Trifecta model of IT-based regulation

Perspectives on digitalization & digital transformation

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Content of the presentation

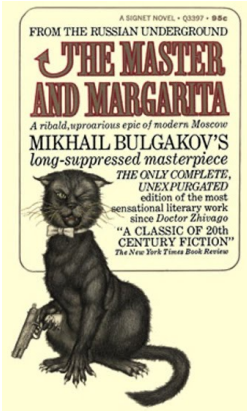
Main research question (RQ):

- how to control / manage / regulate a socio-technical system?

More questions and some answers:

1. What does it mean to be in control of something?
    - Is there a difference in controlling a technical system and a socio-technical system?
    - Rules as algorithms vs. rules in organization
    - The idea of digitalization of an enterprise
2. Trifecta model of IT-based regulatory system (of organization)
    - Regulation in the case of Strongly Structured Systems (SSS)
    - Regulation in the case Weakly Structured Systems (WSS)
    - Stanadrdization as the case of regulation?
        - Value-based standardization (or regulation)
3. Discussion

To be in control…

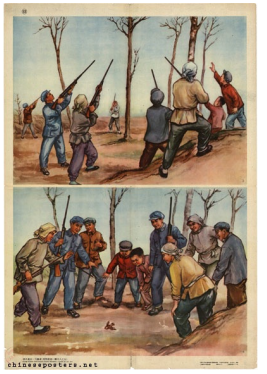


- Bulgakhov: "…**in order to govern, one needs**, after all, to have **a precise plan** for a certain, at least somewhat decent, length of time. Allow me to ask you, then, how can man govern, if he is not only deprived of the opportunity of making a plan for at least some ridiculously short period, well, say, a thousand years , but cannot even vouch for his own tomorrow?"

- Axelrod & Cohen: … to harness complexity [of management task], one can use knowledge from similar past experience or **the knowledge of the elements of and the driving forces** within the **system**.

A system can be defined as:

1. **a set of interacting or interdependent components** forming an integrated whole (i.e., a structure), or
2. **a set of principles or proce**dures according to which something is done; an organized scheme or method… (i.e., a having a certain behaviour)



The concept of controllability

- The concept of controllability was originally introduced by Kalman (1960).
- ***To control a system, one must be able to change certain physical quantities, called inputs, and to measure the behavior of the system, or the physical variables of the system called outputs.***
- The relationship between those inputs and outputs can help us ***define what a system is***. Namely, *a system (it or generic) can be defined as a physical or digital object or a collection of objects that are characterized by input and output variables for which there are cause-effect relationships*
- To develop ***a controllable system***, one must provide ***an algorithm*** for computing the output of the system at any given time t' from the knowledge of input to the system at time t <= t' (Kalman 1960, 151).
- An ***algorithm*** can be defined as a sequence of steps and ***instructions (rules)*** that can be applied to (input) data to produce some result (output).
- In other words, there must be a ***calculatable / predictable cause-effect relatio***nships between input and output -> this gives the user the possibility of choosing a suitable ***control action***.

Rules in algorithms and organizations

Algorithm as a set of rules for building a controllable IT system	Organizational rules as the basis for building a predictable "action system"
An algorithm can be defined as a sequence of steps and instructions that can be applied to data (the input) to produce the intended result (the output).	Rules in general refer to mutual beliefs, which determine how people are expected to behave (or not to behave): permissions, prohibitions, guidance, etc.
An algorithm must be definite: • each step must be precisely defined; • the actions to be carried out must be rigorously and unambiguously specified for each case • An IT system always follows the algorithm precisely	Organizational rules contribute toward controlling variation in organizational behaviors, that is, produce predictability in social interactions and thereby constitute the foundation for building repeatable, low variation, and scalable "concrete action systems"

Digitalization of rules and organizations

Digitalization of rules -> an algorithm

- An ***algorithm*** can be defined as a sequence of steps and ***instructions (rules)*** that can be applied to (input) data to produce some result (output).
- Algorithms are always unambiguous/ definite: each step must be precisely and unambiguously defined

Digitalization of rules -> a case of digital transformation of an enterprise

- Digital transformation (DT) is commonly understood as the ***multifaceted and lasting changes*** brought about by the ***digitalization*** process, including changes to conditions for learning, work, and management practices.
- Digitalization is commonly understood as the implementation of all sorts of digital technologies (IT) in an organization ***to support the capture and manipulation of data*** and ***to support or replace humans at work***.

