MODELS OF REALITY AND SERIOUS GAMING



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UTILIZING MODELS OF REALITY SERVES SEVERAL PURPOSES

All cognition is cognition in models.

Hebert Stachowiak

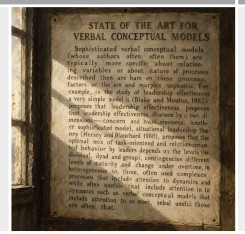
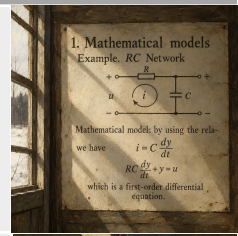
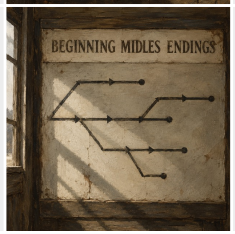
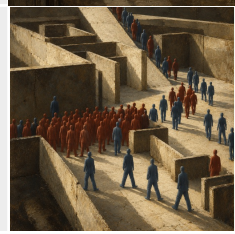


Models of reality serve as conceptual frameworks, offering simplified or abstracted representations of our perceptions of reality. They focus on capturing the essential aspects of objects, phenomena, processes, and systems they depict. They do not have an unambiguous relationship with its original; their shaping depends on the model constructor's historical, social, cognitive, or creative interests.

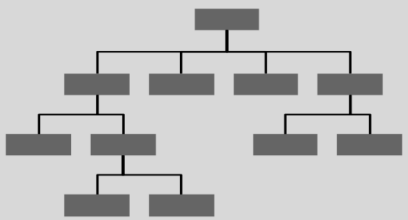
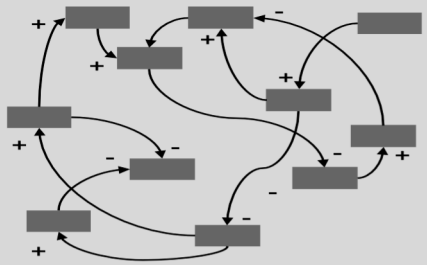
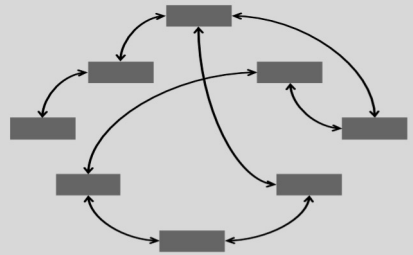
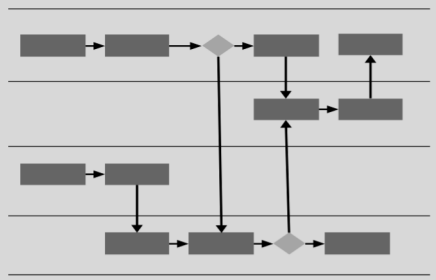
REPRESENTATION	Models can depict, symbolize, or mirror aspects of the real world and through structured representations offer an organized means of conveying complex ideas and relationships.
EXPLORATION	Models can allow us to glean insights into the interactions among different components within a system and understand their contribution to the overall system behavior.
EXPLANATION	Models can provide structured and systematic frameworks that articulate the relationships, principles, and mechanisms underlying observed phenomena.
UNDERSTANDING	Models can simplify reality and render it more comprehensible, thus enabling a grasp of the fundamental principles at play, independently of their ability to provide a strict explanation.
MEDIATION	Models can bridge the gap between theory and reality, serving as bridges that connect abstract theoretical frameworks with empirical observations and real-world phenomena.
PREDICTION	Models can help predicting reality by utilizing mathematical, conceptual, or computational representations of systems, thus enabling the anticipation of future states or outcomes.
COLLABORATION	Models can serve as a shared language, providing reference points that reduce ambiguity and ensure accurate and comprehensible communication.

