Viable Systems Model based Requirements Engineering

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To manage in business environment of global economy, enterprises and their information systems have to change continuously. In this context, the use of Viable Systems Model (VSM) [1] that is designed for enterprises to manage in unpredictably changing environment becomes a promising option for requirements engineering in continuous information systems development and change management. VSM [1], [2], [3] has been applied in many areas, such as computer systems design [4], metaprogram management [5], strategic management [6], and environment scanning and foresight [7], intranet design [8], etc. The VSM of an enterprise prescribes 5 interrelated sub-models, which are called systems: Operational System 1, which brings the benefit to the customer of an enterprise, Coordination System 2, that ensures smooth cooperation of relatively independent parts of the operational system, Integration System 3 that cares for optimal work and auditing (done by System 3*) of the System 1, Strategic Management System 4, and Organizational Identity Management System 5 that ensures balance between intensions of System 4 and goals of the rest of the whole super system of five Systems. System 1, System 2, System 3, System 4, and System 5 are just functional systems and the VSM does not prescribe corresponding 5 organizational units that fulfill theses functions, i.e., the functions can be distributed among different roles in an enterprise. The VSM also prescribes a number of communication channels inside of System 1 and among the Systems1-5. The VSM has the following features that show its potential applicability in requirements engineering:

- VSM prescribes clear groupings of functionality where there are specific functioning units for particular groups of elements (customers) in the environment.
- VSM has a fractal structure, which fosters repetition of particular enterprise architecture patterns at different levels of model hierarchy.
- VSM addresses internal structural changes in the system that opens possibility to identify requirements for mechanisms of adaptation and for adapting of the system.

In requirements engineering, if the organizational processes can be mapped to the VSM, the channels prescribed by the model can suggest a set of repeatable information flows to be identified and described in detail during requirements elicitation process. However, if changes in information systems should be smoothly aligned to the organizational changes, the requirements engineering process shall concern not only the information flows corresponding to the channels of the VSM, but also knowledge flows in an enterprise. Changes of the organizational structure strongly influence the architecture of organizational memory (distribution of knowledge among natural, artificial, and virtual knowledge holders). Therefore the changes in

organizational structure shall be traced to requirements for information systems so that in all cases all necessary information would be available and the ability of knowledge holders to rightly interpret it would be guaranteed.

With the purpose to support requirements engineering for viable, continuously changing, adaptable, and adaptive enterprises we propose the following method: (1) mapping the organizational processes to the VSM (as-is situation); (2) relating VSM mapped processes to information architecture, to organizational and IT solution architecture and to the architecture of organizational memory; (3) identifying virtual actors (consisting of a set of interrelated knowledge holders and a related subset of organizational memory) being behind of each "system" of VSM (System 1, System 2, System 3, System 3*, System 4, and System 5); (4) checking whether each virtual actor has a knowledge potential to interpret all information flows prescribed by VSM and enriching this potential if necessary; (5) in case of organizational changes, repeating points (1) to (4) for to-be situation; (6) identifying and analyzing an architectural gap between to-be and as-is situations; (7) based on the identified architectural gap, defining requirements for information systems development and knowledge growth in an enterprise. Points (5) to (7) shall be repeated in any case of structural changes in the enterprise (including the structure of IT solutions). The proposed method is in the design stage and has only been partly tested.

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