1	0	1   2
autonomy/rights	0	0	0

An important caveat is the use of randomization here (random 2 yields 0 | 1). It is a simple approach to model basic forms of autonomy (and, with this, a modeler's uncertainty). An important issue then becomes how to apply the randomization (at preparing the initial state of a run, at new generations, at new periods or at new bankruptcies. We choose to apply the randomization of table 4 with the initiation of individuals at the setup of the run. Thus, each individual gets its own resource-value table. An example (generalized) converted instance of Table 2 is shown in Table 4. Tables 2 and 4 also illustrate our frame for specifying resource values. It suggests that any value involved in a behavioral choice can be situated in one of four categories. Douglas (1992):178 uses quadrants for identifying these categories in a way that tallies with four natural but incompatible organizational forms – hierarchies, collectives, markets and isolates. These organizational forms have different mechanisms that regulate their resource values: laws, norms, price mechanisms and individual ethics respectively. And these organizational forms generate value in different currencies in what they provide to the agents that constitute, invest in and enjoy their institutions, like public order, solidarity, wealth and respect. One may feel a bit ill at ease with a four-currency vector, embedding specialist atomic evaluative concepts that are respected and at home in specialist disciplinary debates, yet seldom considered in concert.

Yet such concert would be the answer to Douglas (1992)'s appeal for normative debates. It would be served by a multiple value-factor approach such as we suggest. We will show what added values and costs an appeal to inclusive rationality bring to our further understanding of complex adaptive social systems. It may be useful to mention that the cultural-theory based assumption on four behavioral types has been widely tested empirically and has yielded a complete social-scientific sub discipline that some call “neo-Durkheimian theory” (Perri & Swedlow (2016)). On the other hand it is wise to realize that within the neo-Durkheimian community a lively debate is proceeding on what is universal in the framework and what is contingent. I look at this debate through a complexity-theory nursed bias or filter which I will discuss Chapter 4.

<sup>26</sup> In the KEI model each single tick is a time slice that contains 20 bankruptcy-handling processes. Each bankruptcy is modeled to generate 20 messages. So one tick/period means 400 messages which in turn mean 400 channel choices. At the end of each period old bankruptcies will be resolved and new bankruptcies will be initiated with newly selected trustees (the yellow, laughing faces, from the pool prepared for them). The slider top-right allows the user to set the amount of periods - 931 in Figure 5. The six graphs in Figure 5 all map their x-scores on ticks. Consequently, these graphs make the dynamics of their y-scores visible over ticks. This is, however, no steady process: breaks happen periodically. These are related to “generations.”

The periods between breaks are set with another parameter. It is the slider, bottom-left in Figure 5, allowing the model operator to set a number of periods that will together define the length of a generation. At each generation switch two things happen. First the set of active judges is renewed. Second, adaptive processes that relate to what I call cultural climate changes are activated too. The judge-renewal process may have influence because it may change the distribution of tags over active judges. Because there are few of them, such may have genetic-drift like effects. The adaptive processes that are sensitive to cultural climate changes have influence, because they have influence on the individual value tables as applied by individuals to make their choices. The four sliders bottom-right below the black square of the world can be set to indicate how the cultural climate on security, solidarity, economy and autonomy has changed (positive or negative). During each generation change such adaptations are effectuated on the individual value tables, but only for the tag-values as indicated with the chooser named “normative debate”. This mechanism for incorporation cultural-climate change into the model’s dynamics may be useful to the researcher/user of the model.

<sup>27</sup> This results from the mechanism that under different circumstances would generate genetic drift in niche worlds.

<sup>28</sup> How does a sender agent choose a channel and what resources will sender and receiver gain/lose by it? The nodes network that has been prepared will identify the pattern, the sender and the receiver. The model will relate individual tags, resource-scores, resource reservoirs and track records to these. The sender identifies the channel with the best sender-tag resource score (one-of when there are ties) and makes his choice accordingly, with accompanying adaptations of track record and resource reservoir. The receiver gets the resources belonging to the channel that has been chosen for him by the sender. The receiver’s track-record and resource reservoir are also adapted, but with resources as-if the sender had been of the receiver’s tag-induced type.

