

Chapter 1

Toward an Interdisciplinary Engineering and Management of Complex IT–Intensive Organizational Systems: A Systems View

Manuel Mora

Universidad Autónoma de Aguascalientes, México

Ovsei Gelman

CCADET, Universidad Nacional Autónoma de México, México

Moti Frank

HIT - Holon Institute of Technology, Israel

David B. Paradice

Florida State University, USA

Francisco Cervantes

Universidad Nacional Autónoma de México

Guisseppe A. Forgionne

University of Maryland, Baltimore County, USA

ABSTRACT

An accelerated scientific, engineering, and industrial progress in information technologies has fostered the deployment of Complex Information Technology (highly dependent) Organizational Systems (CITOS). The benefits have been so strong that CITOS have proliferated in a variety of large and midsized organizations to support various generic intra-organizational processes and inter-organizational activities. But their systems engineering, management, and research complexity have been substantially raised in

*the last decade, and the CITOS realization is presenting new technical, organizational, management, and research challenges. In this article, we use a conceptual research method to review the engineering, management, and research complexity issues raised for CITOS, and develop the rationality of the following propositions: **P1**: a plausible response to cope with CITOS is an interdisciplinary engineering and management body of knowledge; and **P2**: such a realization is plausible through the incorporation of foundations, principles, methods, tools, and best practices from the systems approach by way of systems engineering and software engineering disciplines. Discussion of first benefits, critical barriers, and effectiveness measures to reach this academic proposal are presented.*

Businesses no longer merely depend on information systems. In an increasing number of enterprises, the systems are the business. (R. Hunter & M. Bloch, Gartner Group, 2003)

INTRODUCTION

An accelerated scientific, engineering, and industrial progress in information technologies and its convergence with communications technologies (the ICT concept) has fostered the deployment of Complex Information Technology (highly dependent) Organizational Systems (CITOS) in the last decade. The CITOS concept subsumes the well-known constructs of *mission-critical systems*, *large-scale information systems*, *enterprise information systems*, and *inter-organizational information systems*. Generic instances of CITOS are worldwide credit card systems, brokerage financial systems, military defense systems, large ERPs, governmental tax payment systems, and worldwide e-commerce and B2B supply-chain systems in automotive and publishing industries.

Empirical evidence, such as (a) the raising of the ICT budget (measured as a percentage of sales) to 5%-9% in the 2000s (Prewitt & Cosgrove, 2006); (b) the growing of world ICT trade from 8% in 1995 to 10% in 2001 with a 4% annual growth rate (OECD, 2004); (c) the IT commoditization or democratization phenomenon being more affordable the ICT infrastructure in mid-sized firms in the 1990s (Carr, 2003); (d) the maturing of the

myriad of ICT in the last decade (e.g., mobile computing, wireless networks, Web services, grid computing, and virtualization services); (e) the new ways for performing business-oriented operational, tactical, and strategic organizational duties through ICT (e.g., workflow systems, business process management, and service-oriented management); (f) the several tangible and intangible organizational benefits from intra-organizational processes (as in Porter's value-chain activities) and inter-organizational activities (supplier-customer value chains, B2B, and e-government initiatives) leveraged by CITOS; and (g) the thousands of US dollars lost due to availability, continuity, and capacity failures in ICT services (van Bon, Pieper, & van der Veen, 2006) because of an hour of system downtime. These factors and others show that CITOS are relevant for business and government organizations (as well as for nonprofit organizations).

Such systems are characterized by having (1) many heterogeneous ICT (client and server hardware, operating systems, middleware, network and telecommunication equipment, and business systems applications) (2) a large variety of specialized human resources for their engineering, management, and operation; (3) a worldwide scope; (4) geographically distributed operational and managerial users; (5) core business processes supported; (6) a huge financial budget for organizational deployment; and (7) a critical interdependence on ICT. Thus, these can be correctly labeled as "complex systems"

22 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/toward-interdisciplinary-engineering-management-complex/38170

Related Content

Conclusion

Vincenzo De Florio (2009). *Application-Layer Fault-Tolerance Protocols* (pp. 326-349).

www.irma-international.org/chapter/conclusion/5131

Flexible Provenance Tracing

Liwei Wang, Henning Koehler, Ke Deng, Xiaofang Zhou and Shazia Sadiq (2011). *International Journal of Systems and Service-Oriented Engineering* (pp. 1-20).

www.irma-international.org/article/flexible-provenance-tracing/55120

Information System Prosumption Development and Application in e-Learning

Malgorzata Pankowska (2013). *Integrated Information and Computing Systems for Natural, Spatial, and Social Sciences* (pp. 408-431).

www.irma-international.org/chapter/information-system-prosumption-development-application/70620

A Comprehensive Fault Prediction Model for Improving Software Reliability

Kamlesh Kumar Raghuvanshi, Arun Agarwal, Khushboo Jain and Amit Kumar Singh (2022). *International Journal of Software Innovation* (pp. 1-16).

www.irma-international.org/article/a-comprehensive-fault-prediction-model-for-improving-software-reliability/297914

Building Elastic Java Application Services Seamlessly in the Cloud: A Middleware Framework

Rostyslav Zabolotnyi, Philipp Leitner and Schahram Dustdar (2014). *Handbook of Research on Architectural Trends in Service-Driven Computing* (pp. 661-685).

www.irma-international.org/chapter/building-elastic-java-application-services-seamlessly-in-the-cloud/115448