FORMATIVE AND SYSTEMIC TYPOLOGY OF MODELS OF REALITY REPRESENTATION

THE FORMATIVE TYPOLOGY OF MODEL REPRESENTATION

	PHYSICAL	VISUAL	VERBAL	COMPUTATIONAL
STATIC	Scale models 	Schematics and diagrams 	Textual descriptions 	Algorithms 
DYNAMIC	Person in the loop mockups 	Virtual reality worlds 	Interactive story telling 	Computer simulations 

THE SYSTEMIC TYPOLOGY OF MODEL REPRESENTATION

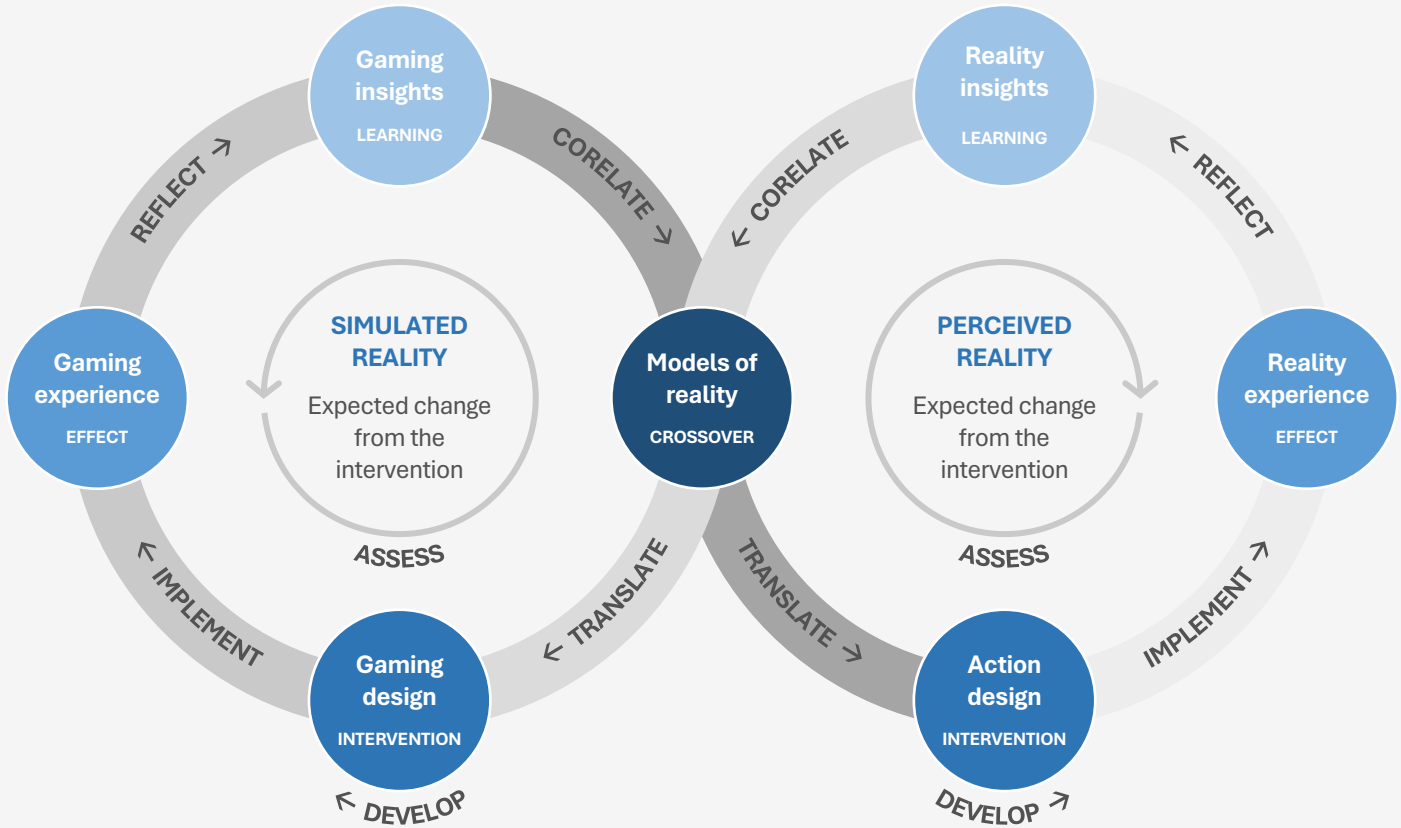
