UNIVERSITÄT LEIPZIG

Systemwissenschaft und Nachhaltigkeit

WS 19/20
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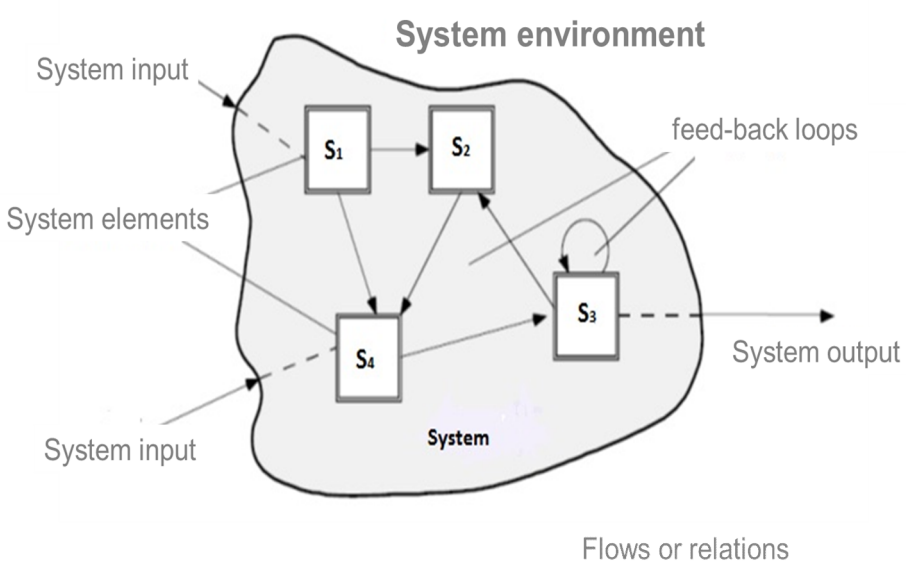
Ökosysteme?-Biologisch? Technisch? Ökologisch? Datenökosystem? Sozial? Ökonomisch? Sozio-technisch? …

System?



- **STRUKTUR** (Aufbau, Anordnungs- und Beziehungsschema seiner Elemente und Eigenschaften),
  - **PROZESS**
- **FUNKTION** (Wirkung, Zweck),
- **EINGANG** und **AUSGANG** (Durchsatz von Informationen, Energie und Stoffen);
- **ZUSTAND** (momentanes Verhalten) und
- **UMFELD** (Vernetzung mit weiteren neben-, über- und untergeordneten Systemen)
- (Dynamik, Raum, Zeit)
- (Deduktiv <> induktiv)
- (Perspektive)
- „ober“, „unter“, „makro“, „mikro“, „vertikal“, „horizontal“, Hierarchie

von Bertalanffy - Vitae

Ludwig v. Bertalanffy
September 19, 1901 – June 12, 1972

Disciplines

- Austrian Biologist,
- His contributions went beyond biology, and extended into cybernetics, education, history, philosophy, psychiatry, psychology and sociology
- v. Bertalanffy grew up in Austria and subsequently worked at the universities of Vienna (since 1934) London (1948–49), Montreal (1949), Ottawa (1950–54), University of Southern California (1955–58), Menninger Foundation (1958–60),University of Alberta in Edmonton (1961–68) State University of New York in Buffalo (SUNY, 1969 - 1972).
- Founder of the General Systems Theory

Starting point

Isomorphism

"…The analysis of general System principles shows that many concepts which have often been considered as anthropomorphic. metaphysical, or vitalistic, are accessible to exact formulation. They are consequences of the definition of systems or of certain system conditions…."

