



Faculty of Design

2016

Complexity and design of management systems

Mesjasz, Czeslaw, Bartusik, Katarzyna, Malkus, Tomasz and Wo, Krzysztof

Suggested citation:

Mesjasz, Czeslaw, Bartusik, Katarzyna, Malkus, Tomasz and Wo, Krzysztof (2016) Complexity and design of management systems. In: Relating Systems Thinking and Design Symposium (RSD), 13-15 Oct 2016, Toronto, Canada. Available at <http://openresearch.ocadu.ca/id/eprint/1960/>

Open Research is a publicly accessible, curated repository for the preservation and dissemination of scholarly and creative output of the OCAD University community. Material in Open Research is open access and made available via the consent of the author and/or rights holder on a non-exclusive basis.

The OCAD University Library is committed to accessibility as outlined in the [Ontario Human Rights Code](#) and the [Accessibility for Ontarians with Disabilities Act \(AODA\)](#) and is working to improve accessibility of the Open Research Repository collection. If you require an accessible version of a repository item contact us at repository@ocadu.ca.

Complexity and Design of Management Systems

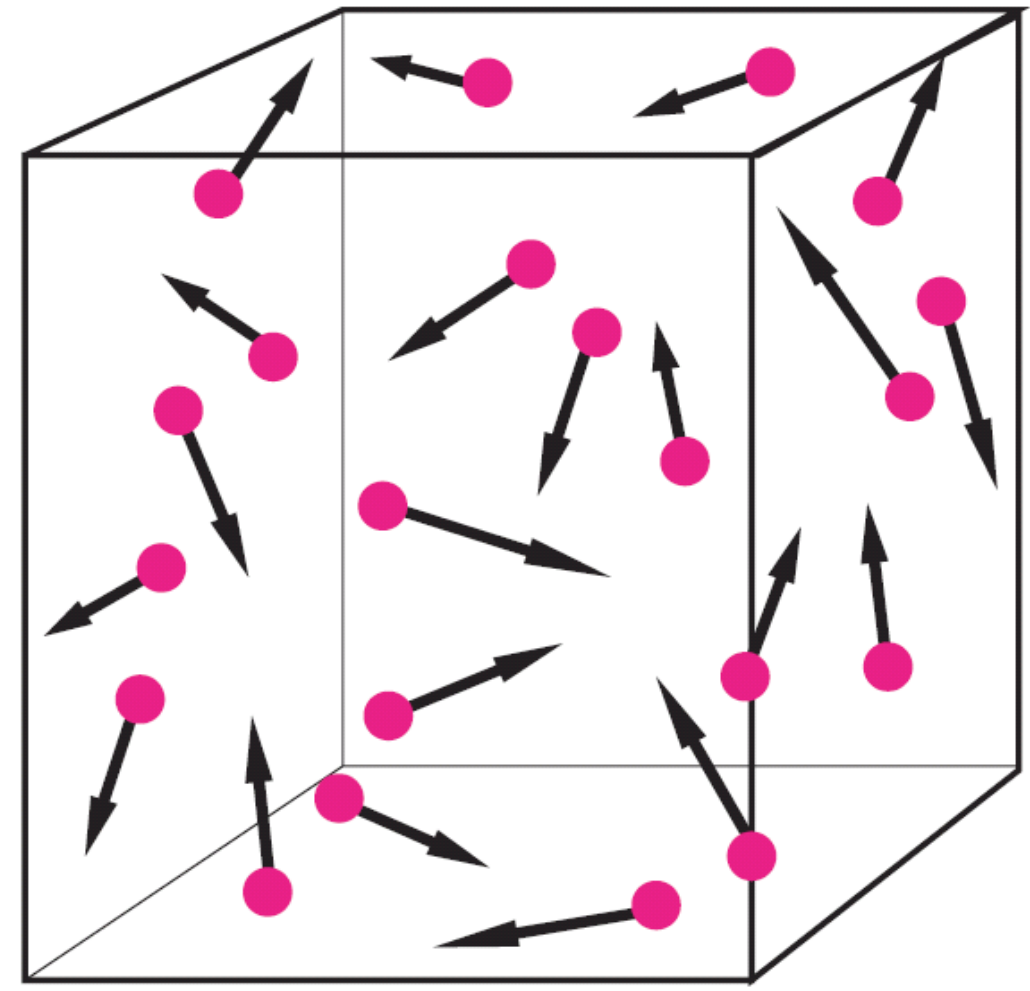
Czesław Mesjasz, Katarzyna Bartusik, Tomasz Malkus,
Krzysztof Woźniak, Mariusz Soltysik

Management Process Department
Cracow University of Economics
31-510 Kraków, ul. Rakowicka 27
Contact e-mail: mesjasz@uek.krakow.pl

What is complexity ?