STRUCTURAL	CAUSAL	RELATIONAL	PROCEDURAL
			

MODELS OF REALITY ARE AT THE CROSSOVER BETWEEN PERCEIVED REALITY AND SIMULATED REALITY

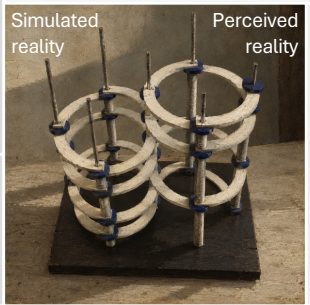
Models of reality are key for comprehending the context and determining the scope of the serious game design.

Ivo Wenzler





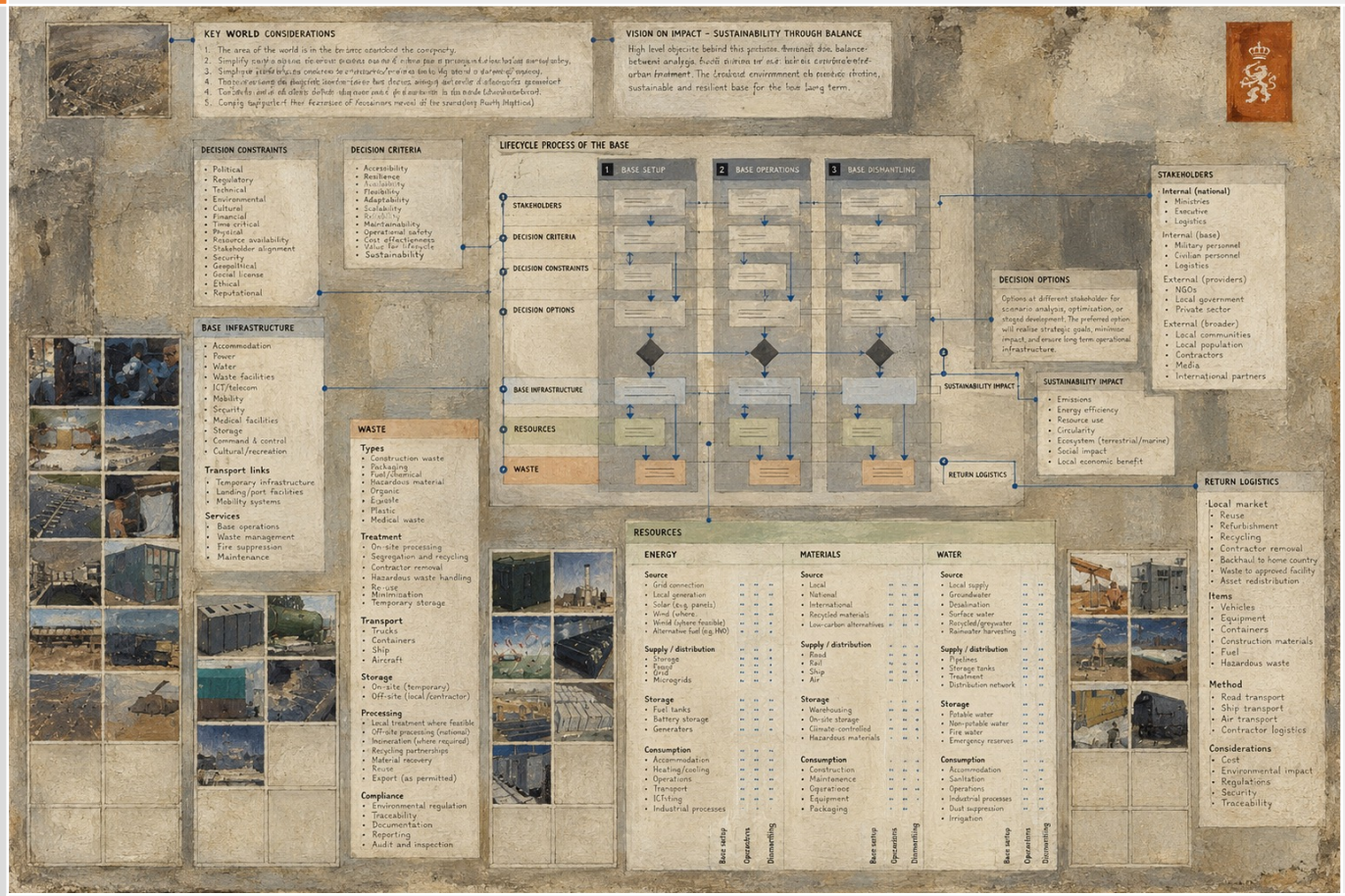
For more information on the lemniscate of reality, see presentation: **Serious gaming methodology.**