In creating and managing an individual agent’s resources I have chosen the following approach: each choice identifies a complete set of resource values, and this complete set is incrementally added to the resource reservoir of the sender. An example for a market-efficiency loving judge:

<i>pattern (i): tags × strategies</i>	letter	email	e-form
solidarity loving [ab]	n	p	?
order loving [aa]	p	p	?
wealth loving [ba]	u	n	u
independence loving [bb]	p	p	u

The Table tells the judge to select email because the other two channels are unpreferred. This choice induces the quartet of resources in the reservoir of this judge to accumulate the complete resource set (in the email

column in the table: [p p n p]) as these are the resources that accompany the choice.

<sup>29</sup> I will offer some of its content here, in the form of an eclectic collection of citations from De Marchi (2005), who discusses three different modeling approaches in the social sciences: empirical, mathematical (also named: formal or game-theory) and computational. Using an example question on when and why standing ovations occur he sketches what the different approaches will be doing:

... The empirical researcher is establishing correlations between different measures and the likelihood of ovation; the game theorist provides advice on how rational audience members should select strategies; and the computational modeler incorporates aspects of both of the forgoing approaches to produce a dynamic model that recreates a standing ovation ... (p. 10)

These different approaches have a serious problem in common:

... One way to think of this is to imagine every salient choice made by the empirical modeler as a parameter; results are thus conditional statements made upon the particular set of parameter values chosen. Given how large these implied parameter spaces are, one cannot place much faith in a final report of in-sample performance... (p. 12)

So all three forms of modeling are subject to some form of what I call the endemic parameter-selection risk. De Marchi provides three more close-up arguments. For empirical modelers ...

... Journals and monographs, by their nature, only report “positive” results and only the “final” model. How much pain or guesswork or outright cheating at the margins that goes into an empirical paper is never seen in print ... (p. 12)

... and for mathematical modelers...

... A deductive modeler (typically relying upon game theory) would certainly agree with the forgoing critique of statistical methods/econometrics. Moreover, most formal theorists believe that their methodological approach is immune to the flaws that plague other approaches ... (p.12) ... Moreover, all choices that go into a particular formal theory that are left to the modeler should be seen as traversing a very large parameter space; again, this problem mirrors the corresponding complaint levied against empirical modelers. As Peltzman (1991) notes, “Game theory has introduced a rigor in the analysis of rational behavior that was missing [but]

skepticism about the marginal value of recent theory is warranted [because] conclusions drawn tend to be very sensitive to the way problems are defined and to the assumptions that follow.” ... (p.15)

... and for computational modelers ...

... Like the formal theorists, computational modelers often claim that they also have transparent models. Instead of presenting a list of assumptions as a fait accompli as formal theorists do, the best computational models typically provide not only the assumptions but also an idea of what happens to the model’s results when the assumptions are modified. But, despite this potential advantage, the fact remains that most social scientists cannot be expected to wade through thousands of lines of C++ code to understand the inner workings of a computational model, nor do journals and book editors publish such details. Just as with empirical and formal models, we are left with a situation in which one can write a computational model (actually, infinitely many) that will (with the right parameter settings, rules, etc.) produce any given result. The only qualitative differences between computational models and formal theory is that computational models are rather more ecumenical in how they encode problems. Additionally, computational models often possess more verisimilitude at the cost of deductive tractability. One does not “solve” a computational model; one uses it to generate simulated data that one tests with the tools of applied statistics. Computational models are thus related to game theoretic models, except that they usually address more complex problems and lack deductive solutions ... (p.15-17)

By now, de Marchi has succeeded in making the endemic parameter selection risk a serious risk for all three methods. His suggestion in the book is that the combination of methods and approaches may help, especially when out-of sample material is used to try and falsify results. We will follow his lead here.

