Preface

INTRODUCTION

Currently, organizations face many business challenges due to the changing business climate, including competition, managerial restructuring due to right-sizing, mergers & acquisitions, and new partnerships. To cope with this fast-changing environment, organizations are focusing on services to stay competitive. There is renewed interest in developing efficient services in every business domain to improve the overall performance of the organization. Especially, nowadays, many businesses are focusing on service dominant logic. The core of service dominant logic is that the “value of a product is co-created through activities between service provider and service consumer.” Moreover, the main focus of service logic is value, which the customer wants to get from the service that is provided. In order to provide the expected value to customers, services should meet their expectations. The requirements for services should be in line with what customers want from the service. Therefore, it is important to not only gather the right requirements from customers but also include the service provider’s requirements in designing appropriate services. The implementation and delivery of services require the integration of a variety of technologies. Thus, IT convergence is also necessary for service implementation and delivery in order to provide a good customer service experience. The IT convergence based service design adds another layer of requirements that also need to be taken into account. Thus, managing the requirements for IT convergence based services is an important issue and is an active area of research.

Eliciting appropriate requirements from both the service providers and consumers is essential for the service identification process. Typically, a Goal and Scenario based methodology is used for eliciting requirements in the context of SOA (Service-Oriented Architecture). To incorporate the notion of value in the service identification methodology, a value-based requirements engineering methodology is used. In this approach, one can distinguish and calculate the value associated with each requirement. Thus, through this methodology, one can address the value issue and identify the high value requirements. Since the traditional service identification methodologies just focus on eliciting requirements from existing, known customers without worrying about value concept, a value-added requirements elicitation methodology should be used that can be applied for IT convergence based services. Results from requirements engineering field and IT convergence field in the context of services and the design of service systems need to be integrated. In addition, these service systems should provide mechanisms for value co-creation. Hence, novel approaches are required which can combine service identification using goal and scenario in SOA and value-based requirement engineering to IT convergence to facilitate value co-creation between provider and customer in a service system.
There are three major factors that impact the success of service design - first, the value co-creation aspect; second, requirements management for service identification; and third, IT convergence. It is important that organizations clearly understand these factors and institute measures to enhance them. Each of these factors is briefly described below. The interaction process between the service provider and customers is referred to as co-creation. Another way of characterizing this phenomenon is through the notion of procurer (consists of producer and consumer). This co-creation activity generates value for all the stakeholders involved, which is then referred to as “value-co-creation.” Through this activity, participants can attain their goals which they wanted to achieve before the participation. Value co-creation is an integral part of service systems. Maglio and Spohrer state that “a service system represents any value co-creation configuration of people, technology, value propositions connecting internal and external service systems, and shared information such as language, laws, and measures.” In addition, the smaller service systems focus on an individual’s interaction with others, while the larger service systems comprise the global economy.

A scenario based approach is used for requirements management and service identification, particularly in the context of IT convergence. This may introduce additional requirements and interactions with system requirements. Goal and scenario methodology has been used for eliciting requirements from a number of stakeholders. In this approach, a goal is something that a stakeholder hopes to achieve in the future. Goals are extracted through the elicitation process from the service provider and customer, and hence represent the objectives of the service provider and customer. Scenarios are the means for achieving the elicited goals. To achieve each scenario, one or more sub-scenarios may be needed. Scenario modeling consists of three levels (Business Level, Service Level and Interaction Level). The first level, called the “Business Level,” is the highest among the three levels. This level represents the business requirements given by an organization or a person who plays the role of a business analyst. Thus, this level represents the direction, purpose, and objective of the organization. The second level, called the “Service Level,” stands for what the system should provide to an organization to fulfill the business requirements. It means that this level is a sub level of the business level. In addition, this level can consist of more than one component to complete the business objectives. The third level is called the “Interaction Level.” Through this level’s processes, we can achieve the different components of the service level. Potential changes are elaborated in variable scenarios that describe possible alternative or optional scenarios of a base scenario. The variable scenario model includes variable scenarios as well as all requirements and scenarios of the scenario model. Finally, potential services can be identified from the variable scenario model.

IT Convergence refers to being able to unify and provide a common platform for co-existence. This may involve getting different components to work together in conjunction. With increasing globalization and the growing dynamics of the business environment, technology is definitely an integral part of operations and service delivery. Technological innovations can be used to link and improve services. This is because technology affects the general public, businesses and government in more ways than one. It can be used as a means of providing better services to customers and a cost effective tool for businesses. The concept of integrating technology with different domains has proved to be innovative as well as successful in the recent past. Some of the most noticeable examples include integrating technology into the communications world. For example, the Voice over Internet Protocol service is definitely providing a new method of communication that successfully links the ICT sector with IT convergence. IT convergence comes into play when we are able to provide a better interface for customers. It can be
viewed as a mechanism for effectively delivering the required services in accordance with the customer feedback. Thus, there is a great need for integrating value based requirements management and IT convergence to improve service identification, design, and delivery.

