

Digital threat and vulnerability management: The SVIDT method

The Human-Environment Systems (HES) framework has been developed for structuring the complexity of how human and different types of environmental systems (see Figure 1 in the main paper) interact. It consists of six postulates. The first four postulates provide refer to defining the multi-layered human system. Postulate 5 and 6 explain basics to the drivers and degrees of environmental awareness of human systems. And Postulate 7 is a methodological one. The reader may find an elaborated reasoning for the selection of these in Chapter 15 and 16 of, four detailed applications in Chapter 17 of the book *Environmental Literacy in Science and Society* [1] [see also 2], and a discussion in what relation the HES framework is seen to other similar models in Chapter 19 of Scholz [1].

Table S1: Seven principles/postulates for structuring the complexity of a multi-level human–digital environment systems relationship HE_{DS} [see 1, Chapter 16: HES Postulates]

Postulate	Label	Description
P1	Complementarity	Human and environmental systems are characterized by complementarity, mutually influencing and adapting to each other. Both systems are inextricably coupled.
P2	Hierarchy	Human and environmental systems both have hierarchical structures. In the case of humans, there is a hierarchy of human systems ranging from the <i>individual</i> level via the <i>group</i> , <i>organizational</i> , <i>institutional</i> , and <i>societal level</i> to the <i>supra-national level</i> and the <i>human species</i> . Each of these levels has its own rationale and its own drivers. Both human and (natural and technical) environmental systems have different ontologies (here we restrict our considerations to the level of the individual and below).
P3	Interference	There are disruptive and synergetic interactions among and within different levels of human and environmental systems (in particular between the ecosphere, ecosystem, and organism levels).
P4	Feedback	There are different types of feedback loops within and between human and environmental systems. Primary feedback loops are formally expressed by the environmental response to actions by the human system that occur after a certain (relatively short) time span. Secondary feedback loops include possibly unintended, and often delayed, feedbacks caused by an action.
P5	Decision	Human systems (but also other organismic systems) can be conceived of as decision makers that have drivers and act to satisfy goals.
P6	Awareness	Human systems have different types or degrees of environmental awareness (deployed during all phases of a decision process).
P7	Environment First	The effective analysis of inextricably coupled human and environmental systems, as well as the planning for sustainable human–environment interactions, should be based on a thorough analysis of the material and social environment and its respective rationales.

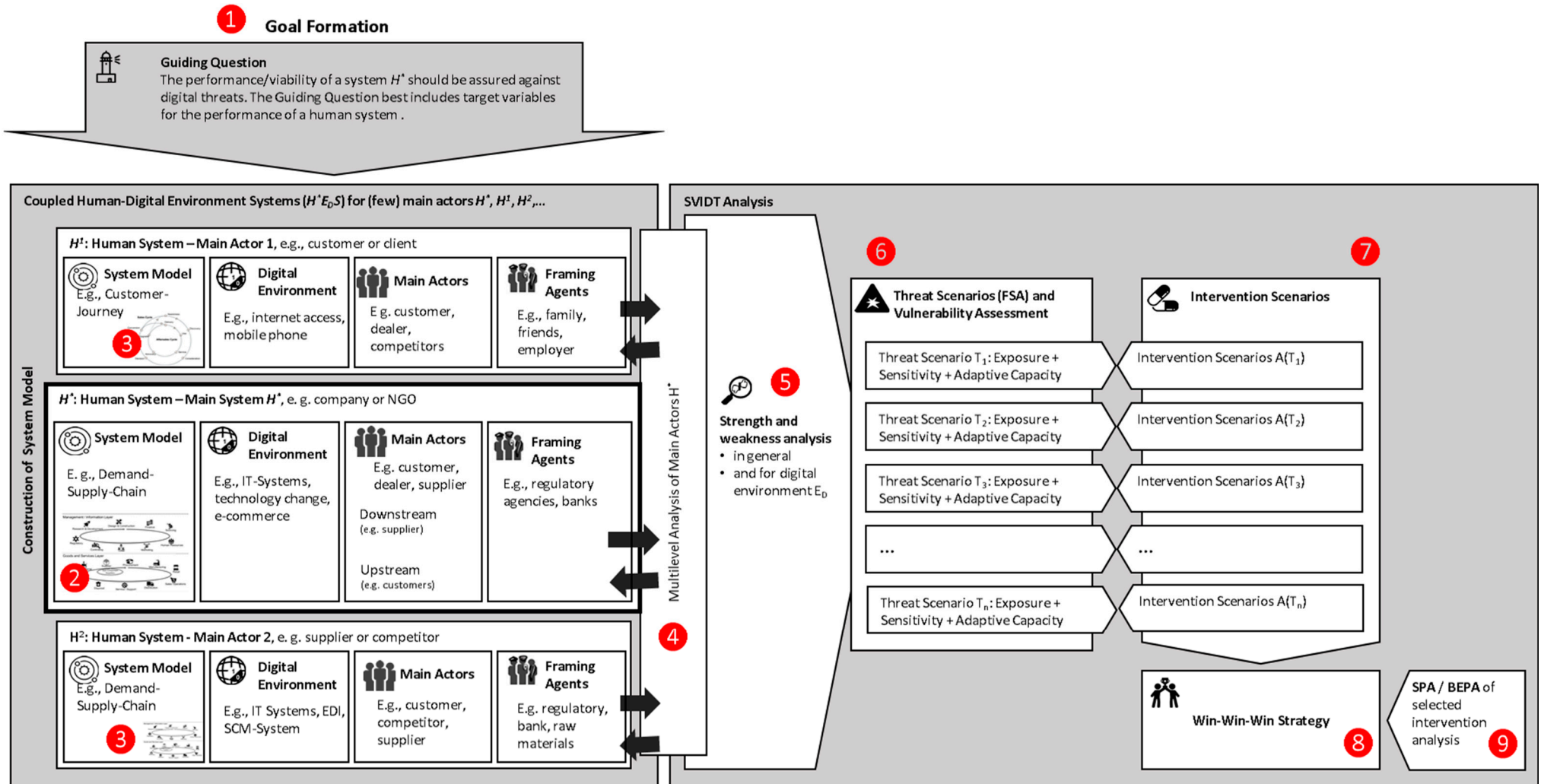


Figure S1. The SVIDT method from a coupled multilevel $HE_D S$ perspective.

References

1. Scholz, R.W., *Environmental literacy in science and society: From knowledge to decisions*. 2011, Cambridge: Cambridge University Press.
2. Scholz, R.W., *The need for global governance of ecosystem services: A Human-Environment Systems perspective on biofuel production*, in *Ecosystem Services and Global Trade of Natural Resources*, T. Koellner, Editor. 2011, Routledge: Oxon. p. 25-44.