But there is more. The three methods mentioned are rather recent to the social sciences. In 1969, when I first came eye to eye with them, a fourth method was popular, yet becoming under siege. Lets call it qualitative and acknowledge it to be quite acceptable to legal scholarship. As de Marchi illustrates, the three empirical modeling methods emerged as a reaction:

... “Niou and Ordeshook, for example, cite the transparency of formal theory as an enormous advantage over both qualitative and empirical methodologies:

... But the rational choice paradigm and formalism are not mushrooms that sprung up in an unattended intellectual forest. They are reactions to a discipline mired in imprecision, vagueness, obscure logic, ill-defined constructs, non-testable hypotheses, and ad hoc argument. They are a reaction to a discipline that in the 1920s proclaimed the Weimar constitution the greatest political- intellectual achievement of its age; a discipline that in the 1960s substituted correlation for cause; a discipline submerged in such conveniently vague and ill-defined ideas as “power,” “leadership,” “authority,” “group,” “alliance,” “function,” “ideology,” “culture,” “regime,” “stability,” and “balance.” They are reactions to a discipline that substituted the well-turned phrase for concrete constructs, operational measures for theoretical primitives, and the gloss of methodological sophistication for true theory. They are, in short, a reaction to a discipline that did and does precisely what Walt critiques the formal analyst of doing – burying key assumptions in an indecipherable format, although generally that format was a language more to the liking of those who studied French and Plato in college rather than calculus. (Niou and Ordeshook 1999, 87)

In addition, it is obvious that Niou and Ordeshook draw a sharp distinction between the results of formal theory (which are uncontested; that is, the results follow deductively from the premises) and empirical work that could be rife with spurious correlation” ... (p. 12-13)

<sup>30</sup> Of course, the rather Apollonian specialists in artificial intelligence and (un)supervised learning technologies are looking enviously to displace the autonomy of qualitative reasoning as the cornerstone for political and legal sense making. Anno 2019, the almost universal (in China and in the West, that is) support for their combined attempts to dominate both the Apollonian *and* the Dionysian would break Nietzsche’s heart (if it weren’t broken already), I guess.

<sup>31</sup> ECHO is a conceptual framework for designing agent-based models that serve to investigate complex adaptive systems. John Holland, who was a founding father of genetic programming, squarely faced the difficulties involved in researching complex adaptive systems and invented — at least conceptually — a complex adaptive model to do so and named it ECHO. Holland claims ECHO to be useful for complex adaptive social systems too, but mainly considers complexity in physical systems. I will focus on social systems with deliberative agents.

<sup>32</sup> Which implies that both *Epiframe* and its applications (as agent-based models) have variables for representing the information required by ECHO.

<sup>33</sup> Although ECHO seems to never have gained a broad following in applications, I have adopted its assumptions explicitly as constraints for designing with *Epiframer* because it is made available by a recognized authority, is the only framework directed to help understand complex adaptive systems available and does naturally allow my interpretation of nDT results. One of these needs special mention because it fits nicely in with nDT: the idea that an agents' agency depends on tags and conditionals (as required by ECHO). I use these to model aspects of an individual's agency as partly social and partly physical (as is currently widely accepted in neuroscience. See for instance Gazzaniga (2011) and Sapolsky (2017). As it is not feasible to model human agency in a completely deterministic manner, I will often use randomization for emulating independent intelligence in groups.

Some of the intricacies in modeling complex adaptive systems are related to the assumption that agent behaviors are situated in environments (like jurisdictions) that, in turn, are agents too, assumed to behave deliberately themselves also, but of a different order and living in environments of again different orders (like the Netherlands in the EU and in NATO and in the UN). Holland suggests to at least consider two of these levels (better: orders) and suggests to name them tier1 and tier2 respectively — again an enormous reduction of modeling options.

<sup>34</sup> Source code available at <https://github.com/dotlegal/Epiframer>.

