PhD Proposal 2016

School: Ecole Centrale de Nantes	
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Title: **Computer-Aided Rapid Generation of Product Development Strategy**
Scientific field (*): Automation and Robotics, System Engineering, Industrial Engineering
Key words: Product Development Process, Value Chain Simulation, Decision Making, Knowledge Management

(*) *: Chemical engineering, Computer Science, Image and data processing, applied mathematics, Electrical engineering, Automation and Robotics, System Engineering, Industrial Engineering, Fluid Mechanics, Aerodynamics, Acoustics, Combustion, Material Science, Optics, Electronics, Nano technology, Micro-system, Bioscience, Solid mechanics, Surface Science, Civil engineering.*

Details for the subject:

Background, Context:

Nowadays, to satisfy the rapid changing customer needs, product development evolves to the directions of short life cycle, large diversity and personalization. Traditional mass production strategy cannot meet the development requirements since different highly customized product requires different rapid product development strategy, which is consists of a chain of development processes. In each step of a product life cycle, from design to manufacturing, there is a large number of alternative development processes. To form a full development chain or strategy, alternative development processes should be selected from each development step to form a global optimal combination according to product development requirements. Hence, how to efficiently and reliably identify a sequential product development processes to form a full optimal product development strategy so as to reduce the global product development time, cost and risk is a key issue to support the frugal innovation in today's product development domain. Due to the long product development chain and the requirement of knowledge intensive decision making, knowledge based method and tools within the computer-aided environment are demanded.

Research subject, work plan:

This research will investigate the development of a computer-aided method with its tools for product knowledge formalization and reuse to support the rapid generation of product development strategy so as to align with the requirement of product development evolution trend and improve the automation of product development. The preliminary general work plan for the PhD candidate is given as follows:

1. Investigate diverse product development chains and strategies;
2. Study the value chain of product development and simulate the value chain;
3. Learn knowledge management methods and tools to represent and evaluate process knowledge;
4. Develop multi-objective optimization methods and decision making tools to help identify the optimal product development process combination, full strategy;
5. Conduct real case study for selected product development examples.

The expected results of the proposed research are several scientific papers with high originality and quality for first-class peer-reviewed journals and international conferences in design and production domains. And, a prototype of computer-aided expert tool for rapid generation of product development strategy is also demanded.

References:

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4. Kengpol, Athakorn, and Christopher O'Brien. "The development of a decision support tool for the selection of advanced technology to achieve rapid product development." *International Journal of Production Economics* 69.2 (2001): 177-191.

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