Digitalization =
(embedding into IT) algorithms (to capture and store data) +
(embedding into IT) organizational rules (to support or replace humans at work)

Principles for controllability of organization

- The Max Weber theory of management, sometimes called bureaucratic management theory, is built on principles outlined by Frederick Taylor in his scientific management theory.
- Like Taylor, Weber advocated a system based on ***standardized procedures*** and a clear chain of command.

Key elements of the Max Weber management theory include:

- Clearly defined job roles
- A hierarchy of authority
- Standardized procedures
- Meticulous record-keeping
- Hiring employees only if they meet the specific qualifications for a job

Rule **following is expected** for "controlability" of the enterprise

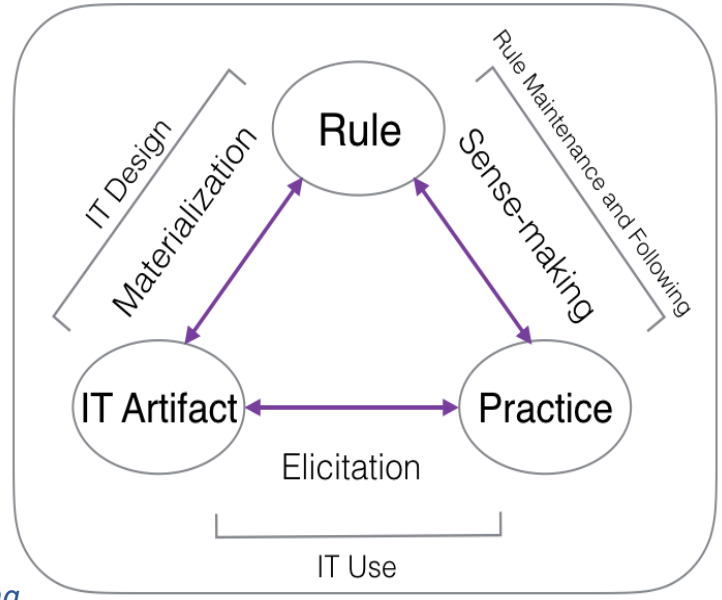
- Rules presuppose rule following capability among agents
- Other that "following" are common:
  - Rule violations
  - Misunderstanding
  - Resistance to rules

http://www.business.com/management/management-theory-of-max-weber/

Lasting effects of digitalization = IT-based organizational regulation

- **Regulation** is required for coordinating collective action systems
- **Organizational regulation** is a collective process constitutive of rule –making, rule-maintenance, rule-following, and rule-enforcement achieved by organizational members through the configuration and mobilization of appropriate resources

- Any **IT-based regulation system** 'ties' together three elements that all jointly are constitutive of a regulatory system:
  (1) organizational rules,
  (2) the rule-carrying artifacts,
  (3) the (sociomaterial) practices



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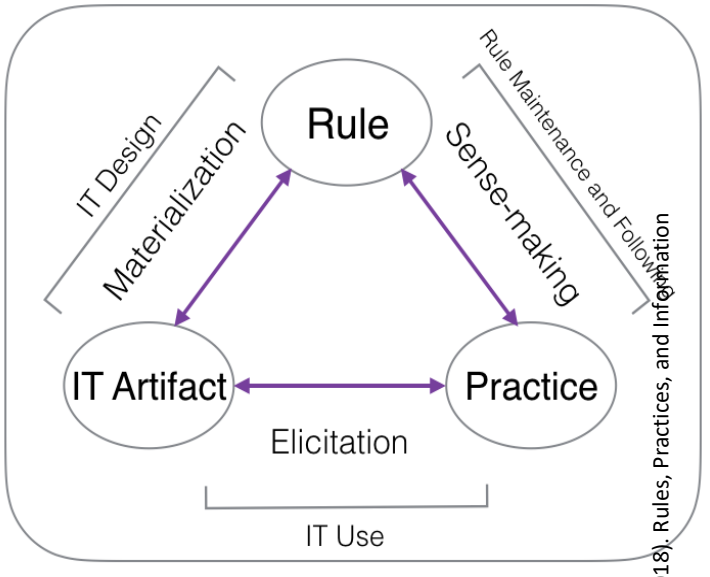
de Vaujany, F.-X., Fomin, V. V., Haefliger, S., & Lyytinen, K. (2018). Rules, Practices, and Information Technology: A Trifecta of Organizational Regulation. *ISR*.

