

Semantic-Aware Metadata and Resilience of Socio-Cultural Ecosystems

Leipzig Data Week 2022

Hans-Gert Gräbe

InfAI Leipzig, Germany

<http://www.informatik.uni-leipzig.de/~graebe>

July 6, 2022

What is Resilience?

Term originated in the 1950s in psychology as adaptability to external conditions and has been applied to the internal adaptability of ecosystems since the 1970s.

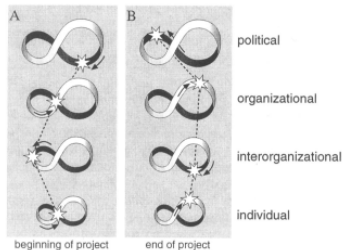
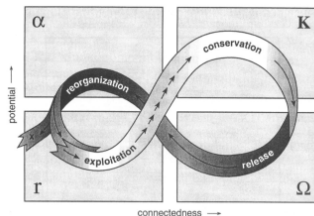
Today, we also speak of technical ecosystems, energy ecosystems, business ecosystems, etc. when we are talking about social structures of a large number of independent stakeholders with diverging interests. It is summarised here under the term *socio-cultural ecosystems*.

Socio-cultural ecosystems have to fulfil specific functions within the human community.

Resilience of a socio-cultural system is its ability to adapt to changing environmental conditions while continuing to fulfil its functions.

Resilience and Panarchy

Question: Is the disruptive restructuring of a system to secure its future viability under environmental conditions beyond certain tipping points part of resilience management?



Pictures from C.S. Holling (2001). Understanding the Complexity of Economic, Ecological, and Social Systems.

Resilience as Systemic Notion

Resilience management of socio-cultural systems, and especially socio-cultural ecosystems, is concerned with a system-environment relationship.

In a systemic view (Holling), however, the environment is itself systemically structured and thus it is about relationships between different systems.

What is a System?

A system is a unit which is delimited against an environment.

The delimitation takes place under at least three aspects:

1. As unit of analysis (functions)
2. As unit of operation (processes)
3. As unit of development (contradictions)

A system provides emergent functions that cannot be reduced to its individual parts (components), but are the result of interaction of its parts in a systemic whole.

A system requires a qualitatively and quantitatively determinable throughput of material, energy and information to maintain its inner structure as an operating condition.

Systems and Semantics

A socio-cultural system as a system of cooperative action develops its own *conceptual system* (semantics) oriented towards functionality and produces *data* on this basis.

In a socio-cultural ecosystem, the semantics of the system and its subsystems are to be put into relation.

The resilience requirements of the system and those of the subsystems must be distinguished.

Systems and Semantics

For this purpose, data recorded in domain-specific semantics of the subsystems must be processed at the level of the overall system and its semantics.

this prepared data is *metadata*, because it is “structured data containing information about characteristics of other data” .

It is also semantic-aware, because semantic aspects are transported from the subsystems into the overall system.

An Example: The Science Publication Ecosystem

Publishers and libraries provide publishing and dissemination of publications as service to the various scholarly communities as subsystems of the ecosystem.

Data collections of publications significant within the scholarly community.

Conceptual world of the scholarly community – *content aspects* of the publications.

Conceptual world of publishers and libraries – *formal aspects* of publications such as author and title (DCMI standard).

An Example: The Science Publication Ecosystem

This is extracted as *semantic-aware* metadata, since it takes part of the semantics of the subsystem to the system of publishers and libraries.

Problem of author disambiguation and development of VIAF and the ORCID system.

Designing new services at the level of the upper system: h-index, cross reference structures between different publications.

This is available as semantic-aware metadata for the scholarly communities as the systemic units of the ecosystem.

Conclusion

Semantic-aware metadata is an important concept to combine semantics in different systemic contexts for a semantic-aware management of a domain-specific data collection for cross-domain use.

However, it is only one building block in a complex organisational framework of resource management of data stocks to maintain resilience in socio-cultural ecosystems.

Thank you for your attention.