Chapter 4.6
Comparison of Ten Agent-Oriented Methodologies

Quynh-Nhu Numi Tran
University of New South Wales, Australia

Graham C. Low
University of New South Wales, Australia

ABSTRACT

This chapter provides a comparison of the 10 agent-oriented software engineering methodologies presented in the preceding chapters. An evaluation framework comprising process-related, technique-related, model-related and supportive-feature criteria is used in this comparison. As each application entails a different set of requirements that indicate which evaluation criteria are the most important and should be supported by the chosen methodology, the "best" methodology is dependent on the target application. The results provide a useful framework to assist the developer in selecting the most appropriate methodology for any target application.

INTRODUCTION

This chapter presents an evaluation and comparison of the 10 agent-oriented software engineering (AOSE) methodologies discussed in the preceding chapters. The objective is to assist researchers and practitioners in selecting the most appropriate methodology for a particular application. In order to achieve this, we discuss the similarities and differences between the methodologies, noting their strengths and weaknesses with regard to their support for multi-agent systems (MAS) development. This comparison is not a straightforward task, considering the heterogeneity of the methodologies in terms of their scope, approaches, terminology, development activities, and modelling notations.

The evaluation and comparison are conducted using the *feature analysis* approach. Feature Analysis is the most common and cost-effective approach compared to other evaluation techniques such as survey, case study, and field experiment (Siau & Rossi, 1998). Feature analysis employs a checklist of evaluation criteria to assess and compare methodologies based on selected methodological features.

We have adopted the feature analysis framework proposed by Tran, Low, and Williams (2003). This framework was developed from a synthesis of previous evaluation efforts and is capable of assessing AOSE methodologies from both the dimensions of conventional system development methodologies and those specific to AOSE. Its evaluation criteria are comprehensive, case-generic, and multi-dimensional, covering AOSE methodology's process, techniques, and models.

We will describe the evaluation framework in more detail in the next section. The section entitled "Comparative Analysis" presents the evaluation and comparison of the 10 AOSE methodologies, using the framework.

THE EVALUATION FRAMEWORK

The selected evaluation framework was formed by identifying and integrating the evaluation criteria from various feature analysis frameworks, including those for assessing conventional system development methodologies–namely Wood, Pethia, Gold, and Firth (1988), Jayaratna (1994), Olle, Sol, and Tully (1983), and the Object Agency Inc. (1995), and those for evaluating AOSE methodologies–namely Shehory and Sturm (2001), O'Malley and DeLoach (2001), Cernuzzi and Rossi (2002), and Sabas, Badri, and Delisle (2002). The former category provides a well-established list of *generic system engineering features* to be considered, while the latter presents various *agent-oriented and MAS-specific aspects* for assessment. We have also added several evaluation criteria that are not yet included in existing frameworks, for example, "approach towards MAS development," "support for mobile agents," and "support for ontology." A survey had been conducted to substantiate the relevance of the proposed criteria and to make the necessary refinements to the criteria specification.

The structure of the framework is shown in Figure 1. Its criteria are grouped into four categories:

- **Process-Related Criteria:** evaluating an AOSE methodology's development process.
- **Technique-Related Criteria:** assessing the methodology's techniques to perform development steps and/or to produce models and notational components.
- **Model-Related Criteria:** examining the capabilities and characteristics of the methodology's models and notational components.[1]
- **Supportive-Feature Criteria:** evaluating a variety of high-level methodological capabilities.

This structure highlights the framework's attention to all three major components of a system development methodology—process, models, and techniques.

Each evaluation criterion is accompanied by one or more questions to guide and assist the evaluator. A detailed specification of the criteria is presented below.

Figure 1. Structure of the evaluation framework