IT-based organizational regulation

- Any **IT-based regulation system** 'ties' together in ***a recursive and dynamic relationship*** three elements:
  (1) organizational rules,
  (2) the rule-carrying artifacts,
  (3) the (sociomaterial) practices



- The **materialization** relationship defines how rules are formulated regarding content, conditions, and character, and how they are embedded in the IT artefact, i.e., ***how IT conveys or embodies organizational rules.***

- The meaning of the rule must be established through the actor's **practical sense-making**, where the rule's content is expressed, defined, negotiated, and enacted within ***local practices that define and socially enforce rule-following***. **Sense-making**, reveals the rule's meaning and renders regulation effective.
- The use of the IT artefact invokes **elicitation.** During elicitation, the ***artefact "invites" practices to follow the rule***. Simultaneously, the actor's awareness of the rules embedded within the artefact (also the actor's skills) shapes their interactions with it.

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Implementation of IT in organization

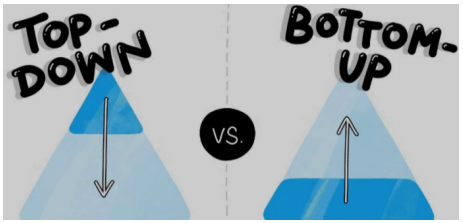
- **Implementation** is about episodic introduction of information technology (IT) systems that makes them fit the organization's modus operandi (Cooper & Zmud, 1990; Leonard-Barton, 1988; Lyytinen & Newman, 2008).

a particular way or method of doing something

IT

How tyo make IT fit the organization's *modus operandi*?

IT implementation process



Modus operandi

Compliance Subordination Bracketing Exploration

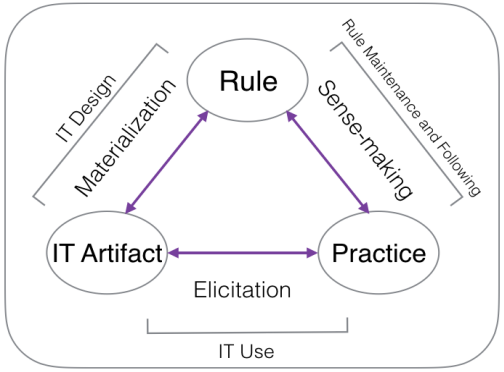
Standard operating procedures (SOPs) Emerging rules

Discussion Experimentation Competition Centrally-defined rules

Moodle ERP

ChatGPT EHR

Zoom CRM



HSS & WSS: Examples and references

	Highly Structured System (HSS)	Weakly Structured System (WSS)
Examples of materialization and rules	Rules for intermediated procurement Rules for procurement approval Rules for project budget management Rules for project fund allocation	Rules for the use of digital objects Systems functions to display and relate local information Rules for disseminating information among local user groups
System examples	Enterprise resource planning (ERP) systems Customer relationship management (CRM) systems Electronic health record (EHR) systems, Business process management (BPM) systems	E-mail E-learning systems Knowledge management systems and repositories Operations support system (OSS) tools and coordination systems
References	(Berente et al., 2016, 2019; Boudreau & Robey, 2005; Dumas et al., 2018; Volkoff et al., 2007; Volkoff & Strong, 2013, 2017)	(Barley, 2015; da Cunha & Orlikowski, 2008; Denyer et al., 2011; Gal et al., 2014; Malhotra et al., 2021)