(About 45 definitions)

| Engineering approach | Social science narratives |
|---|---|
| Social systems are but slightly more "complex" physical phenomena | Social systems can be studied with analogies and metaphors supported with mathematical models |



BARRIERS OF PREDICTION AND DESIGN OF SOCIAL SYSTEMS (INCLUDING MANAGEMENT)

Epistemological limits:

- Limits deriving from systems complexity ("hard" and "soft")
- Consequences of the role of the observer-participant
- Constructivism, post-modernism and prediction
- Fundamental limits of mathematical models, which in some cases, e.g. non-linearity and indeterminism, computational complexity, computational (algorithmic intractability) can be treated as an ontological limit, i.e. it's not only limited cognition but existence of such entities, subjectivity of definitions of risk/threat/hazard, etc.
- Subjectivity of definitions of risk/threat/hazard, etc.
- Process of identification and communication of uncertainty and risk
- Inherent cognitive limits of observer – limited physiological capability to identify and process variables (information) depicting phenomenon (phenomena) under scrutiny; they are also causes of "bounded rationality" (Simon, 1997), framing and prospect theory (Kahneman & Tversky 1979)
- Consequences of reflexivity, self-reflexivity, multiple recursions

Socio-political limits:

- Socio-political consequences of complexity of social systems
- Socio-political influence (external pressure, conformism, political correctness)
- Socio-cultural factors – culturally-determined interpretations of risk, cultural bias in prediction and anticipation
- Inherent limits of subjectivity and intersubjectivity exposed in post-modernist and constructivist approaches, e.g. definitions of meaning, deficiencies in transfer (negotiation) of meaning
- Uneven access to information (asymmetry of information)

The main thesis:

Reduction of complexity in the agile methodologies is to a large extent a declaration and not any well-designed characteristic in design of management systems (human systems, machine/man systems)

The aim of the project:

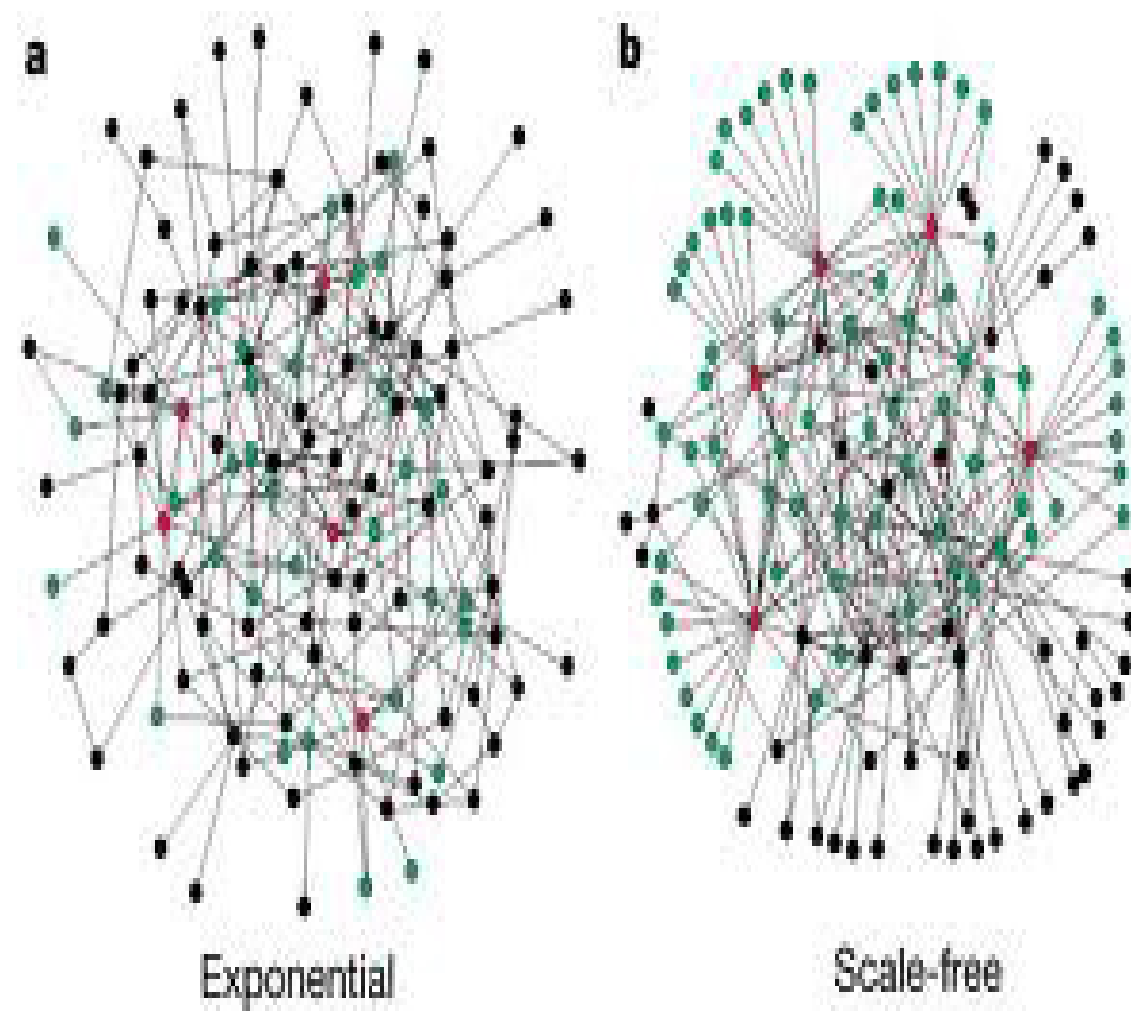
To prove that the utterance "complexity" is applied in the agile methodologies in the following sense:

