

Viable Systems Model in Information Systems Development

(Abstract)

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Inventive, humanistic, cognitive, community-oriented, liquid, agile, sensing, global, and sustainable - these are the features expected from enterprises in the 21st century [1]. To obtain these features enterprises need appropriate models of functioning. The Viable Systems Model (VSM) [2] has been suggested as an alternative for highly competitive enterprise models [3, 4, 5]. The VSM is rooted in the ideas of cybernetics [6] and comprises five mutually related systems [5]: System 1 is responsible for the production and delivery of enterprise goods or services to the pertinent environment; System 2 is intended to make the set of organizational units which comprise System 1; the task of System 3 is to manage the set of operational units comprising System 1; System 4 is mainly responsible for decisions regarding the future role of the enterprise in the environment; System 5's function is to balance the present and future of the enterprise; it constitutes the maximum authority in the enterprise. One of the essential features of the VSM is its suitability for supporting self-organization and variety handling, e.g., System 5 can absorb all the variety that Systems 3 and 4 cannot absorb between themselves.

In the context of information systems development research the VSM is relevant for two reasons: (1) it is necessary to investigate what the information systems requirements are for enterprises that base their functionality on the VSM; and (2) the applicability of the VSM for information systems where an information system is an enterprise functioning according to the VSM has to be analyzed further [7]. Currently research in these areas is quite fragmentary. Most of the work so far has focused on the fractal nature of the information systems [8, 9]. The VSM prescribes a fractal architecture of the enterprise [3, 10], however it is not clear how exactly fractality has to be addressed with respect of five systems of the VSM at the business level and separately at the information systems level. From the point of view of fractality, the interplay between both levels has been considered in [11], however only in the case where both the enterprise at the business level and the information system are structured as fractal systems. There can be situations where the VSM and/or fractal architecture are applied only at the business level [5] or only at the information systems level. New models of business and information systems alignment might be necessary for handling these situations of heterogenous systems architectures at different levels of representation.

To move forward to well-elaborated information systems support for enterprises which have chosen the VSM as the basic model of their functioning, the following questions have to be answered:

- What database architecture and data structures are applicable for the use of the VSM, e.g., shall the structure of the VSM be mirrored by the data structures?
- What are the basic information flows to be supported by the information systems? What are the potential barriers in information flows to be taken into consideration when designing the information systems for companies using the VSM?
- How information flows relate data in databases and organizational knowledge [12]? What are the roles of enterprise architectures and enterprise ontologies in the VSM-based knowledge and information infrastructure development?
- How agent/subject, service, and object paradigms influence implementation of the VSM-based business and information systems?
- How the information system can support a VSM-based enterprise in continuous extending of its ability to sense and handle internal and external variety [6].

The results achieved by partial implementations of some features of the VSM allow drawing a hypothesis that answers to the questions above can give new information systems-based tools for enterprises to manage in a highly turbulent economic environment.

References

- [1] *FlInES Research Roadmap 2025: Final Document (Version 3.0)* [Internet]. European Communities, 2012. Available from: http://cordis.europa.eu/fp7/ict/enet/documents/fines-research-roadmap-v30_en.pdf.
- [2] S. Beer. *Brain of the Firm*. Allen Lane the Penguin Press, 1972.
- [3] P. Hoverstadt. *The Fractal Organization: Creating Sustainable Organizations with the Viable Systems Model*. Wiley, 2008.
- [4] R. Espejo, A. Reyes. *Organizational Systems: Managing Complexity with the Viable System Model*. Springer, 2011.
- [5] J. Peres Rios. *Design and Diagnosis for Sustainable Organization*. Springer, 2012.
- [6] W. R. Ashby. *An Introduction to Cybernetics*. William Clowes and Sons, 1957.
- [7] W. V. Grembergen. *Information Systems Evaluation Management*. IRM Press, 2002, 17-34.
- [8] M. Kirikova. Towards multifractal approach in IS development. In: Ch. Barry, K. Conboy, M. Lang, G. Wojtkowski, W. Wojtkowski, editors. *Information Systems Development: Challenges in Practice, Theory and Education I*, Springer, 2009, 295-306.
- [9] N. S. Ahmed, N. M. Yasin. Inspiring a fractal approach in distributed healthcare information systems: a review. *International Journal of the Physical Sciences* 2010, 5(11): 1626–1640.
- [10] H. J. Warneke. *The Fractal Company: A Revolution in Corporate Culture*. Springer, 1993.
- [11] R. Strazdina, M. Kirikova. Change management for fractal enterprises. In: J. Pokorny, V. Repa, K. Richta, W. Wojtkowski, H. Linger, C. Barry, M. Lang, editors. *Information Systems Development: Business Systems and Services: Modeling and Development*. Springer, 2010, 735-745.
- [12] M Kirikova. Towards flexible information architecture for fractal information systems. In: A. Kusiak, S.-G. Lee, editors. *Proceedings of the International Conference on Information, Process, and Knowledge Management (eKNOW 2009)*. IEEE Computer Society, 2009, 135-140.