

Preface

CHALLENGES AND OPPORTUNITIES FOR SERVICE INTELLIGENCE AND SERVICE SCIENCE

Introduction

The global economy and organizations are evolving to become service-oriented. There have recently been more and more research works on services provision, particularly with a cross-disciplinary approach. Beyond the Services Oriented Architecture (SOA), intelligence in computing is essential to achieve service excellence for the ever complicating requirements in the rapidly evolving global environment. This involves knowledge from various disciplines such as computer science, industrial and systems engineering, management science, operations research, marketing, contracts and negotiations; as well as culture transformation and integration methods based on beliefs, assumptions, principles, and values among organizations and humans. In this preface, we would also like to outline some challenges and opportunities for Service Intelligence and Service Science (SISS).

Challenges And Opportunities

As Zhang (2004) has pointed out, killer applications are required to drive Web Services researches. Since the publication of International Journal of Web Services Research (Zhang, 2004), basic researches for services have been steadily progressing. However, the big challenge of the engineering killer applications for intelligent services is still emerging based on the accumulating experiences of services deployment within and across organizations.

The current basis of services and most systems is the Web, which is ever evolving, towards Web 2.0, Web 3.0 (Lassila & Hendler, 2007), etc., so called Web x.0. Web 2.0 refers to a second generation of the Web, facilitating communication, information sharing, interoperability, and collaboration based on user-centered design. Virtual systems and virtual communities based on autonomous and peer-to-peer systems, in which a wide range of intelligent services and analysis are applicable, are therefore among the hottest research topics.

To scale up service provision, the Grid is a high-potential technology for the solution (Foster & Kesselman, 2004). Based on the Grid, concepts like software as a service (SaaS), communications as a service, utility computing, meta-services, and recently cloud computing have emerged (Hayes, 2008).

Such emerging system architectures and computing paradigms bring new power to massive intelligent systems and services, and provide opportunities in new application domains (such as aviation services).

However, they also bring ever increasing complexities that calls for innovations and standardization. In addition, social and legal issues of such emerging technologies and systems must not be ignored (Chiu, Kafeza, & Hung, 2009).

Recently, though there is still much debate on the scope of Web 3.0, key components of Web 3.0 include semantics and intelligence.

Agent based technologies is one of the most promising solution for the integration of systems and services in an intelligent context (He at al., 2003; Chiu, Cheung, & et al., 2010). Intelligent agents are considered as autonomous entities with abilities to execute tasks independently. Various technologies from artificial intelligence can be applied at services, agents, and systems level, including computational intelligence, soft computing, game theory, genetic algorithms, evolutionary computing, logics, machine learning, cybernetics, planning, optimization, and so on. Such intelligence is vital for excellence in service matchmaking, recommendation, personalization, operation, and monitoring (Chiu, Yueh, & et al., 2009). Further, ontology and semantics provides better understanding of the requirements for users and systems, as well as related trust, reputation, security, forensic, and privacy issues in order to provide a better foundation for intelligent system behaviors.

Example application areas include but not limit to service management, service marketing, relationship management, negotiations, auctions, and electronic marketplaces. Further, with increasing popularity of mobile and ubiquitous computing, location and pervasive intelligence for services (Hong et al., 2007) is also an active research area.

To empower systems and services with intelligence, knowledge acquired beforehand and during system execution is the key ingredient. Therefore, knowledge engineering is a key to excellence in systems and services, which includes knowledge modeling, architectures, acquisition, discovery, integration, and applications. Typical knowledge engineering services include content, multimedia, and metadata management, design management, engineering management, electronic education, and so on. As for knowledge application, they can be deployed for decision support and strategic information systems, integration of research and practice, and the management of service personnel and workforce, etc.

Book Content

This book intentionally seeks scientists, engineers, educators, industry people, policy makers, decision makers, and others who have insight, vision, and understanding of the big challenges in Service Intelligence for excellence in service provision. We also aim at helping in communicating and disseminating relevant recent research across disciplines, cultures, and communities. This book comprises of fourteen chapters that covers some novel practical issues of this emerging field. They can be divided into three categories or sections: (1) basic concepts and theories, (2) intelligent technologies, and (3) applications and case study.

Basic Concepts and Theories

The first section contains three chapters covering some basic concepts and theories of SISS, such as service composition and demand analysis.

Bræk et al. propose a policy-based methodology for dynamic service composition and recommendation taking context into account. They demonstrate their approach using a multi-media over IP service that considers security requirements, monitored threat levels, user locations, and preferences.

Li et al. investigate transactional support for composing and scheduling Web services with different transactional properties in workflow constructs. They introduce the concept of connection point to derive the transactional properties of composite Web services and discuss the scheduling issue of composite Web services.

Sun et al. examine some fundamentals for demand analysis in Web services. They propose a demand-driven architecture and demand-driven Web service lifecycle for service providers, service requestors, and service brokers, respectively, in order to facilitate research and development of web services, e-services, service intelligence, service science, and service computing.

Intelligent Technologies

The second section contains four chapters covering some issues on intelligent technologies for SISS, such as ontology and data mining technologies.