ORGANIZATION OF THE BOOK

In Chapter 1, titled “Classifying Consumer Comparison Opinions to Uncover Product Strengths and Weaknesses,” Xu et al. discuss opinion mining on the Web. A huge volume of Web content is generated by users in online forums, wikis, blogs, and social networks, among others. These user-contributed contents include numerous user opinions regarding products, services, or political issues. Among these user opinions, certain comparison opinions exist, reflecting customer preferences. Mining comparison opinions is useful as these types of viewpoints can bring more business values than other types of opinion data. Manufacturers can better understand relative product strengths or weaknesses, and accordingly develop better products to meet consumer requirements. Meanwhile, consumers can make purchasing decisions that are more informed by comparing the various features of similar products. In this chapter, a novel Support Vector Machine-based method is proposed to automatically identify comparison opinions, extract comparison relations, and display results with the comparison relation maps by mining the volume of consumer opinions posted on the Web. The proposed method is empirically evaluated based on consumer opinions crawled from the Web.

Nikolai Dahlem, in Chapter 2 titled, “OntoClippy: A User-Friendly Ontology Design and Creation Methodology,” describes OntoClippy, a tool-supported methodology for the user-friendly design and creation of ontologies. Existing ontology design methodologies and tools are targeted at experts and not suitable for users without a background in formal logic. Therefore, this research develops a methodology and a supporting tool to facilitate the acceptance of ontologies by a wider audience. In this article, the author positions the approach with respect to the current state of the art, formulates the basic principles of the methodology, presents its formal grounding, and describes its phases in detail. To demonstrate the viability of his approach, the author performs a comparative evaluation. The experiment is described, as well as real-world applications of the approach.

Chapter 3, “Combining Supervised Learning Techniques to Key-Phrase Extraction for Biomedical Full-Text,” by Qi et al., discusses extracting key phrases from PubMed. Key-phrase extraction plays a useful role in research areas of Information Systems (IS) like digital libraries. Short meta-data like key phrases are beneficial for researchers to understand the concepts found in the documents. This chapter evaluates the effectiveness of different supervised learning techniques on biomedical full-text: Sequential Minimal Optimization (SMO) and K-Nearest Neighbor, both of which could be embedded inside an information system for document search. The authors use these techniques to extract key phrases from PubMed and evaluate the performance of these systems using the holdout validation method. This chapter compares different classifier techniques and performance differences between the full-text and its abstract. It concludes that SVMreg-1 performs best in key-phrase extraction for full-text, whereas Naïve Bayes performs best for abstracts. These techniques should be considered for use in information system search functionality.

In Chapter 4, Dollmann et al. discuss the “Design and Usage of a Process-Centric Collaboration Methodology for Virtual Organizations in Hybrid Environments.” This chapter describes a collaboration methodology for virtual organizations where the processes can be automatically executed using a
hybrid web service, grid or cloud resources. Typically, the process of deriving executable workflows from process models is cumbersome and can be automated only in part or specific to a particular distributed system. The approach introduced in this chapter, exemplified by the construction industry field, integrates existing technology within a process-centric framework. The solution on the basis of a hybrid system architecture in conjunction with semantic methods for consistency saving and the framework for modeling VO processes and their automated transformation and execution are discussed in detail.

Kim and Storey provide an ontology engineering method in Chapter 5, titled “Construction of Domain Ontologies: Sourcing the World Wide Web.” As the World Wide Web evolves into the Semantic Web, domain ontologies, which represent the concepts of an application domain and their associated relationships, have become increasingly important as surrogates for capturing and representing the semantics of real world applications. Much ontology development remains manual and is both difficult and time-consuming. This chapter presents a methodology for semi-automatically generating domain ontologies from extracted information on the World Wide Web. The methodology is implemented in a prototype that integrates existing ontology and web organization tools. The prototype is used to develop ontologies for different application domains, and an empirical analysis carried out to demonstrate the feasibility of the research.