*Epiframer* is meant to be easily forked to implement and run any agent-based model that serves to research the behaviors of a complex adaptive social system. Forking and adaptive implementation may require some programming skills (and support from its author).

<sup>35</sup> Modelers have to generalize — like economic modeling shows with its *homo economicus* — and sometimes with devastating results. In economics, the assumptions involved have ignited serious discussion that have propelled serious work to add sophistication to the economist's models (e.g., DSGE models) but they also have caused havoc when adopted by the general public and abused by tale-trading 'hawks.'

<sup>36</sup> A contention fundamentally falsified around a century ago in Durkheim (1893) and in Coase (1937).

<sup>37</sup> Consider, for instance, Akerlof (1984) and Kirman (2010)

<sup>38</sup> See Durkheim (1893)

<sup>39</sup> Durkheim (1893), especially its Preface to the Second Edition (p. xxxi - lix) from 1902.

<sup>40</sup> Like many, I choose 'nDT' for their field's name. Several other names float around, like 'Group-Grid theory,' 'Cultural Theory,' the 'Cultural theory of Risk' and 'CT.' For the current discussion I am deeply indebted to several prominent scholars in the neo-Durkheimian scientific community. When I showed them my choices for application of their theories in the context of my fight against the endemic parameter-selection risk to

my project, I received several critiques on the way I interpreted work by Émile Durkheim, Mary Douglas and Perri 6. This concerns especially the way I handle markets and networks. The problem here is that my fight against the endemic parameter-selection risk is about being transparent on what the parameters I did select are, and not about being true to any brand of nDT.

<sup>41</sup> For modeling purposes, one aspect of Mary Douglas' work has become widely popular: the *group × grid* analysis.

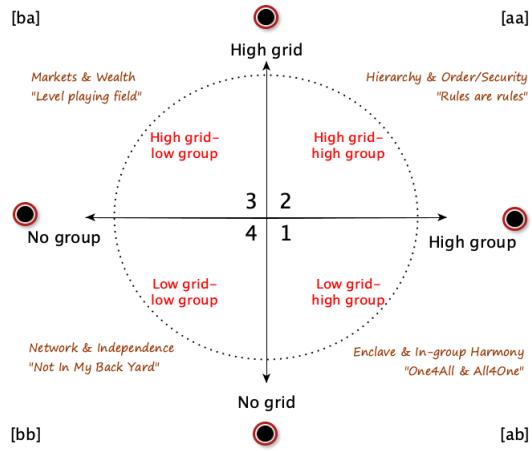
There is a problem related to its adoption, however: it presents itself as a moving target. Originating from Durkheim (1893), Douglas (1978) processed this into a fresh form, after which Gross & Rayner (1985) modeled it for measurability, Douglas (1992) added a relationship with institutional forms, Perri 6 (2011) reworked it into finer grained framing of *organizational forms × thought styles* for explaining political judgment, Olli (2012) used it for classifying thought styles in refugee families and Ingram *et al.* (2012) applied it for pluralistic rationalities. The problem is that we cannot refer to a standard version of the theory. My discussion here explains how and why I adopt and adapt what version of the framework explicitly.

As I am not an anthropologists, I do not aim (nor pretend) to contribute to the scholarship on Mary Douglas' work. I simply process the seven sources mentioned for what versions of the framework I can distinguish as useful for my modeling. For comparison, I use the graph.

It has two “dimensions.” One refers to *group* (low → high) and one refers to *grid* (low → high). The graph determines four quadrants for the four combinations these two dimensions allow. What these dimensions and quadrants refer to varies per author mentioned. We give our interpretation per publication and in chronological order.

<sup>42</sup>The organizational forms all need to have a substantial presence in a stable institution's social fabric and in return help to nurse the institution's fitness to survive. Reversely, if the value of a public service is below par for members that prefer a specific form, these may jump ship or revolt, which can be risky to the fitness of the whole service. In other words, purity of organizational form is a danger to, not an asset for institutions.

