Title: Enterprise Engineering Environment to support Risk Management in SME Servitization projects

Location: University of Vienna, Austria, Research Group Knowledge Engineering, with some periods in France.
International collaboration: Ecole Nationale Supérieure des mines de Saint Etienne (ENSMSE), France, Institut FAYOL.
Scientific field: Computer Science, Business Informatics

PhD Director: Prof. D. Karagiannis, University of Vienna
Co-director: Prof. X. Boucher, ENSMSE

Contact and application
Prof. Dimitris Karagiannis
Univ.-Prof. Prof. h.c. Dr. Dimitris Karagiannis
Tel: (+43) 1 / 4277 78910, Fax: (+43) 1 / 4277 878910
e-mail: dk@dke.univie.ac.at
http://www.dke.univie.ac.at

Research context
During recent years, we have witnessed a development and an expansion of servitization and Product Service System (PSS) concepts in industrial and economic fields. Servitization involves the substitution of a product offering by a service offering. In many advanced economies, servitization is thought of as a development approach capable of providing opportunities for achieving sustainability, improving enterprise competitiveness, and better satisfying customer needs [1]. Nevertheless, turning to this new paradigm requires questioning business and organization roles and goals. In addition to technical and functional aspects, PSS are also based on organizational aspects, which introduce an additional difficulty in the implementation of this concept in businesses [2]. Consequently, transitioning from a product manufacturer into a service provider constitutes a risky managerial challenge [3] [5]. It involves the company in a dynamic and complex decision-making process, where many different kinds of risks can appear.

The general endeavor of the PhD research developed in this proposition is to develop a decision-aid approach, based on enterprise modelling, to help decision-makers in managing risks, along projects of organizational transition by servitization. Previous state of the art and research developed in [4] have underlined the lack of methods or approaches to support the management of servitization from the point of view of risk management. This research work aims at answering this need.

Objectives of the research

The main purpose of the PhD research is to develop a decision-aid method to support the management of risks throughout servitization projects within manufacturing companies. The aim of the PhD work is not only to formalize conceptually the method, but also to implement it within an enterprise modelling and decision-aid environment, so as to take advantage of the full added-value of information technologies.

Additionally, one of the objective of this research work is to launch an innovative collaboration between two research institutes with very complementary competences: on the one side, the Institut FAYOL (Ecole Nationale Supérieure des Mines de Saint Etienne – France), with key inputs concerning the formalization and diagnosis of servitization processes; on the other side the Research Group Knowledge Engineering (University of Vienna – Austria), with key added-value on enterprise modelling methodologies.
Based on this strong collaboration and complementarity, the key objectives of the PhD research will focus on:

- Conceptual specification of all models required to model formally a servitization project and the decision-process associated, in order to proceed to a risk assessment throughout the whole decision-process. This formalization will be based on the recent scientific advances of Institut FAYOL concerning risk assessment for servitization.
- Specification, development and test of specific decision-supports systems (DSS), required for risk assessment. Fuzzy subset theory is proposed as a potential research orientation to implement these decision-aid algorithms, with the scientific rigor necessary.
- Customization of a specific Enterprise Modelling Environment able to support the implementation of servitization-oriented models, as well as the implementation of the DSS systems required. This work could take advantage of recent research on the formal development of open models for enterprise modelling, and could require new advances for the visualization of models and decision-aid results.
- Specification of a decision aid methodology to support the management of risks throughout servitization projects. This final work consists in embedding all the models and tools defined above within a consistent and well-structured methodology to help managers in supervising servitization projects. This methodology will be concretely evaluated with industrial case studies.

### Research Methodology

The research methodology aims at structuring and taking advantage of the added-value of the 2 research teams implicated, with a PhD student which will start, in a first period, by integrating specific advanced skills from both laboratories, in order to generate (second period) a new innovative methodology at the interface between the two fields of expertise:

**ENSMSE – FAYOL**
- Servitization of Industry
- Risk management
- SME case study

**UNIVIE – KE**
- Metamodelling
- Open models
- Service Oriented Enterprise

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**International PhD Research**
- Conceptual models for servitization transformation projects
- Decision Support System for risk management
- Methodology for transition management in a context of servitization

The research methodology will be structured with 3 main phases:

**Research level 1: mutual learning process**
- Develop strong skills on servitization, risk management for servitization projects, decision-aid for SME managers
- Develop strong skills on meta-modelling, advanced method for enterprise engineering and model-driven decision support systems.

**Result expected:** general specification of enterprise models for servitization, and general specification of risk-oriented decision support systems. Illustration of the various research issues on an industrial case study

**Research level 2: development of models and decision support systems**
- Incremental design and implementation of the models and modelling method.
- Detailed specification, then implementation of a risk assessment and management method
- Tests and experiments on the illustrative case study
Result expected: First version of a modelling and decision-aid environment for the management of servitization projects. Analysis of the experimental results on a first case study.

Research level 3: generalization

- Specification of a general methodology for transition management in a context of servitization
- Validation of the models, decision-support systems and methodology on a case-study

Result expected: formalization and validation of a risk-oriented method to help the management of servitization projects.

References