Fredj et al. deal with the dynamic maintenance of service orchestrations in the presence of unavailable services with a focus on the dynamic substitution of stateful services. They propose the SIROCO middleware platform based on ontology and present some experimental evaluation of their first prototype, showing that SIROCO provides the necessary means for achieving dynamic maintenance with a reasonable expense on the execution of service orchestrations.

Overbeek et al. study the main concepts for integrated service delivery together with relationships, relational constraints, and interdependencies between the main concepts for integrated service delivery have been determined. They develop an ontology for integrated service delivery based on studying public domain knowledge from different viewpoints to support for organizations that wish to participate in integrated service delivery processes and monitor the execution of services.

Wang et al. propose a six-element based ontological structure for semantic retrieval, and use description logic to semantically describe the atomic term, complex terms, instances, instances description, attribute assignment and axioms. The new structure is evaluated by the Gruber's criteria including explicitness and objectivity, consistency, extensibility, minimal encoding bias and minimal ontological commitment. Based on the new structure, they propose two reasoning mechanisms, i.e., terms-oriented and instances-oriented, for semantic retrieval application. They also propose conversion mechanisms and determining algorithms, which enable the reasoning for various relations in a specific area according to the rules made by domain experts. Finally, they put forward four kinds of rules for information retrieval, and analyze the applications of the new structure in semantic retrieval.

Hung proposes a framework to develop different probabilistic data mining techniques by classifying uncertain data into different categories, in order to apply this directly on uncertain data and produce results that preserve the accuracy. Hung also proposes a variety of definitions and approaches for different mining tasks on uncertain data with different properties. The advances in data mining application in this aspect are expected to improve the quality of services provided in various service industries.

Applications and Case Studies

The third section contains seven chapters covering some contemporary applications and cases for SISS to demonstrate the applicability and potential of this emerging field.

Lee et al. present a practitioner's tool, Business Transformation Workbench, for business transformation built on a component-based model, which implements a methodical approach that was devised to

analyze business transformation opportunities and make business cases for transformation initiatives, thereby providing decision-support to the consultants. The Business Transformation Workbench has been instantiated with data from finance management domain and applied to address a client situation as a case study. An alpha testing of the tool was conducted with about dozen practitioners with 90% positive feedback. The tool is currently being piloted with customer engagements in a large IT consulting organization.

Tosic et al. research context specification for a management system performing various management activities and potentially used by mobile service-oriented systems. They model context properties analogously to QoS metrics because of their processing similarities. They built their solutions for specification of context properties and related management activities into two languages: the Web Service Offerings Language (WSOL) and WS-Policy4MASC, which increase usefulness of WS-Policy4MASC for management of mobile service-oriented systems.

Zhang et al. propose a service-oriented approach to solve interoperability problem by providing an integrated platform, on which interoperability is considered as utility-like capability and delivered in the form of Software as a Service (SaaS). Each enterprise in a supply chain could establish the interoperation activities with other partners in this platform and thus they could efficiently collaborate. They illustrate how two SaaS-typed applications interact with each other with a case study on an automobile supply chain.

Yoshikawa proposes a new car navigation system which enables the following three services: route search service with unspecified stopover points, route search service for traveling through sightseeing spots in consideration of sightseeing time, and quick response using dedicated hardware. The proposed car navigation system is implemented on a field programmable gate array, and its validity is verified by several evaluative experiments using actual map information.

Blinn et al. investigate process-oriented integration of product development and service documentation for technical customer services support in machine and plant construction. They discuss the problem, as well as the solution on the basis of hybrid added value, the structure of the product service system, the IT-concept and the implementation of the service process modeling with a practical use case.

Swaid and Wigand explain how service quality is evaluated in online-oriented shopping. Because customer satisfaction is paramount, a service quality model incorporates customer satisfaction as an outcome. As this study is the first of its types focusing on service quality in the setting of “buy online, pickup in-store”, traditional retailers can consider these findings as guidelines of advancing into the online world. As such, pure online retailers can benefit from these findings in understanding the impact of establishing a physical presence on service quality models and customer satisfaction.

Liu et al. propose three insurance models for business Web services and enabling technologies, including quality description, reputation scheme, transaction analysis, etc. They believe that the insurance of business Web services will help service competition and hence boost the development of more and more business Web services, and the software industry at large.

Summary

The creation, operation, and evolution of the research and practice in Service Intelligence and Service Intelligence raise concerns that range from high-level requirements and policy modeling through to the deployment of specific implementation technologies and paradigms, as well as involve a wide (and

ever growing) range of methods, tools, and technologies. They also cover a broad spectrum of vertical domains, industry segments, and even government sectors.

We are continuously seeking collaborations and carrying out various scholarly activities, including workshops, conference special tracks, and journal special issues on this topic. The *International Journal of Systems and Service-Oriented Engineering* (IJSSOE) (Chiu, 2010) of IGI has been established to provide a continuing forum for SISS and beyond. We also have edited a related special issue the *International Journal of Organizational and Collective Intelligence* (IJOICI).

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