- Basic analogy (metaphor)
- Heuristically stimulating metaphor
- Element of promotion

COMPLEXITY AND DESIGN OF MANAGEMENT SYSTEMS

Two basic groups of design methodologies:

- Traditional, structured (Waterfall, PRINCE2, PMBOK, etc.)
- Agile (flexible, adaptive, iterative, learning process)



Physical tangible collectivities can be reduced to interacting particles creating various types of networks

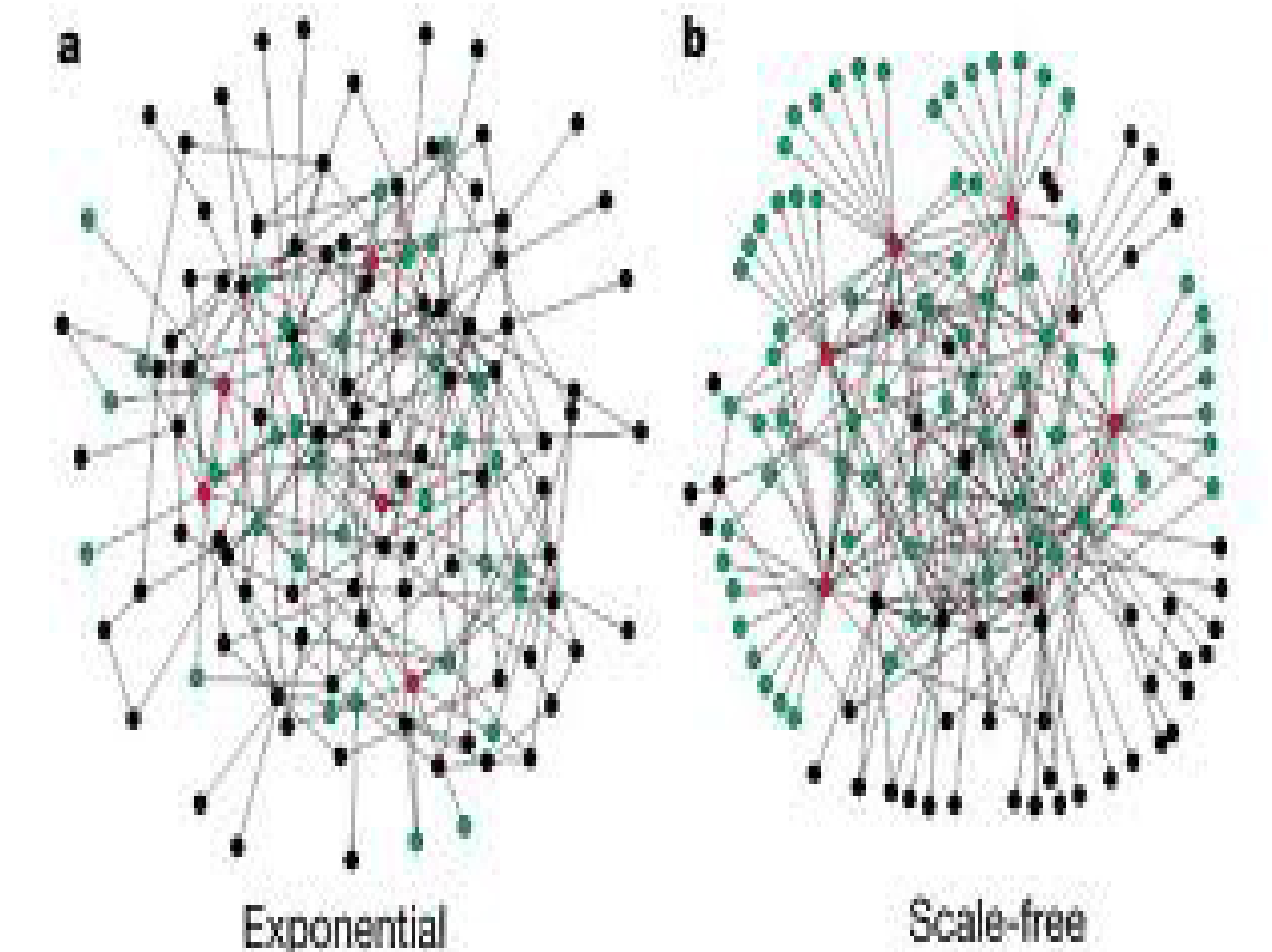
(Dyadic interactions, multiple interactions and systemic properties)