Approach

$$\frac{d\boldsymbol{Q_1}}{d\boldsymbol{t}} = f_1(Q_1, Q_2, \ldots\ldots Q_n)$$

$$\frac{d\boldsymbol{Q_2}}{d\boldsymbol{t}} = f_2(Q_1, Q_2, \ldots\ldots Q_n)$$

$$\frac{d\boldsymbol{Q_3}}{d\boldsymbol{t}} = f_3(Q_1, Q_2, \ldots\ldots Q_n)$$

Wholeness, sum, mechanisation, centralisation

- A system behaves as a whole (biological phenomena, such as growth, metabolism, biocenosis…);

Or

– Physical summativity (e.g. heap of bricks, parallelogram of forces, …) ;

But

– Progressive segregation from a state of equipotentiality;

„In this duality of segregation, implying progressive differentiation and mechanisation, lies the tragic character of every evolution. Progress is possible only by subdivision of an initially unitary action into actions of specialised parts. This, however, means at the same time loss in other respects. The more parts are specialised in a certain direction, the more they are irreplaceable, and loss of parts leads to the breakdown of the whole system."

Wholeness, sum, mechanisation, centralisation

- Connected with this is yet another principle: centralization. If one element plays a leading part, we say that the system is centred around that element;
- “The principle of centralisation is especially important in the biological realm……At the same time, the principle of progressive centralization is that of progressive individualisation.”

- hierarchy

Competition

"…competition of two species for the same resources is, in some way, more fatal than a predator-prey relation, i.e. partial annihilation of one species by the other. For competition eventually leads to the extermination of the species with the smaller growth capacity; a predator-prey relation only leads to periodic oscillation of the numbers of the species concerned around a mean value. These relations have been stated for biocoenotic systems, but it may well be that they have also sociological implications."

" Another point of philosophical interest should be mentioned. If we are speaking of 'systems,' we mean ' wholes ' or 'unities.' Then it seems paradoxical at first that, with respect to a whole, the concept of competition between its parts is introduced.

Closed and open systems

„…In the multicellular organism, cells are dying and are replaced by new ones, but it maintains itself as a whole. In the biocoenosis and the species, individuals die and others are born. Thus every organic system appears stationary if considered from a certain point of view. …"

".. The characteristic state of the living organism is that of an open system. We call a system closed if no materials enter or leave it.' It is open if there is inflow and outflow, and therefore change of the component materials…"

" ….In the case in which the variations in time disappear, systems become stationary. Closed systems thus attain a time-independent state of equilibrium where the composition remains constant. In fact, closed systems must eventually reach a state of equilibrium, according to the second law of thermodynamics. Open systems may, provided certain conditions are given, attain a stationary state…." → steady state

