

Research title

Process Decision Frameworks for DoD and e-Services Projects

Contact information

Supannika Koolmanojwong

Address:

University of Southern California
Center for Systems and Software Engineering
941 Bloom Walk, SAL 328
Los Angeles, CA 90089-0781

Email:

koolmano@usc.edu

Abstract

The growing diversity of software systems (requirements-driven, NDI-driven, services-driven, learning-driven, qualities-driven, systems of systems) has made it clear that there are no one-size-fits-all processes for the full range of software systems. Some process models are being developed that provide specific evidence-based and risk-based decision points. One of the most thoroughly elaborated of these models is the Incremental Commitment Spiral Model (ICSM). The ICSM with its risk-driven nature and its process decision table can help new projects converge on a process that fits their process drivers and circumstances. To select and follow the appropriate process pattern should help the projects conclude more quickly and efficiently. A set of process decision criteria and the ICSM decision points have been defined on a general-experience basis. But quantitative evidence has been lacking on the ability of the criteria to produce a viable process decision early in the life cycle.

The ICSM has been developed to support the users to use the framework to create a development process appropriate for their system of interest. The differences in their risk pattern or opportunity pattern determine difference course of actions in each life cycle phase. The following eight common cases cover the very small to the very large project as well as the use of non-developmental item to the development of a large, complex custom development or maintenance of the developed systems. Eight common cases of the ICSM are (1) Software-Intensive Applications (2) Software-Intensive Devices, (3) Platform with Embedded Software Systems (4) Large and diversified Software-Intensive System (5) Family of Systems (6) System of Systems (7) Enterprise Systems, and (8) Brownfield Modernization.

To experiment about the process decision framework, a process selection decision tool is developed by focusing on the sub common cases of software-intensive application common case, which are commonly found in the USC real-client MS-level systems and software engineering team projects. The four sub common cases of the software-intensive applications are Use Single NDI; Architected Agile; NDI-Intensive; and Services-intensive. Early in the project, in the Exploration or Valuation phase, when the shared vision and capabilities are defined, the development team together with the success critical stakeholders uses the process selection decision tool to select the appropriate process pattern by answering a list of questions that can be categorized into 4 groups: alternative solution, life cycle, architecture, and resources. The result will suggest the most appropriate process.

The experiments are conducted with 84 teams of graduate level systems and software engineering class projects. The experimental results have shown that without the process decision framework, the development teams are not sure which process to follow. There are many projects that followed the wrong process pattern and suffered from poor performance on both unnecessary effort and resources. These risks and problems could have been mitigated by using process decision criteria to select the appropriate process common case. The process decision framework is then extended to cover other common cases.