

# EXPERIMENTAL SOFTWARE RISK MANAGEMENT

## White Paper

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*Started by interventions of* Luigi Cantone, Bernd Freimut, Fred J. Heemstra, Rob J. Kuster, Macario Polo Usaola, *further interventions of* Fred J. Heemstra, and Rob J. Kuster, and *comments of* Giovanni Cantone, Francisco Ruiz Gonzalez, Roberto Meli [, others if any].

*Continued by further comments of* [this is a dynamic list of names].

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### **Abstract**

*This white paper deals with the following questions: • What is the state of the art in the Empirical Software Risk Management (ESRM) in different fields like Economics, Industrial Organization, and Software? • What is the role, if any, that Risk Management plays nowadays in the software industry? • Has Experimentation any mean as part of ESRM, or this should limit to inquiry and case studies? • Are there options for the establishment of proficient collaborations among ESRM people having different types of research points of view? The paper reports on an exchange of opinions that was started by a two day ESRM workshop held at the University of Roma "Tor Vergata", was continued successively, and is still going on the e-mail.*

### **1. Goal**

On October 21-22 a workshop on Experimental Software Risk Management (ESRM) was organised by Giovanni Cantone at the University of Roma at Tor Vergata. The ESRM workshop was supported by the Ministry of Education, University and Research, MIUR, Italy, Grant No. 020906003.

Goal of the workshop was to explore a number of different approaches towards ESRM, to identify overlap and relationships between the various approaches and to explore options for further collaboration. To this end a number of presentation were held, followed by an extensive discussion among the participants. In this white paper the results of the discussions will be presented.

Invited speakers were: *Luigi Cantone*, University of Naples "Frederic the 2nd", Faculty of Economics, Dept. of Business Management (I) - *Bernd Freimut*, Fraunhofer IESE, Kaiserslautern (DE) - *Rob J. Kusters*, Dutch Open University, Department of Management Sciences (ND) - *Fred J. Heemstra*, Dutch Open University, Department of Management Sciences (ND) - *Macario Polo Usaola*, University of Castilla-La Mancha, Escuela Superior de

Informática, Ciudad Real (SP) - and *Francisco Ruiz Gonzalez*, University of Castilla-La Mancha, Escuela Superior de Informática, Ciudad Real (SP).

Attending were participants from industry and academia (see Section 6) Further contributions to discussion were given by *Luigi Buglione*, SchlumbergerSema, *Roberto Meli*, DPO-Srl, *Carlo Quattropani*, Intecs, *Orsio Romagnoli*, Geotronics.

## **2. A short overview of all presentations and comments.**

Slides related to presentations can be placed ASAP on <http://ese.uniroma2.it/events/esrmw> and <http://eseg.uniroma2.it/events/esrmw>

*F. Heemstra: Risk management: The Point of View of Industrial Organization Research.*

An overview was presented of concepts, methods and tools regarding risk and risk management. Focus was on software development project risk management. Requirements for a risk management method were presented.

*M. Polo Usaola: The Point of View of Software Maintenance Research.*

A method was discussed to identify and estimate risks of software maintenance projects. Risk analysis was used to obtain an overview of sources of variation in these costs in order to achieve better estimation and planning of maintenance effort. The information resulting from the risk assessment was used to refine estimations. A description of a method and supporting tools for this method were presented.

*B. Freimut: Performing Empirical Risk Management Studies in Industrial Organizations: a Case study.*

In order to demonstrate how empirical studies can be performed with risk management in an industrial setting, results from a case study were presented that introduced a systematic risk management method, namely the Riskit method, into a large German telecommunications company. The objective of the case study was to analyse the usefulness and adequacy of the Riskit method and also to analyse the cost-benefit of the method in this industrial context. Results showed the method is practical, adds value to the project, and that its key concepts are understood and usable in practice.

*L. Cantone: The Point of View of Economic Research.*

Risk was looked at in the context of an organisation that operates in a fast changing environment in which complex product systems are developed. This environment is characterised by high knowledge content, complex development, high degree of competitiveness and a high degree of relationship intensiveness. Many software development environments fall within this scope. Risk was described as the probability that the organisation is not able to deliver a new complex product system. Risk is thus measured against the ability to provide customer value. Customer value is defined by the difference or ratio between the value of the benefits (advantages) delivered to

the customer and the total costs (price, cost of use of the system, switching cost, cost of up-grading and other opportunities costs).