In Chapter 6, titled “Self Adaptive Particle Swarm Optimization for Efficient Virtual Machine Provisioning in Cloud,” Jeyarani, Nagaveni, and Ram discuss a novel approach for load balancing in a cloud infrastructure. Cloud Computing provides dynamic leasing of server capabilities as a scalable, virtualized service to end users. Their work focuses on Infrastructure as a Service (IaaS) model where custom Virtual Machines (VM) are launched in appropriate servers available in a data-center. The context of the environment is a large scale, heterogeneous, and dynamic resource pool. Nonlinear variation in the availability of processing elements, memory size, storage capacity, and bandwidth causes resource dynamics apart from the sporadic nature of workload. The major challenge is to map a set of VM instances onto a set of servers from a dynamic resource pool so the total incremental power drawn upon the mapping is minimal and does not compromise the performance objectives. This chapter discusses a novel Self Adaptive Particle Swarm Optimization (SAPSO) algorithm to solve the intractable nature of the above challenge. This approach promptly detects and efficiently tracks the changing optimum that represents target servers for VM placement. The experimental results of SAPSO were compared with Multi-Strategy Ensemble Particle Swarm Optimization (MEPSO) and the results show that SAPSO outperforms the latter.

Rigi and Khoshalhan discuss the meeting scheduling problem in Chapter 7. The chapter, “Eliciting User Preferences in Multi-Agent Meeting Scheduling Problem,” applies the analytical hierarchy process to solve this problem. The Meeting Scheduling Problem (MSP) arranges meetings between a number of participants. Reaching consensus in arranging a meeting is very difficult and time-consuming when the number of participants is large. One efficient approach for overcoming this problem is the use of multi-agent systems. In a multi-agent system, agents are deciding on behalf of their users. They must be able to elicit their users’ preferences in an effective way. This chapter focuses on the elicitation of users’ preferences. Analytical hierarchy process (AHP) - which is known for its ability to determine preferences - is used in this research. Specifically, an adaptive preference modeling technique based on AHP is developed and implemented in a system and the initial validation results are encouraging.

“Wireless Sensor Node Placement Using Hybrid Genetic Programming and Genetic Algorithms,” is Chapter 8 by Tripathi et al. This chapter models a wireless sensor network, consisting of a number of nodes, and a unique sink to which all the information is transmitted using the shortest connecting
path. Traditionally the systems have used Genetic Algorithms for optimal placement of the nodes that usually fail to give results in problems employing large numbers of nodes or higher areas to be covered. This chapter provides a hybrid Genetic Programming (GP) and Genetic Algorithm (GA) for solving the problem. While the GP optimizes the deployment structure, the GA is used for actual node placement as per the GP optimized structure. The GA serves as a slave and GP serves as master in this hierarchical implementation. The algorithm optimizes total coverage area, energy utilization, lifetime of the network, and the number of nodes deployed. Experimental results show that the algorithm could place the sensor nodes in a variety of scenarios. The placement was found to be better than random placement strategy as well as the Genetic Algorithm placement strategy.

In Chapter 9, Lai et al. discuss an “Intelligent Agent-Based e-Learning System for Adaptive Learning.” Adaptive learning approaches support learners to achieve the intended learning outcomes through a personalized way. Previous studies mistakenly treat adaptive e-Learning as personalizing the presentation style of the learning materials, which is not completely correct. The main idea of adaptive learning is to personalize the learning content in a way that can cope with individual differences in aptitude. In this study, an adaptive learning model is designed based on the Aptitude-Treatment Interaction theory and Constructive Alignment Model. The model aims at improving students’ learning outcomes through enhancing their intrinsic motivation to learn. This model is operationalized with a multi-agent framework and is validated under a controlled laboratory setting. The result is quite promising. The individual differences of students, especially in the experimental group, have been narrowed significantly. Students who have difficulties in learning show significant improvement after the test.

The next chapter, titled “Intelligent Information Retrieval Using Fuzzy Association Rule Classifier,” by Veeramalai and Kannan, investigates ways for efficient web page retrieval. As the use of web applications increases, when users use search engines for finding some information by inputting keywords, the number of web pages that match the information increases at a tremendous rate. It is not easy for a user to retrieve the exact web page which contains information he or she requires. In Chapter 10, an approach to web page retrieval system using the hybrid combination of context based and collaborative filtering method employing the concept of fuzzy association rule classification is introduced and the authors propose an innovative clustering of user profiles in order to reduce the filtering space and achieves sub-linear filtering time. This approach can produce recommended web page links for users based on the information that associates strongly with users’ queries quickly with better efficiency and therefore improve the recall, precision of a search engine.

