CREATING A COMPREHENSIVE AGENT-ORIENTED METHODOLOGY – EXTENDED ABSTRACT

Brian Henderson-Sellers

Faculty of Information Technology, University of Technology, Sydney, PO Box 123, Broadway, NSW 2007, Australia

While individual agent-oriented methodologies are useful for restricted situations, for wider industry adoption it is useful to create a methodological framework that provides method fragments from which situationally specific methodologies can be constructed. Such a flexible approach can be found in the use of situational method engineering (SME). In this context, this article describes the details of SME and its embodiment in the OPEN Process Framework (OPF) [1]. The OPF uses an underpinning metamodel, a repository (a.k.a. methodbase) of method fragments and guidelines to assist method engineers create the final methodological approach from a selected number of fragments to form an organization-specific or project-specific methodology.

Having described SME with the OPF, we then show how this basis is suitable not only for objects but also for agents and discuss agent-specific method fragments. We then demonstrate how it becomes possible not only to recreate whole agent-oriented methodologies such as Prometheus or Gaia or Tropos but how it is also possible to create an enhanced methodology such as might be obtained, for instance, by adding Tropos method fragments into a Prometheus-style methodology in order to tailor Prometheus to situations for which it was not originally designed.

This paper was originally published as Chapter XIII in a book entitled *Agent-Oriented Methodologies* (edited by B. Henderson-Sellers and P. Giorgini) by Idea Group in July 2005. The aim of the book was to present a significant number of agent-oriented methodologies, written by the original developers, but in a standard format. They were asked to not only describe their approaches but also highlight specific positive features and areas not addressed in their methodologies. These were followed by a chapter evaluating these 10 approaches objectively [2] and then this final chapter [3]. The overall aim is to encourage "convergence" between methodologies so that when industry en masse adopts agents there will be an agreed methodological offering. The idea is to avoid the errors of OO wherein industry sought an OO methodology to adopt in the early 1990s and were offered between 20 and 60 (depending upon which author you read) – this was tantamount to an admission that OO was not ready for industry usage.

The way forward is proposed to be Situational Method Engineering (SME) [4]. Rather than seeking a single unified methodology, unification occurs at the metamethodology level [e.g. 5] and method fragments are generated from concepts in this metamodel [1] and stored in a repository or methodbase [4,6,7]. Construction guidelines [1,7-9] are then followed in order to create a methodology that takes into account the many industry situational factors, including, for instance, security, reliability, real-time, safety criticality, organizational maturity, project size and developers' skills levels. This approach is technology agnostic and all these elements are as suitable for agent technology as for object technology.

The sources for fragments are largely existing methodologies [10] plus best practice. For agents, there are around a dozen or so extant methodologies that have provided fragments to enhance the original OO-focussed repository of the OPF so that it can offer full support for the re-creation of AO methodologies. The fragments have thus far been gleaned from each individual AO methodology and are summarized in the book chapter [3]. Future work, under way, is to investigate possible (and likely) overlaps between various method fragments across the various AO methodologies. This is particularly evident in the proferred AO work products i.e. diagrams to represent various AO features not found in traditional OO diagrams such as those provided by the UML [11].

As well as proposing a community effort to create a merger of methodological ideas, there are other interesting research issues raised. In particular, how does one measure the quality of the constructed methodology, both in terms of internal qualities such as consistency, but also external

quality in terms of its suitability for a particular situation? Evaluating how a methodology works in practice requires liaison with industry, possibly using an Action Research style of investigation [12]. Other possible community efforts could also be instigated. For example, intercomparison of approaches, not only theoretically as, for instance, in [2] and other similar studies [e.g. 13], but also on a test example (e.g. [14]) and, preferably, in industry situations, might yield significantly improved understanding of what works and what is less successful. Similarly, such intercomparison could reveal any significant weak points in agent-oriented methodology research and help researchers target areas where results are likely to be the most fruitful.

The ultimate result of the substantial efforts of the various AO methodology teams, complemented by method engineering techniques will be the consolidation of the agent-oriented methodological community's contribution to the better development of commercial software systems and the provision of an agreed and widely supported methodological approach to the development of agent-oriented applications in the future.

References

[1] D.G. Firesmith and B. Henderson-Sellers. The OPEN process framework. Harlow, UK: Addison Wesley, 2002.

[2] Q.-N.N. Tran and G.C. Low. Comparison of ten agent-oriented methodologies. Chapter XII In *Agent-Oriented Methodologies* (edited by B. Henderson-Sellers and P. Giorgini), Idea Group, Hershey, PA, USA, 2005.

[3] B. Henderson-Sellers. Creating a comprehensive agent-oriented methodology – using method engineering and the open metamodel. Chapter XIII In *Agent-Oriented Methodologies* (edited by B. Henderson-Sellers and P. Giorgini), Idea Group, Hershey, PA, USA, 2005.

[4] A.H.M. Ter Hofstede and T.F. Verhoef. On the feasibility of situational method engineering. *Information Systems*, 22: 401-422, 1997.

[5] Standards Australia. Standard metamodel for software development methodologies, AS4651-2004, 23 August. Sydney, NSW: Standards Australia International, 2004

[6] S. Brinkkemper. Method engineering: engineering of information systems development methods and tools. *Inf. Software Technol.,* 38(4): 275-280, 1996.

[7] J. Ralyté and C. Rolland. An assembly process model for method engineering. In *Proceedings of the 13th Multi International Conference on Advanced Information Systems Engineering, CAISE'01, Interlaken, Switzerland. June 6-8.* LNCS2068, Berlin: Springer-Verlag, 267-283, 2001.

[8] S. Brinkkemper, M. Saeki and F. Harmsen. Assembly techniques for method engineering. In *Proceedings of CAISE 1998*, Berlin: Springer-Verlag, 381-400, 1998.

[9] J. Ralyté, C. Rolland and R. Deneckère. Towards a meta-tool for change-centric method engineering: A typology of generic operators. In *Proceedings of CAiSE2004* (eds. A. Persson and J. Stirna). LNCS 3084, Berlin: Springer-Verlag, 202-218, 2004.

[10] J. Ralyte. Towards situational methods for information systems development: engineering reusable method chunks. *Procs. 13th Int. Conf. on Information Systems Development. Advances in Theory, Practice and Education* (eds. O. Vasilecas, A. Caplinskas, W. Wojtkowski, W.G. Wojtkowski, J. Zupancic and S. Wrycza), Vilnius Gediminas Technical University, Vilnius, Lithuania, 271-282, 2004.

[11] Object Management Group. OMG: Unified Modeling Language Superstructure, Version 2.0, August 2005, OMG document formal/05-07-04 [Online]. Available http://www.omg.org/cgi-bin/doc ?formal/05-07-04 (2005).

[12] D.E. Avison, F. Lau, M. Myers and P.A. Nielsen. Making academic research more relevant. *Communications of the ACM*, 42(1): 94-97, 1999.

[13] K.H. Dam and M. Winikoff. Comparing agent-oriented methodologies. In *Agent-Oriented Systems* (eds. P. Giorgini, B. Henderson-Sellers and M. Winikoff), LNAI 3030, Berlin: Springer-Verlag, 778-793, 2004.

[14] E. Yu and L. Cysneiros. Agent-oriented methodologies - Towards a challenge exemplar. In *Agent-Oriented Information Systems 2002, Procs.AOIS-2002* (eds. P. Giorgini, Y. Lespérance, G. Wagner and E. Yu), 47-63, 2002.