*R. Kusters: Designing checklists: a comparison of approaches.*

A checklist often supports identification of project risk. In this presentation advantages and disadvantages of using such checklists are identified. Based on this a series of requirements for checklist design are derived. Three different approaches towards checklist design are described and assessed against the derived criteria.

*F. Heemstra: Design of a project risk management method.*

When looking at risk management as a human information processing and decision making activity a number of requirements for a project risk management method can be derived. Based on these requirements a method was designed.

*R. Kusters: Empirical evaluation of a project risk management method.*

The project risk management method described by Heemstra in the previous presentation was designed with a number of premises in mind. These are that role based bias would prevent any individual (including project managers) from providing a sufficient identification of project risk and that a well-designed group performs better in this respect. Empirical evidence is presented to support these premises.

The following comments were given by:

*Roberto Meli, DPO SRL, [Rome](#).*

[TBI]

### **3. Discussion**

In the discussion it was concluded that three different views on risk and risk management were taken in the various discussions.

Cantone described risk as the probability that the organisation is not able to deliver a new complex product system, so as required by the customer. Risk is thus measured against the ability to provide customer value. The level of discussion is not directed at a single project, but at the structural ability of an organisation to perform. He says it's possible refer the ability to perform customer value to a single project: it's could be the case of the new product or system development. Of course, there is a general competence of the firm to perform product innovation (multi-project management competence). This competence is embedded in the organisational routines, which are firm specific. So, the problem can be sketched as in the following questions: is the firm able to transfer such a general competence to innovative projects (new systems development)? What are the core competencies of the firm that facilitate the development of new innovative projects? In other words, can knowledge, capabilities, skills that were developed in other successful

innovative projects be used synergistically in order to develop new systems, which have value for the customer?

Polo and Ruiz used information resulting from the risk assessment to schedule resources for software maintenance projects. These very some data can be used to determine commitments of service levels, specially in outsourcing relationships . No attempt was made to identify actions to influence probability of risks occurring or risk impact. The level of discussion was aimed at risk assessment for a single or a portfolio of maintenance projects<sup>1</sup>

Freimut, Heemstra, and Kusters all looked at risk management within the context of a single development project. Aim was to identify and deal with project risks before it could have adverse effects on project performance and / or delivery.

If we look at these three points of view we can notice two fundamental differences in the approaches:

1. The contributions of Cantone, Freimut, Heemstra, and Kusters all look at product development (innovation) while the contribution of Polo and Ruiz looks at product maintenance (improvement).
2. The contribution of Cantone looks at risk on the strategic level, indicating an interest in the risks of the organization. The contributions of the other participants all look at the tactical level, indicating an interest in execution risks of the projects.

Combining these two viewpoints we can develop a framework (figure 1) with two dimensions: Process point of view (vertical)<sup>2</sup>, and Product point of view (horizontal). In this framework the approaches are positioned as:

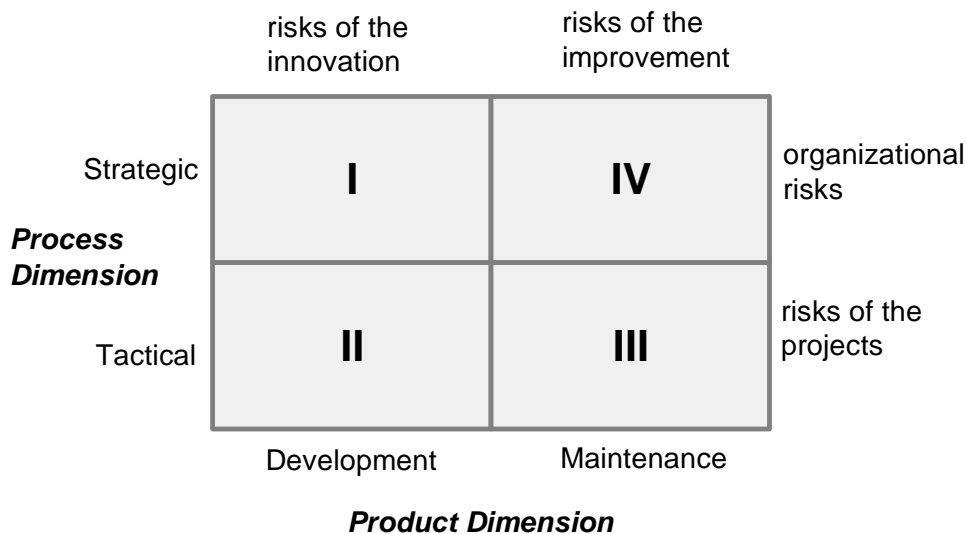
- I. Product development / Strategic or organizational (business) process (Cantone)
- II. Product development / Tactical or project process (Freimut, Heemstra, Kusters)
- III. Product maintenance / Tactical or project process (Polo & Ruiz)
- IV. Product maintenance / Strategic or organizational (business) process.