This is an important heuristic for making the normative debate between different disciplinary specialists work: like purity of organizational



form is a danger to, not an asset for institutions, just like purity of disciplinary argument is a danger to, not an asset for the normative debate.

<sup>43</sup> Freenet is a peer to peer infrastructural service for censorship resistant communication. When I investigated it in the slipstream of our research into file sharing in 2002-2005, the network (as designed along Ian Clarke's design) was turning into a strong free haven, not only for free speech, but also for child porn. So much so, in fact, that accessing Freenet may well have become a criminal liability in the Netherlands. I stopped investigating it then. Nevertheless I mention it as an example of network purity (no responsibility for content) and the acquisition of a bad name.

<sup>44</sup> Translation of the Dutch “Formulieren voor een E...”

<sup>45</sup> It also is a design problem, where someone must formulate a dream before anything can be done in a serious design/consult/commit/deploy/evaluate cycle. This type of analysis in life-cycle networks is discussed extensively in the Episode 1 clips of the MOOC.

<sup>46</sup> The current (December 2018) state of affairs of the e-CODEX project is conveniently sketched in a graph by the e-CODEX team that is displayed in Figure 22. It shows a house for e-CODEX. I read it as a metaphor for the path to mature e-CODEX. It shows that there is much more to e-CODEX than EPO user volume alone. We see applied e-CODEX services, candidate services, building blocks, methods and core services. There are five *applied* e-CODEX services for legal procedures: besides the EPO (European Payment Order) we have EIO (the European Investigation Order), BRIS (the Business Register Informations System), SC (the Small Claims procedure) and FP (the mutual recognition of Financial Penalties). At the same floor in the house are candidate applied services mentioned for a few procedures currently under review for adoption. The House shows at the ground floor infrastructural and core services. These are operational in the interconnectedness with IT building blocks that have resulted from other European projects: eID (identification), e-Signature, e-Delivery and e-Translation and in the methodological results of the e-CODEX project (that have been reported and made available in methodologies that can be invoked in services when applied to new legal procedures or to the maintenance of existing ones). The latter are the central testing platform and the connector framework. These are — with the e-CODEX interoperability layer itself (lets call this e-CodexIL) — required to make a service operational.

<sup>47</sup> In computing history it emerged in the early 1980s under the ICMP protocol and got named “ping.”

<sup>48</sup> Often client-server based, with the client running in the user's browser.

<sup>49</sup> And certainly not in the spirit of Hegel's philosophy and Marx's interpretation of it.

<sup>50</sup> *In-group-harmony loving groups.* Short after the second world war

most people in the Western world realized themselves how whole societies had been blinded by conceptions about different and dangerous identities and wondered how what after the fact became mass delusions could have been brought about. In the 1950s and 1960s a few remarkable social psychological experiments suggested that all of us are sensitive to group pressure when making behavioral choices that are noticed by sibling group members. The experiments, *e.g.*, in Asch (1951), Sherif (1958) and Milgram (1963) showed that group members tend to take those Grand Stories serious that however flimsily provide identity to their groups — so serious, in fact, that many (around 1 in 3) are prepared to fight, distort their judgment and/or allow their fellow beings to be tortured when their peers give the example or show approval, and that the minds of those who do not succumb to such group pressures are seriously unsettled.

<sup>51</sup>The legal theorist, as a specialist, will generally be concerned about the legitimacy of behavioral choices as (hopefully) observable in case judgments and dogmatics, and about the coherence of the laws as a system which emerges from qualitative analysis. In e-CODEX the legitimacy of behavioral choices lead the focus towards the question whether choosing or mandating a strategy (ping, e-mail, e-form, app) is legitimate in the situation concerned. Both issues (behavioral legitimacy and legal system coherence) are incredibly complex in a legal technical sense. “The law” is the collection — a huge, constantly growing, collection — of international treaties, EU-regulations, member state laws (constitutional, criminal, administrative, private), local regulations and innumerable private contracts that may be valid in any combination and in any place and time of action. Organizational, the EU is a very complicated network of networks, of which its Commission, 45 Agencies and 28 (soon 27) member states only touch the surface, hiding what is legally going on at *e.g.* municipalities, firms, courts, markets, parishes, parties, foundations, hospitals, schools and universities. We need legal specialists for helping us out when questions are raised.