COGNITIVE AND PERCEPTUAL THEORIES ON HOW VISUAL MODELS OF REALITY ENHANCE COMPREHENSION

GESTALT PRINCIPLES	Visual elements are naturally organized into coherent wholes rather than isolated parts, which helps developing a more holistic comprehension of complex systems • M. Wertheimer
COGNITIVE LOAD	Human brain benefits from visualization, which simplifies complex information and aligns it with the cognitive abilities of individuals • J. Sweller
DUAL CODING	Combining verbal and visual presentations provides multiple pathways for encoding, retention, and retrieval of information • A. Paivio
INFO PROCESSING	Organizing and interpreting complex information through visualization allows for a simplified or abstracted representation, enhancing information processing • G.A. Miller; D. Broadbent
VISUAL NARRATIVES	Visual narratives help visualize and comprehend key system components and their causal relationships, making the overall structure more accessible • E. Tufte; J.D. Mackinlay
COGNITIVE MAP	Cognitive maps are mental representations of spatial relationships and connections between different elements in our environment • E.C. Tolman
SEMIOTICS	Semiotics is used to explore how signs and symbols can represent concepts, convey meaning, and influence understanding in visual representations • R. Barthes; U. Eco
VISUAL SALIENCY	Visual saliency refers to the perceptual prominence or attention-grabbing quality of certain regions or features within a visual scene • L. Itti
COGNITIVE FIT	Visualizations that align with users' mental models and cognitive processes enhance cognitive fit and improve understanding • I. Vessey