Equifinality

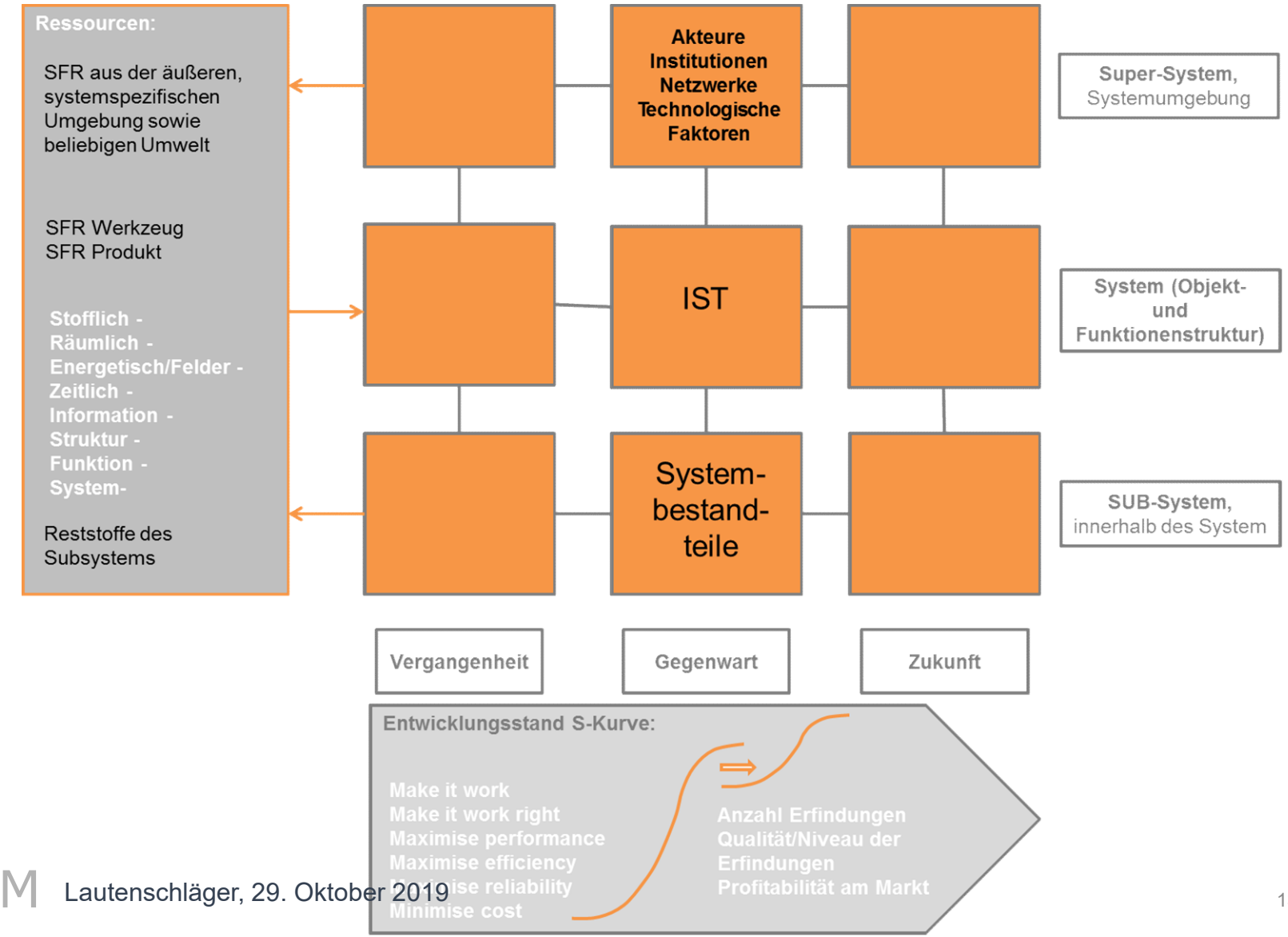
- “….closed systems cannot behave equifinally..”
- “….open systems, which are exchanging materials with the environment, in so far as they attain a steady state, the latter is independent of the initial conditions, or is equifinal…”

- “…growth is equifinal: the same final size which is characteristic for the species can be reached from different initial sizes… or after a temporary suppression of growth..”

Mintzberg, H.; Ahlstrand, B.; Lampel, J. (2009)

1.	**Die Designschule**	*Strategieentwicklung als konzeptioneller Prozess*
2.	**Die Planungsschule**	*Strategieentwicklung als formaler Prozess*
3.	**Die Positionierungsschule**	*Strategieentwicklung als analytischer Prozess*
4.	**Die Unternehmerschule**	*Strategieentwicklung als visionärer Prozess*
5.	**Die kognitive Schule**	*Strategieentwicklung als mentaler Prozess*
6.	**Die Lernschule**	*Strategieentwicklung als sich herausbildender Prozess*
7.	**Die Machtschule**	*Strategieentwicklung als Verhandlungsprozess*
8.	**Die Kulturschule**	*Strategieentwicklung als kollektiver Prozess*
9.	**Die Umweltschule**	*Strategieentwicklung als reaktiver Prozess*
10.	**Die Konfigurationsschule**	*Strategieentwicklung als Transformationsprozess*

9-Felder-Matrix



SUSTAINABILITY