Such a question would evoke a legal theorist’s Pavlov reactions. They would include the urge to find out: What types of agents could experience what conflicts of interest in what situations? What is their access to justice?

*What laws are relevant?* We consider legislators, executives, judges and civilians as the agents that could experience conflicts of interest in situations wherein they need a communication channel with one of the other agents involved. Possible conflicts of interest that relate to forbidding or ordaining the use of specific communication-channels relate to the control that comes with it. The laws on the organization of the judiciary are relevant, and on access to justice, and the laws on freedom of communication — and also the policies that the judiciary have for access. These regulations are founded in constitutions, procedural laws and administra-

tive practices. Many more specific laws are potentially relevant, copyright laws, privacy laws, security duties with digital evidentiary materials, laws for ex ante policing and data and Big Data surveillance (and for protecting against illegal forms of it) to mention just a few. And these have to be interpreted against the special position of the judiciaries with protected separation-of-power independence. And all these can come into play with e-CODEX's uses in practice.

*How should these laws be read?* Legal theory has ideas about this. Bobbitt (1982) offers a neat, almost complete list of argumentations that have to be and that actually have been used by the USA supreme court to find and defend positions taken in constitutional review cases: *historic* (considering the reasons for the regulation when it was made), *textual* (considering what the wording of the regulation conveys to the civilian), *dogmatic* (considering how the reading fits into default legal practice), *prudential* (considering how the reading will affect public order — especially the authority of the judiciary), *structural* (considering what institutional context has been made available), *ethical* (considering the moral climate ). These are the tools of the legal theorist in face of a contested situation and a set of relevant, valid case law and substantive laws.

<sup>52</sup> Economics, so says Wikipedia, “is the social science that studies the production, distribution, and consumption of goods and services.” How would an expert economist professional or theorist diagnose my approach to valuate communication channels?

*Another Level Playing Field.* Adopting the role of project principal and chair in the debate, I have set some debating rules that may be counter-intuitive to some. What may be counter-intuitive to economists is that *the Matrix* does not allow to model resources in terms of financial currency. Although this is generally considered beneficiary to an economic model’s quality I decided to create *a level playing field for the normative debate* between specialists by requiring them to formulate their valuations in a simple ordinal scale (forbidden - unpreferred - neutral - preferred - mandatory) and base their valuations on combining their opinions on all four values (community, security, wealth, independence) combined.

One of the reasons to do this is that sporting precision where other specialists cannot, carries the risk of the natural sciences and economics to gain clarity and status that they do not deserve in the normative debate. Being numerically precise does not imply being right in the world. And being most efficient does not imply a solution to be right, just like being most secure or having most in-group harmony or supporting most individual independence do not imply solutions to be right.

*Slogan Imperialism.* The fallacy of blindly assuming that the most wealth-bringing (or efficient) solution is right may be at the foundation of many failing IT projects. And, although it has become somewhat softened, for instance in more recent European procurement practice, it still remains

a dominant source for failures and abuse.

Abuse as a corollary of the spectacular *knowledge-asymmetries* that have evolved between principal and service provider in combination with a certain reluctance to go for liability compensations in litigation, which constitute risks to a badly prepared principal's reputation. Yet this is not impossible to handle as Akerlof (1984) argues: "... it is often surprising how truthful sellers are to buyers who ask the right questions, so that imperfect asymmetric information may be a less potent phenomenon than is suggested by a world view that sees all people as selfish maximizers ..." (p. 5)

A sobering observation is that the discipline that has published most and best on what I will further call the *efficiency-first fallacy* are from the economic discipline itself (see for instance Keynes (2018), Akerlof (1984), Bowles (2016).)