STRUCTURAL MODEL REPRESENTATIONS FOR VISUALIZING COMPLEX SYSTEMS



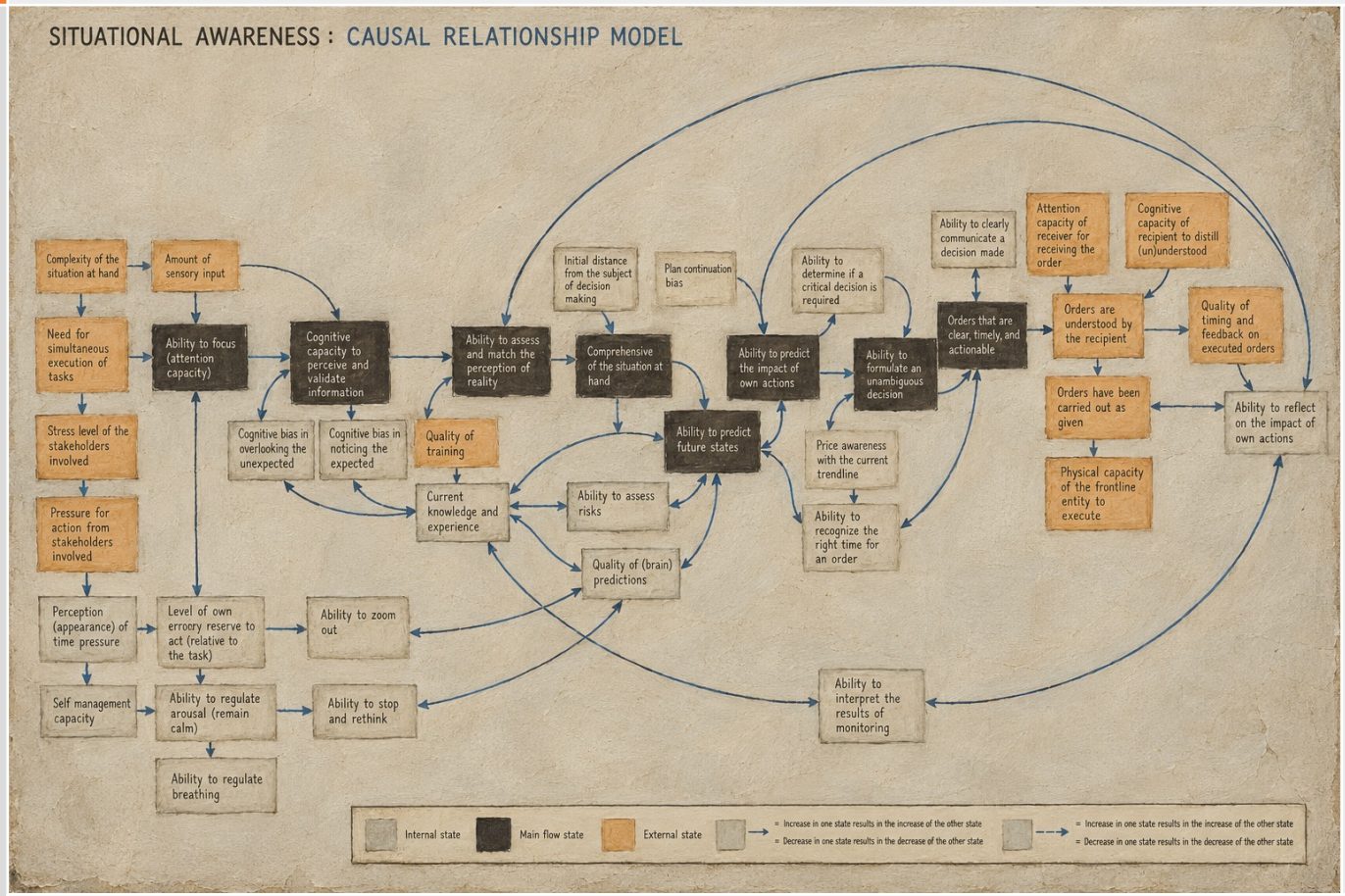
A structural organizing framework for visualizing complex systems focuses on identifying and presenting the structures of real-world systems along with the relationship patterns within them.

There are various approaches to visualize the structure of a particular system. These include hierarchical models, network diagrams, system architecture diagrams, organizational charts, and formalized ontological structures designed for organizing information.

Example above is a visualization of the problem environment that was used to guide the development of the Sustainability Game for the Royal Netherlands Army.

The model describes the structure of military missions, including: stakeholders; infrastructure components; base setup, operations, and dismantling processes; supply of energy, water, and materials, as well as the management of waste; and the sustainability impact components.