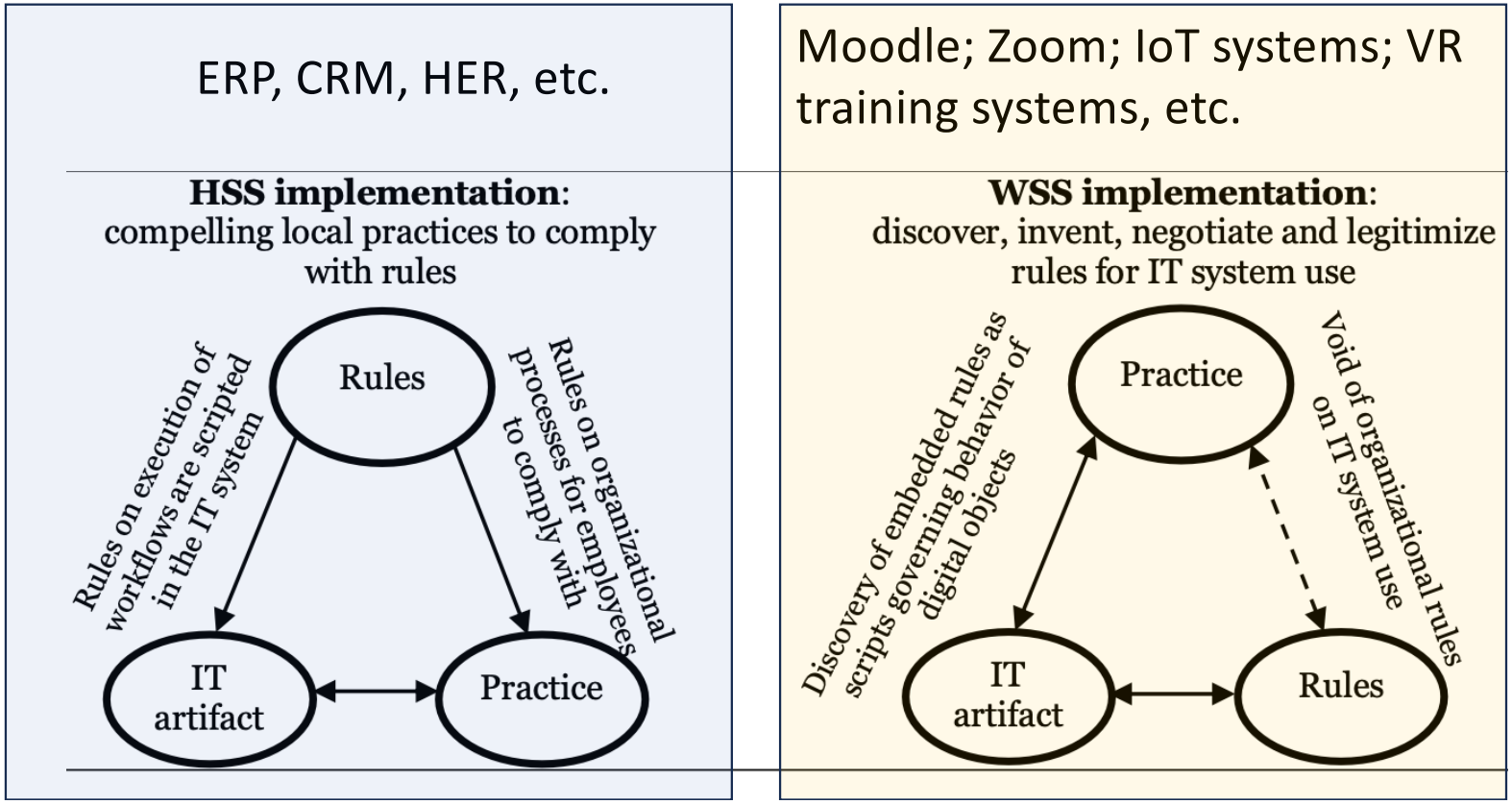
Highly and weakly structured systems

The nature of regulation depends broadly on the process of regulation that the system brings along

	Highly Structured System (HSS)	Weakly Structured System (WSS)
Metaphors to describe the implementation process	Freezing & compliance: Enforcing pre-defined, centrally formulated rules in local practices. The aim is to comply with centrally formulated rules during the execution of organizational tasks.	Exploration & bracketing: Discovery of scripts for system uses and their legitimation through bracketing of system features within the context and scope of work. The aim is to expand/ revise information flows associated with organizational tasks.
Nature of materialization	Organization's guiding rules that define its core functions integrated into and coordinated with use of IT systems through inscription and by ensuring their enforcement through elicitations	How, when, by whom system functions are used treated as affordances, which are invented and later formulated as shared rules which expand and direct the system's use collectively
Nature of implementation	From rules to practices Exogenous regulation Staged implementation, from unfreezing (loosen current rules) to refreezing (compliance with new rules) Group of stakeholders involved in during phase, distinguishing (practice) insiders from outsiders	From practices to rules Joint regulation Continuous, expansive and evolving regulation of local system uses Fluid and unstable group of stakeholders, making a separation of inside and outside of the practice challenging