The caste that abuses such fallacies most and with most devastating results aggregates who cynically exploit the popular attractions of the one-liners that have been conveniently distilled from serious and situated research results, yet are presented as universally valid to audiences in (often desperate) need of the vistas they open up. However, Akerlof (1984) argues that "The unwritten rules that only economic phenomena be considered in economic models, with agents as individualistic, selfish maximizers, restrict the range of economic theory [...] because, *without relaxation of these rules* [...] indisputable economic facts [...] become inconsistent with economic theory." (p. 2, italics AS)

and suggests an alternative approach: "... I disagree with any rules that limit the nature of the ingredients in economic models ...." (p. 2/3) with a resounding appeal to his peers: "... economists have ignored the other social sciences and continue to do so. At its worst, such ignorance may have deprived economists of a sensible theory of unemployment and probably also of a good theory of discrimination. So the lack of consideration of the findings of the other social sciences may make differences of practical importance." (p. 5)

The issue is clear: economic theory could not only be more careful in allowing its situated results to be opportunistically transformed into simplified universal truths (or "Grand Stories"). It could also be more careful in making its assumptions explicit when widening its domain.

*Sources for Slogans.* This is, of course, exactly what the main concern of the normative debate (as an academic proxy of a political debate) must be. And the authority of such debates is fragile and can be seriously and almost irreparably damaged when experts get opportunistic and join the fallacy-abusing castes too, as current and recent cultural climate changes have made obvious. An example of such a risk to the quality of the normative debate is for instance the report by Boston Consulting Group (2013) on KEI suggesting up to 40% efficiency gain without quality loss. This

report is not a maverick example: a whole series of such reports precedes later failures of large Dutch governmental IT projects.

Since (and of course already a long time before) Akerlof's appeal to let more assumptions that are based on sibling social sciences' disciplines' results in, a whole collection of economic results that could compete for becoming transformed into simplified universal truths (or even Grand Stories) have followed. Let me mention a few references:

Smith (1776) (the invisible hand, from 1776) [complexity theory?]  
Krugman (1996) (on Ricardo's comparative advantage, from 1821 [social psychology?])

Keynes (2018) (on conditions for governmental action on aggregate demand, from 1935) [complexity theory?]

Coase (1937) (on the economics of institutionalization — a dent in the efficiency of spot markets, from 1937) [complexity theory?]

Friedman (1953) (particularly harmful with his "... truly important and significant hypotheses will be found to have 'assumptions' that are wildly inaccurate descriptive representations of reality, and, in general, the more significant the theory, the more unrealistic the assumptions ..." p. 14, from 1953) [social psychology?]

Eichengreen & Hausmann (1999) (original sin, from 1999) [complexity theory?]

Hidalgo *et al.* (2007) (product spaces and networks, from 2007) [complexity theory?]

Thaler & Sunstein (2008) (Nudge — draws on research in psychology and behavioral economics to defend libertarian paternalism and active engineering of choice architecture, from 2008), [social psychology?]

Acemoglu & Robinson (2012) (extractive institutions and failing states, from 2012) [anthropology?]

I mentioned these references with the beginning of a candidate one-liner added, and, between square brackets, an indication of a sibling specialist discipline that might consider some of the subject matter to belong to its domain.

<sup>53</sup>When we code these dichotomies in bytes with a length of 4 we get 16 possible combinations (0000 — 1111).

<sup>54</sup>Often called paradigms.

