

# Automatic Service Agreement Negotiators in Open Commerce Environments

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**ABSTRACT:** There is a steady shift in e-commerce from goods to services that must be provisioned according to service agreements. This study focuses on software frameworks to develop automated negotiators in open commerce environments. Analysis of the literature on automated negotiation and typical case studies led to a catalog of 16 objective requirements and a conceptual model that was used to compare 11 state-of-the-art software frameworks. None of them was well suited for negotiating service agreements in open commerce environments. This motivated work on a reference architecture that provides the foundations to develop negotiation systems that address the previous requirements. A software framework was devised to validate the proposal by means of case studies. The study contributes to the fields of requirements engineering and software design, and is expected to support future efforts of practitioners and researchers because its findings bridge the gap among the existing automated negotiation techniques and lay the foundations for developing new software frameworks.

**KEY WORDS AND PHRASES:** Automated negotiation, electronic services, negotiation requirements, reference architecture, service agreements, services science, software frameworks.

E-commerce has evolved from shopping for goods on the Internet to outsourcing electronic services, such as flight reservations, payments, or executing business intelligence jobs on the cloud [10, 47, 56]. The focus of the present study is on so-called next-generation companies, which rely heavily on the automation of business processes that build on services outsourced around the world because this enables companies to be more efficient and cost-effective by exploiting economies of scale [4, 12, 13, 14, 15, 22, 40, 55]. For instance, Gartner predicts that at least 30 percent of the investment in software will go to outsourced services instead of product licenses by 2012, and 40 percent of capital expenditures will be made for outsourced infrastructure by 2011 [44].

Services science focuses on merging results in computer science, software engineering, and classical business sciences so that business requirements are better mapped onto technology [5]. The complex issues involved in this mapping require the simultaneous development both of business methods and of the technology that supports them. Fortunately, the technologies of service-oriented architecture (SOA) seem to be helping business analysts

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