CAUSAL MODEL REPRESENTATIONS FOR VISUALIZING COMPLEX SYSTEMS



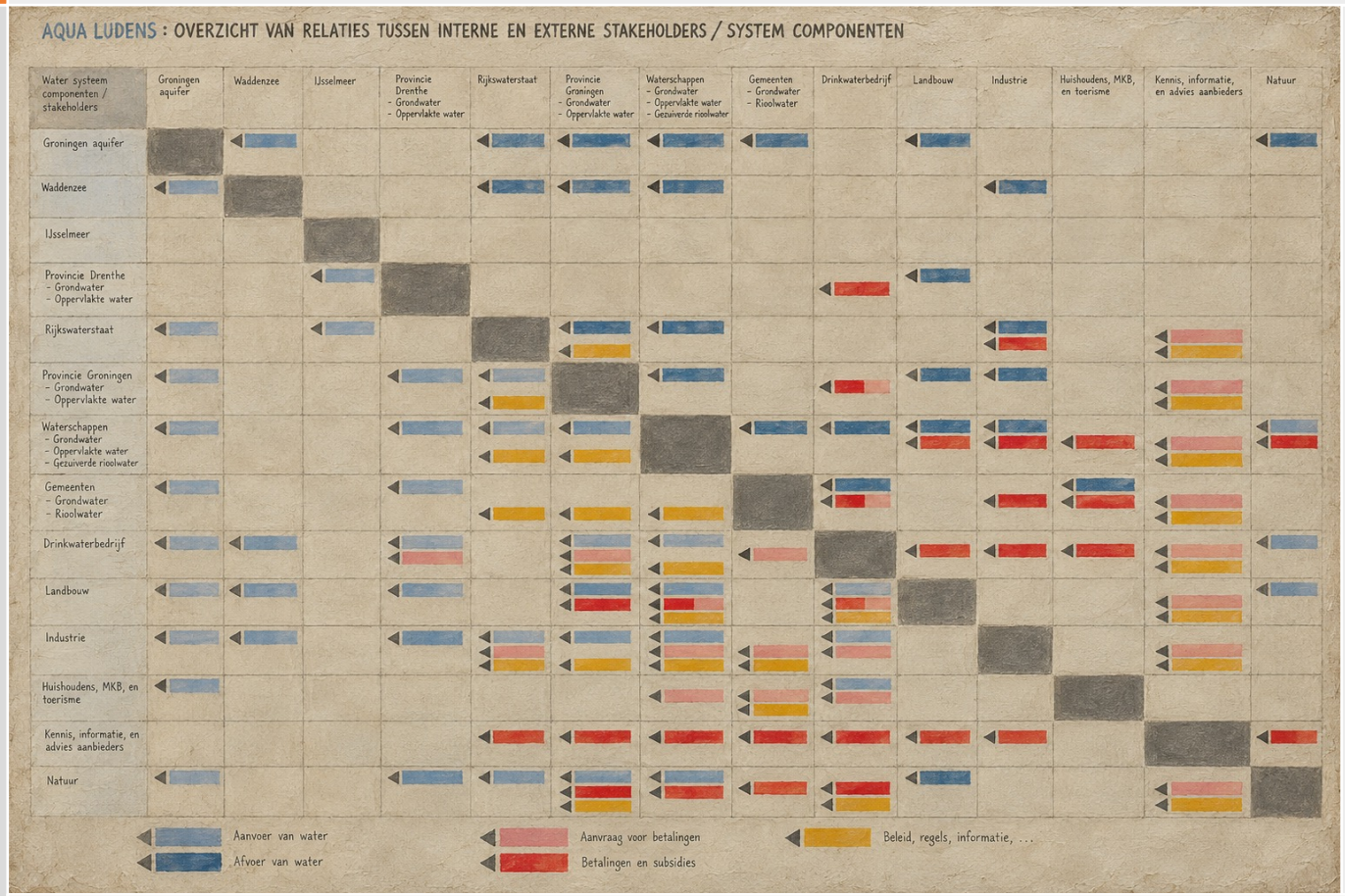
A causal organizing framework for visualizing complex systems focuses on identifying and presenting the causality between actions and their impacts within the described system.

Common approaches for visualizing causality include the use of causal loop diagrams, models depicting dynamic cause-and-effect relationships, event chain diagrams, decision trees, and networks illustrating probabilistic causality and conditional dependencies.

Example above is a visualization of a problem environment that has been used to guide the development of the Situational Awareness Game for the Fire Department Fryslân.

The model describes the intricate process involved in gaining situational awareness and making decisions during a complex incident, the internal and external states of various components within the process, and the nature of causal relationships between them.