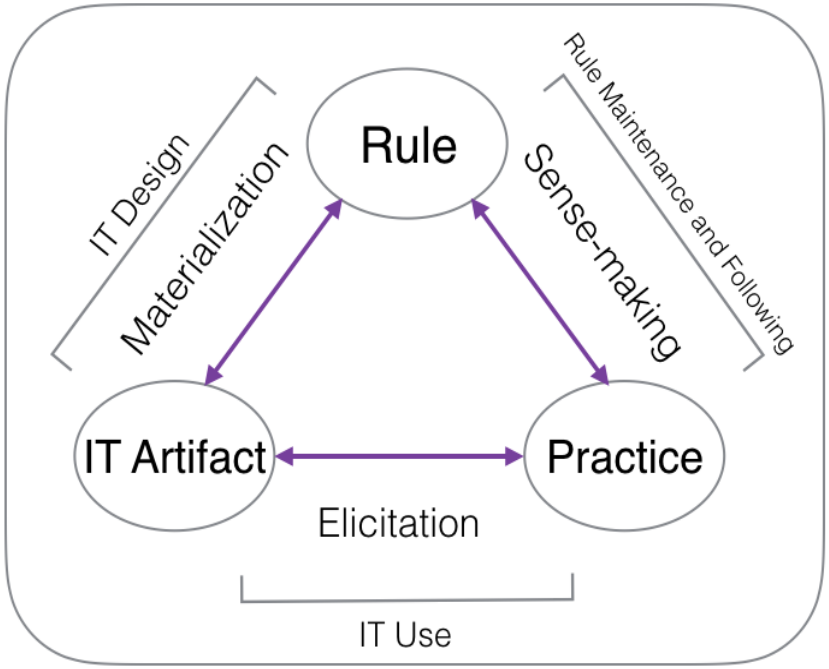
The regulatory trifecta and IT systems: HSS vs. WSS

- When implementing WSS, **the regulation system must be developed by moving from practices to rules**, which establishes the "missing" connections between the Rules, Practice and IT elements
- WSS starts from **the void of organizational rules governing system uses** (Figure, right).



The regulatory trifecta and standard

Per Reynaud (1997, p. XV) the ***regulation process*** is grounded into ***collective negotiation of meaning*** as "actors try to justify in front of others the principles or maxims that underlie their actions, by postulating and claiming that they ***have a value***, if not universal, but generalizable. By trying to make rules acceptable and legitimate, actors ***contribute to the emergence and transformations of rules***, to the regulation which is grounded into actors' interactions."



Materialization (writing down, embedding in IT) of rules ***allows their effective and dynamic propagation across time and space***

Standards are understood as documents '***established by consensus*** and approved by a recognised body, that [provide], ***for common and repeated use***, ***rules, guidelines or characteristics*** for activities or their results, aimed at the achievement of the optimum degree of order in a given context' (ISO, 2004, 12).

Few relevant publications

de Vaujany, F.-X., Fomin, V. V., Haefliger, S., & Lyytinen, K. (2018). Rules, Practices, and Information Technology: A Trifecta of Organizational Regulation. Information Systems Research, 1–19. https://doi.org/10.1287/isre.2017.0771

Fomin, V. V., Lyytinen, K., Haefliger, S., & de Vaujany, F.-X. (2023, December 8). Implementation of weakly structured systems: Moving from local practices to common organizational rules. The International Conference on Information Systems (ICIS). https://aisel.aisnet.org/icis2023/itadopt/itadopt/3

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Fomin, V. V., & Mosakas, K. (2023). Singularity and Control. In J.-S. Gordon (Ed.), Future Law, Ethics, and Smart Technologies (pp. 126–137). Brill. https://doi.org/10.1163/9789004682900_013

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Thank you!

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Perspectives on digitalization & digital transformation

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Few more thoughts…

- People who work in organizations develop customary ways of working; they gain attachments to existing relationships; and they make arrangements with subordinates and superiors about how work will be done, the amount of work that will be done, and under what conditions work will be done.
- ***Most of organizational practices are not discussed in any formal rulebook.***

- "How did you do it?"
- "With my hands! What do you mean?
- "Where did you study?
- ???

https://youtu.be/0CQxRI9qLPY

1:40: "Not in a book!"

https://youtu.be/N16YkjFVAyE

https://youtu.be/fgIBG8q1Gjc

Laudon, Kenneth C., and Jane P. Laudon. 2010. Management Information Systems: Managing the Digital Firm. 12th ed.