"Hard complexity" PREDICTION AND DESIGN IN ENGINEERING-LIKE APPROACH

- System identification (parameters, control parameters, measurement, limited negotiation of meaning)
- Data collection (measurement, interpretation, precision, disturbances)
- Model dynamics (linearity, non-linearity)
- Reification of objects of study in the process of negotiation of meaning (limited discrepancy of interpretations)
- Entropy, energy, rare events, chaos, edge of chaos, self-organized criticality, power law

COMPLEXITY AND STRUCTURED (STANDARDIZED) METHODOLOGIES

- Initially – simple systems, no need for complexity reduction
- Further development - imposed reduction of complexity – rigid systems and procedures
- Evolution: implementation of elements of adaptation – flexibility of procedures, feedback, reflexivity, learning
- An ultimate aim – convergence of standardized methodologies with agile methodologies, e.g. PRINCE 2 Agile



Complexity as a social construct („in the eyes of the beholder)

Social systems („Complexity of complexities")
Social systems (Tangible + intangible elements)

"Soft complexity" PREDICTION AND DESIGN IN SOCIAL SCIENCES (IN MANAGEMENT)

- Social systems are intersubjective constructs (degree of reification)
- Analogies, metaphors and mathematical models
- Biased analogies and metaphors, and mathematical models (!) – politicization of discourse
- Incomplete data gathering

COMPLEXITY AND THE FAMILY OF AGILE METHODOLOGIES (SCRUM, XTREME, etc.) OF MANAGEMENT SYSTEMS DESIGN

Agile methodologies and coping with internal and external complexity

- Flexibility
- Iterations
- Reflexivity (self-reflexivity, self-reference)
- Adaptation to environment (demands)
- Evolutionary
- A new phenomenon – agile methodologies in non-agile environment

Defining complexity of agile methodologies – what is missing?