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<sup>1</sup> [We think that the risk concept is always referred to a work/effort which is realized to reach an objective \(i.e., it is related with the project concept and not with the system concept\).](#)

<sup>2</sup> [In this dimension we use the planning hierarchy proposed by D.J. Reifer in "The Planning Hierarchy"; Software Management, 5th edition. IEEE Computer Society, 1997; pp. 168-171.](#)

Process design	I	IV
Process execution	II	III
	Product development	Product maintenance



**Figure 1:** the different approaches positioned in a framework

On the basis of this framework it is possible to formulate a number of questions.

A first type of question naturally focuses on area IV (process design / product maintenance). Given that no representatives from this area were present this issue was not discussed during the workshop. Anyway, it looks that the goal in this area is to consider risks of the software maintenance inside organizational (business) processes.

A second set of questions focuses on cross fertilisation: can lessons learned in one area be applied to another area. Some suggestions are mentioned below:

#### 1 What can I learn from area II

- Research in area I focuses on the identification of a generic list of key success factors. Maybe local situational factors play a role here. The brainstorm / checklist based approach used in area II might prove useful.
- Project risks identified in area II might be more structural, and influence the ability to perform of the entire development organisation.

#### 2 What can I learn from area III

- The approach used here to develop a risk factor checklist makes use of structural factors related to the type of development process used. This might translate to area I.

#### 3 What can I learn from area I

- A problem identified in area II is the difficulties encountered when trying to embed the developed risk management approaches in the standard way of working of the development organisation. Area I aims part of its research at just this type of problem.

#### 4 What can I learn from area III

- The approach used in area III to develop a checklist provides an interesting addition to the approaches currently discussed in area II.

#### 5 What can I learn from area I

- A problem identified in area III is the difficulties encountered when trying to embed the developed risk management approaches in the standard way of working of the development organisation. Area I aims part of its research at just this type of problem.

#### 6 What can I learn from area II

- Both areas have aimed their research at risk assessment. An area under investigation in area III is the use of assessment results as an input into maintenance decision-making. Research in area II might provide some suggestions to this effect. Furthermore the idea is explicitly control risk might also provide a stimulus to the area III research.

It is clear that the different areas can inspire one another. This naturally leads to the final question: should we strive for actual cooperation between the areas or should we acknowledge the benefits of mutual exchange of information and inspiration as a welcome result of the workshop and focus further research within the specific areas.

## 4. Conclusions

In a two-day workshop researchers representing different approaches to risk management research discussed possible further collaboration. In the discussion it was concluded that, although there definitely were topics where the research areas touched one another and the discussions had provided mutual benefits, the focus areas of research (organisational design, project risk management, maintenance planning and execution) differed to such a large degree that joint research would not be profitable. On the other hand, exchange within each area was deemed beneficial.

However, there exists a possible way to integrate these disjoint proposals through a more global conceptual framework. For this, figure 1 can be a first approach. In order to advance in this research, it should be considered that Computing is no longer a discipline that designs/builds technical systems with social repercussions, but a discipline that designs/builds social systems which are technically implemented.

## 5. Participants

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## 7. Further comments

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*Date of the day Given name Family Name: Company, e-mail.*