Knowledge Management Framework for IT Project Portfolio Risk Management

Ulysse Rosselet
Information Systems Institute
Faculty of Business and Economics
University of Lausanne
1015 Lausanne, Switzerland
ulysse.rosselet@unil.ch

Maia Wentland
Information Systems Institute
Faculty of Business and Economics
University of Lausanne
1015 Lausanne, Switzerland
mwf@unil.ch

Categories and Subject Descriptors
H.4 [**Information Systems Applications**]: Miscellaneous; D.2.9 [**Software Engineering**]: Management—*project portfolio management, risk management*

General Terms
Management, Design

Keywords
IT project portfolio, knowledge management system, risk management, strategic alignment, knowledge management environments

1. INTRODUCTION
Striving to improve performance, the portfolio approach to Information Systems (IS) builds on analogies with financial portfolio theory to manage IT as a portfolio of assets [3, 4]. As shown by [3], the mature, synchronized management of project portfolio has a significant positive impact on its return. Key critical aspects for successful IT project portfolio management (ITPPM) are (i) assessing individual project risk and (ii) considering the aggregate risk of the portfolio of projects [3, 4].

Our poster presents, following the guidelines of [2], a research in progress conducted together with a FTSE 100 company aiming at reaching a higher level of maturity of their ITPPM process. This process was redesigned according to best practices [3, 4] and analyzed using the CommonKADS methodology [7]. This work uncovered important shortcomings in the knowledge related to project and portfolio risk management [6]. To enable appropriate understanding and management of risk at project and portfolio level, we designed a model for risk analysis which led us to specification, deployment (integration in the company's ITPPM portal) and evaluation of a risk Knowledge Base (KB).

K-CAP'09, September 1–4, 2009, Redondo Beach, California, USA.
ACM 978-1-60558-658-8/09/09

2. MODEL FOR RISK ANALYSIS
Risk management should consider positive as well as negative dimensions of risk [9]. The definition *"risk—an uncertain event or condition that, if it occurs, has a positive or negative effect on a project objective"*[5] leads us to model risk as a threefold structure:

1. **Risk factor** is the nature of the uncertain event or condition. Risk factors of projects touch specific production factors of the organization in what regards performance, effectiveness, continuity or conformity.
2. **Production factor** represent any element that is necessary to the realization of the project during its complete life-cycle. Production factors can be of human, technical, informational or organizational nature.
3. **Impact** is the effect of risk factors on production factors in terms of quality, time, budget or scope. It is characterized by a probability and level of effect.

Risk needs to be considered at different levels of granularity as long as it is composed of smaller scale risks. For instance, the project's risk of failure is composed of the risk that the project output is rejected and of the risk that the output is not delivered. At portfolio level, concurrent projects generate interdependencies between risk factors by reason of production factors sharing. This interweaving of risks suggests that risks could be regarded as a fractal structure and described homogeneously at all levels of granularity.

During its whole life-cycle, we assume that the fractal structure of a project risk evolves according to changes

in the risks factors, production factors and changes in the objectives. Within a dynamic perspective, the interactions between risk factors of different projects may produce complex self-organized behaviors.

At each iteration of the portfolio risk management process, the inferences made by experts regarding risk mitigation and synergies exploitation are capitalized in the form of *risk patterns*. These have the form of IF... THEN... rules and are linked to instances of risk that corroborate the pattern.

Example of rule for position of project owner: IF the project owner is at a low hierarchical position, THEN the customer turnover risk is significantly higher.

Example of rule for concurrency of new components: IF projects require the addition of components to the existing architecture, THEN they should be phased. The risk of conflict between the components in the environments, where projects share the same resources, is difficult to anticipate and can result in service interruption.

3. APPLICATION

The risk KB is part of the KM system for ITPPM operating on the company's intranet [6]. It is tightly integrated to other elements of the IT project and portfolio management portal and is accessible to the department's portfolio manager, project managers (staff or external) and relevant project team members.

The risk KB allows for direct access to experiences of past projects and to sources of expertise such as staff and consultants. This KB enables the update of risk factors, production factors, impacts and responses according to observations during project and portfolio management. The storage/retrieval and transfer phases of the knowledge process are thus supported [1], which builds individual as well as organizational memory and fosters intergroup knowledge access. These new sources of knowledge are then combined by experts in the risk assessment process. The application of risk patterns allows for identification of new and update of existing risk patterns.

4. EVALUATION

Based on users' comments, the risk knowledge base improves their understanding of project interdependencies, allowing them to better consider risk in the selection and prioritization of projects. The integration of our KM framework in the company's intranet portal demonstrates the feasability of our research [8].

As further evaluation methods, we are working on (i) using metrics to assess the impact of our artifact on the ITPPM process performance and (ii) benchmarking to evaluate our design compared to other risk management methods.

5. CONCLUSIONS

By considering that the structure of risk is fractal, our framework is helpful in understanding the way different risks combine within and across distinct projects to form the global risk of the project portfolio. In order to identify and elicit best practices for project and portfolio risk management, the experience gained through project risk evaluation and follow-up is capitalized in the form of risk patterns, which become guidelines for subsequent project selection and portfolio balancing decision making. This fact is confirmed by decision makers who use the functional prototype operating on the intranet IT portal of the company.

6. REFERENCES

[1] M. Alavi and D. E. Leidner. Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *Management Information Systems Quarterly*, 25(1):107–136, March 2001.

[2] A. Hevner, S. March, J. Park, and S. Ram. Design science in information systems research. *Management Information Systems Quarterly*, 28(1):75–106, March 2004.

[3] M. Jeffery and I. Leliveld. Best practices in IT portfolio management. *MIT Sloan Management Review*, 45(3):41–49, Spring 2004.

[4] F. W. McFarlan. Portfolio approach to information systems. *Harvard Business Review*, 59(5):142–150, September 1981.

[5] Project Management Institute. *Guide to the Project Management Body of Knowledge*. Project Management Institute Publications, 2000.

[6] U. Rosselet, Y. Jolliet, and M. Wentland. Knowledge Management for IT Project Portfolio. In *Proceedings, European Conference on Knowledge Management*, 2009.

[7] G. Schreiber. *Knowledge Engineering and Management: The CommonKADS Methodology*. MIT Press, Cambridge, 2000.

[8] V. Vaishnavi and W. Kuechler Jr. *Design science research methods and patterns: innovating information and communication technology*. Auerbach Pub, 2007.

[9] S. Ward and C. Chapman. Transforming project risk management into project uncertainty management. *International Journal of Project Management*, 21(2):97–105, February 2003.