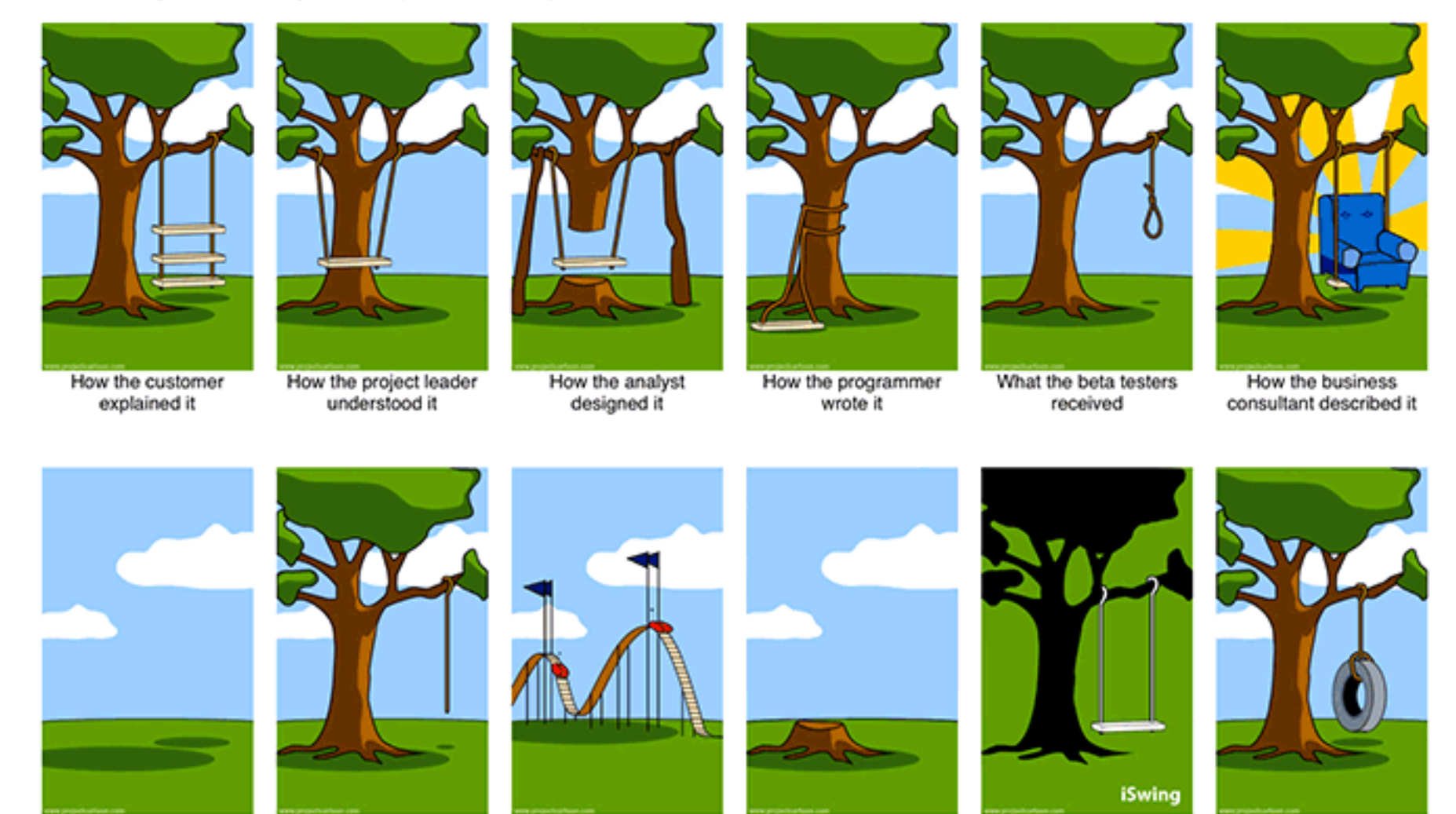
(The areas of inquiry of the project/paper)

| ONTOLOGICAL ASSUMPTIONS (Ontology in a double sense – philosophical and IT) | EPISTEMOLOGY (Dealing with "hard" and "soft" complexity) | METHODOLOGY (Meta-methodological level) |
|--|---|--|
| <ol style="list-style-type: none"> Defining complexity of the object of design – constructivism and reification Defining customers, authors (suppliers) and their "complexities" ("hard" and "soft") | <ol style="list-style-type: none"> Awareness of the role of observer-participant Abuses of metaphors, e.g. "edge of chaos", "emerging properties" Awareness of intersubjectivity in communication <ol style="list-style-type: none"> Multiple, hierarchical recursivity Awareness of language limitations | <ol style="list-style-type: none"> What methods to choose in dealing with complexity? Achieving effectiveness in intersubjective discourse (definitions) Avoidance of too strong impact of loosely defined ideas (insufficient knowledge of constructivism) |

CONCLUSIONS

- Dealing with complexity – insufficiently comprehended in agile design theory and implementations
- The term "complexity" applied rather as a heuristically supportive and not as an analytical tool (in a constructivist sense)
- Necessity to elaborate more precise interpretations of relations between agile methodologies and complexity (ontology, epistemology, methods)
- Impossibility of developing a precise agile methodology of dealing with complexity – there is always a room of maneuver for constructivist interpretations
- However, a better understanding of the links between complexity and agile methodologies should lead to improvement of design processes and methods.

How Projects Really Work (version 1.5) Create your own cartoon at www.projectcartoon.com



source: <http://www.agile-scrum-master-training.com/agile-project-management/>