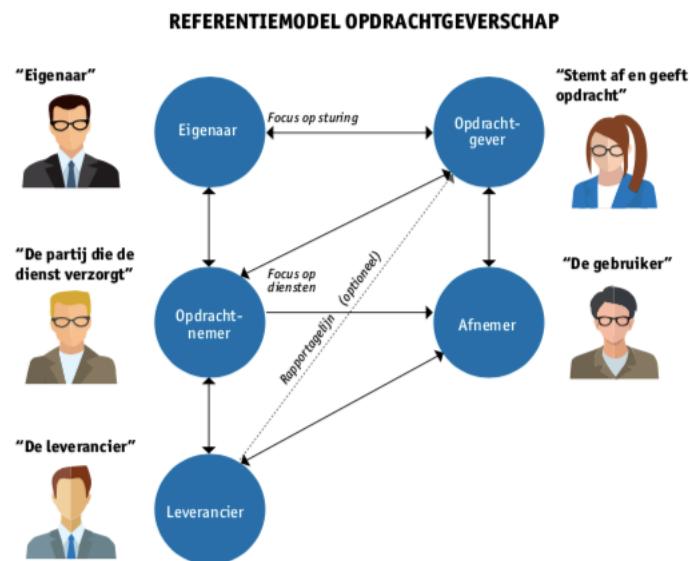
<sup>55</sup>The Tier2 analysis for KEI is in Schmidt & Zhang (2019).

<sup>56</sup>There are five *applied* e-CODEX services for legal procedures: besides the EPO (European Payment Order) for EIO (the European Investigation Order), BRIS (the Business Register Information System), SC (the Small Claims procedure) and FP (the mutual recognition of Financial Penalties). At the same floor in the house are candidate applied services mentioned for a few procedures currently under review for adoption.

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<sup>57</sup> Actually, the organizational aspect is becoming a central issue in governmental IT project management and will most often be addressed as “governance.”



The Dutch ministry of Justice and Security has recently begun applying and promoting a “Reference model for IT-project Governance” (my translation of “referentiemodel opdrachtgeverschap”; I lifted the graph from the March 2019 issue of the ministry’s periodical “iBestuur.”) The graph shows five agents (left-right, top-bottom): the owner, the service provider, the contractor; the principal and the user. In its simplicity it may be used to illustrate what the real problems are by making the attempt to instantiate this model with e-CODEX and ask ourselves who (or which institution) the owner is. Currently, in my observation, e-CODEX does not have an established owner at all. When we consider the current discussion on how the KEI project can be resurrected as a feasible option, the question about ownership is being answered by making the courts (the users) participate in a specific form of collective ownership. Considering the track record of KEI, this seems a wise decision. Yet it also does conceal a warning: making users participate in governmental IT-project ownership may not immediately tally with a natural interpretation of the Reference model.

<sup>58</sup>The tier2 analysis for KEI is in Schmidt & Zhang (2019).



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This book provides (as a deliverable to the e-CODEX project) background material for a MOOC that shows experts (e.g., from science, economics, law and the social sciences) how to blend their various specialist opinions on the designs of complex public IT services into coherent action plans. Normative debates are instrumental in bringing such plans about. They resemble political debates but are not identical. In the context of agent-based simulation it is a practical (empirical) mechanism, not a philosophical fling. ‘Normative’ ≠ ‘political.’

The *normative* debate sports respect for various knowledge types, yet evades (or attempts to ignore) social pressures on its results. The *political* debate sports interest-based rhetorics that, when considered effective, will freely wield fact-free Big Stories.

A major problem in agent-based modeling is not only how to be explicit about assumptions, but also how to select relevant parameters at all. For the current approach I adopt elements from five theories for guidance: (i) my own conception of institutional fate, (ii) Mary Douglas' conception of normative debates, (iii) John Holland's ECHO (with its two-tier approach to modeling complex adaptive systems for understanding them), (iv) Mary Douglas' neo-Durkheimian classification of cultures into four styles and (v) Scott de Marchi's conception of a methodological commons.

This book thus also provides an introduction to use agent-based modeling in this manner. During the work (which was co-funded by the European Commission under the Justice Programme 2014-2020) I have developed some software. It runs under NetLogo, is open source and available on my GitHub site at <https://github.com/dotlegal/Epiframer>. I am available for discussing it on Twitter.