RELATIONAL MODEL REPRESENTATIONS FOR VISUALIZING COMPLEX SYSTEMS



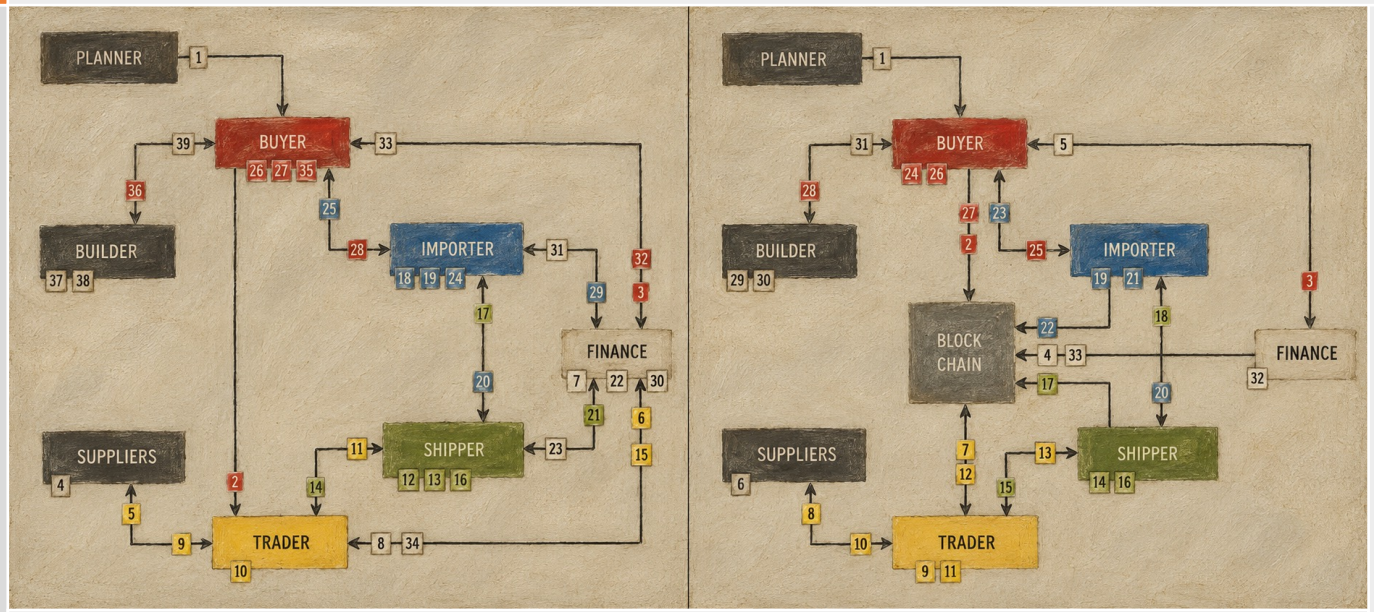
A relational organizing framework for visualizing complex systems focuses on identifying and presenting the connections, dependencies, and interactions between various components of the system.

Common approaches for visualizing these relations include the utilization of network models, dependency diagrams, system architecture diagrams, mind maps, and diagrams illustrating the relative strength or volume of connections.

Example above is a visualization of the problem environment that has been used to guide the development of the Aqua Ludens Game for the Water in the Circular Economy (WiCE) Program.

The model describes the intricate relationships among key stakeholders, encompassing aspects such as the supply and discharge of water, contractual agreements and financial flows, as well as the provision of water-related information, policies, and regulations.

PROCEDURAL MODEL REPRESENTATIONS FOR VISUALIZING COMPLEX SYSTEMS



A procedural organizing framework for visualizing complex systems focuses on identifying and presenting the steps in a process or activities occurring at distinct points in time.

Common approaches for visualizing these discrete event process flows include the use of flowchart diagrams, activity-based diagrams, event-driven process chain diagrams, and models illustrating discrete events and their impact on a system over time.

Example above is a visualization of the problem environment that has been used to guide the development of the Blockchain Game for the Dutch Building Association.

The model visually outlines the building materials supply chain process both before and after the integration of blockchain technology.



THANK YOU

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