Faculty of Design

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The Pattern Atlas of System Vulnerabilities

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The Pattern Atlas of System Vulnerabilities

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The SystemViz Project[1]

> Societal systems can be thought of as a complex "tangle." That metaphor can be extended in order to map an array of human-made vulnerabilities. The result is a Pattern Atlas, which can serve as both an analytical and teaching tool. It comes from the forthcoming book *How Small Players Change Big Systems* (2023). Some 28 types of systemic vulnerability are identified at four levels of scale. The Atlas has several implications for designers.

> First, the Atlas explains the "(n) ever-changing world" paradox – how systems adapt to remain more-or-less the same. Misunderstanding that paradox is the source of continual frustrations by those who aspire to change systems for the better. Second, the Atlas explains the scalar dynamics by which small mishaps or design blunders can cascade to become major catastrophes. That is crucial for understanding the Risk Society that has us (mis)directing our collective fears. Third, a lot of designer-led interventions lead to churn or minor changes among systems. The Atlas helps designers target their interventions to make more fundamental changes and (as importantly) reduce the potential for harmful side effects. All three of these implications are central to designing over time. A handout that visually summarises the Atlas is available.

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[1] http://systemviz.com/

KEYWORDS: systemic design, risk and vulnerability, precarity, risk society, systems change, problem framing, process ontology, visualisation, information design

RSD TOPIC(S): Sociotechnical Systems, Mapping & Modelling

Presentation summary

The presentation provides an overview of The Pattern Atlas of System Vulnerabilities, an analytical model from the forthcoming book, *How Small Players Change Big Systems* (2023). It is often said that society is reliant on a complex "tangle" of systems, both natural and human-made. The tangle metaphor can be expanded as an intellectual scaffolding to better understand the array of vulnerabilities caused by system complexity.

These vulnerabilities result in everything from chronic injustices to large-scale catastrophes. A visual map of the tangle of vulnerabilities—a pattern atlas— serves as an analytical and teaching tool. The Atlas identifies 28 types of systemic vulnerabilities at four levels of scale. The levels of scale are: (a.) the mess (in the sense popularised by Ackoff, 1982), or complex interrelations between many systems; (b.) the entanglements, or groups of interoperating systems; (c.) the threads, or individual systems and subsystems; and (d.) the thread fibres, or routines and sub-routines. These vulnerabilities are something any practical program of sustainability or change will have to contend with.

Implications for designers

First, the Atlas explains the "(n) ever-changing world" paradox – how systems adapt to remain more-or-less the same. Misunderstanding that paradox is the source of continual frustrations by those who aspire to change human-made systems for the better.

Second, the Atlas explains the scalar dynamics by which small mishaps or design blunders can cascade to become major catastrophes. That is crucial for understanding the "risk society" that has us (mis)directing our collective fears.

Third, a lot of designer-led interventions lead to churn or minor changes among systems. The Atlas helps designers target their interventions to make more fundamental changes and (as importantly) reduce the potential for harmful side effects. All three of these implications are relevant to the conference theme of design over time.

Indeed, the Atlas is inspired by a process ontology that describes a world in flux with meta-stable patterns, not full of static objects and structures per se. The presentation is accompanied by a handout that visualises and annotates the Atlas.

Reference

Ackoff, R. L., 1982. The Art and Science of Mess Management. Interfaces, 11(1) (1982), 20-26.

atlas
OF SYSTEM VULNERABILITIES

V.1.0.0   BY PETER STOYKO

system entanglements

the (n)ever-changing world paradox

HAYWIRED

DISCONNECTED

OPAQUE

RIGGED-UP

ENSNARING

CORRALLING

IMITATION

HOOKED

OVER-EXTENDED

PRECARIOUS

UNIFORM

PROPPED-UP

DEFERRED

UNTETHERED

COMPROMISED

REINFORCING

SPIRALING

AMPLIFYING

EXTRACTING

BARRON

CRUFTY

QUIRKY

BUGGY

FAMILY

STARVED

STUCK

CONFLICTED

BRITTLE

CHAFING

THREADS
[Systems and sub-systems]

MESSES
[Complex system inter-relations]

ENTANGLEMENTS
[Cross-system dynamics]

PROPPED UP

OVEREXTENDED

UNTETHERED

DEFERRED

PRECARIOUS

UNIFORM

ENSNARING

SPIRALING

CHAFING

REINFORCING

EXTRACTING

AMPLIFYING

BARRON

HAYWIRED

DISCONNECTED

IMITATION

CORRALLING

OPAQUE

ENSNARING

COMPROMISED

HOOKED

RIGGED-UP

FAMILY

BUGGY   STARVED

QUIRKY

CRUFTY

STUCK

BRITTLE   CONFLICTED

FIBERS
[Routines and sub-routines]

THREADS
[Systems and sub-systems]

SPACE SCALES   TIME SCALES

scale and scope

pace layers and change

TIMING   CHANGE

PERIODIC   SECULAR

QUASI-PERIODIC   CYCLICAL

NON-PERIODIC   DISJUNCTIVE

SYSTEMVIZ

www.systemviz.com

faults + confounds

REGULAR DISRUPTIONS

IRREGULAR DISRUPTIONS

NEGATIVE EXTERNALITIES

CHRONIC DIFFICULTIES

problem maintenance