Rani and Deepa, in Chapter 11, propose “An Intelligent Operator for Genetic Fuzzy Rule Based System.” This chapter proposes a modified form of operator based on Particle Swarm Optimization (PSO) for designing Genetic Fuzzy Rule Based System (GFRBS). The usual procedure of velocity updating in PSO is modified by calculating the velocity using chromosome’s individual best value and global best value based on an updating probability without considering the inertia weight, old velocity and constriction factors. This kind of calculation brings intelligent information sharing mechanism and memory capability to Genetic Algorithm (GA) and can be easily implemented along with other genetic operators. The performance of the proposed operator is evaluated using ten publicly available bench mark data sets. Simulation results show that the proposed operator introduces new material into the population, thereby allows faster and more accurate convergence without stuck into a local optima. Statistical analysis of the experimental results shows that the proposed operator produces a classifier model with minimum number of rules and higher classification accuracy.

It is important for quality management in the software development industry, yet its automation still remains a challenging issue. Applying machine learning algorithms alone often cannot achieve satisfactory results. This chapter presents an integrated data mining framework that incorporates domain knowledge into a series of data analysis and modeling processes, including visualization, feature selection, and model validation. An empirical study on the software effort estimation problem using a benchmark dataset shows the necessity and effectiveness of the proposed approach.

The next chapter, Chapter 13, is titled “An Ontology Based Model for Document Clustering,” by Sridevi and Nagaveni. Existing clustering research emphasizes the development of more efficient clustering method without considering the domain knowledge and user’s need. In recent years the semantics of documents have been utilized in document clustering. This chapter focuses on the clustering model where ontology approach is applied. The major challenge is to use the background knowledge in the similarity measure. This chapter presents an ontology based annotation of documents and clustering system. The semi-automatic document annotation and concept weighting scheme is used to create an ontology based knowledge base. The Particle Swarm Optimization (PSO) clustering algorithm can be applied to obtain the clustering solution. The accuracy of clustering has been computed before and after combining ontology with Vector Space Model (VSM). The proposed ontology based framework gives improved performance and better clustering compared to the traditional vector space model.

Chapter 14, by Elayeb et al., presents a possibilistic information retrieval system using semantic query expansion. It utilizes query expansion strategies based on external linguistic resources such as the French dictionary “Le Grand Robert.” First, the authors model the dictionary as a graph and compute similarities between query terms by exploiting the circuits in the graph. Second, the possibility theory is used by taking advantage of a double relevance measure (possibility and necessity) between the articles of the dictionary and query terms. Third, these two approaches are combined by using two different aggregation methods. The authors also adapt an existing approach for reweighting query terms in the possibility matching model to improve the expansion process. In order to assess and compare the approaches, the authors have performed experiments on the standard ‘LeMonde94’ test collection.

“Effective Fuzzy Ontology Based Distributed Document Using Non-Dominated Ranked Genetic Algorithm,” is Chapter 15 by Thangamani and Thangaraj. They contend that ontologies are useful in improving the performance of document clustering. An ontology is concerned with the conceptualization of a domain into an individual identifiable format and machine-readable format containing entities, attributes, relationships, and axioms. By analyzing the existing techniques for document clustering, a better clustering technique depending on Genetic Algorithm (GA) is proposed. Non-Dominated Ranked Genetic Algorithm (NRGA) is used in this chapter for clustering, which has the capability of providing a better classification result. An experiment has been conducted using a 20 newsgroups data set for evaluating the proposed technique. The result shows that the proposed approach is very effective in clustering the documents in a distributed environment.

In Chapter 16, Chen and Chia discuss “A Dynamically Optimized Fluctuation Smoothing Rule for Scheduling Jobs in a Wafer Fabrication Factory” in Taiwan. The rule has been modified from the four-factor bi-criteria nonlinear fluctuation smoothing (4f-biNFS) rule, by dynamically adjusting factors. Some properties of the dynamically optimized fluctuation smoothing rule are also discussed theoretically. In addition, production simulation is also applied to generate some test data for evaluating the effectiveness of the proposed methodology. According to the experimental results, the proposed methodology is better than some existing approaches to reduce the average cycle time and cycle time standard deviation. The results also show that it is possible to improve the performance of one without sacrificing the other performance metrics.
The book ends with Chapter 17, titled “A Heuristic Method for Learning Path Sequencing for Intelligent Tutoring System (ITS) in E-Learning,” by Al-Radaei and Mishra. In this chapter, heuristic semantic values are assigned to the keywords in the courseware based on the importance of the keyword. These values are used to find the relationship between courseware based on the different semantic values in them. The dynamic learning path sequencing is then generated. A comparison is made with two other important methods of course sequencing using TF-IDF and Vector Space Model (VSM), respectively. The proposed method produces more or less same sequencing path in comparison to the two other methods. This method has been implemented using Eclipse IDE for Java programming, MySQL database, and Tomcat web server.

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