System (glossary)

system

> *(1) A set of elements in interaction.* (von Bertalanffy 1968)

> *(2) combination of interacting elements organized to achieve one or more stated purposes (ISO/IEC/IEEE 2015)*

> (3) A system is an arrangement of parts or elements that together exhibit behavior or meaning that the individual constituents do not. (INCOSE Fellows, 2019)

Source

(1) von Bertalanffy, L. 1968. *General System Theory: Foundations, Development, Applications.* Revised ed. New York, NY, USA: George Braziller, Inc.

(2) ISO/IEC/IEEE. 2015. *Systems and Software Engineering - System Life Cycle Processes.* Geneva, Switzerland: International Organization for Standardization (ISO)/International Electrotechnical Commission (IEC), Institute of Electrical and Electronics Engineers. ISO/IEC/IEEE 15288:2015. The second definition is an expanded version of the ISO/IEC/IEEE version.

(3) INCOSE Fellows Briefing to INCOSE Board of Directors, January 2019.

Discussion

Definition (1) is the System Science definition and applies to all systems: natural, social or technical.

Definition (2) is the recognized definition for systems engineers. Elements in this sense may include hardware, software, firmware, people, information, techniques, facilities, services, related natural artifacts and other support elements. This definition should be restricted to engineered systems which are created with a purpose which provides value to one or more beneficiaries.

Definition (3) was created by the INCOSE Fellows Initiative on System and Systems Engineering Definitions. This was established in 2016, to review current INCOSE definitions of SYSTEM and SYSTEMS ENGINEERING and to recommend any changes necessary to align the definitions to a) current practice, and b) the aspirations of INCOSE's 2025 Vision. At the January 2019 INCOSE Board of Directors meeting, a new INCOSE definition for "system" was approved and is given above.

Expanding on this definition, the INCOSE Fellows state:

Systems can be either physical or conceptual, or a combination of both. Systems in the physical universe are composed of matter and energy, may embody information encoded in matter-energy carriers, and exhibit observable behaviour. Conceptual systems are abstract systems of pure information, and do not directly exhibit behaviour, but exhibit "meaning". In both cases, the system's properties (as a whole) result, or emerge from:

· the parts or elements and their individual properties; AND

· the relationships and interactions between and among the parts, the system and its environment.

Note, definitions (1) and (2) remain applicable to the usage of this term in the current SEBoK, unless specifically stated. As the fellow initiative definition becomes more widely used we expect it to become the default definition in future releases of the SEBoK

See Introduction to Systems Fundamentals for a full discussion of the nature of systems in general and the scope of engineered systems of particular interest to systems engineering.

SEBoK v. 2.6, released 20 May 2022

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