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GUEST EDITORIAL

Architecture & Design for Application Agility

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The extremely dynamic, competitive, and global business environment has dramatically increased the rate of change in businesses resulting in mergers and acquisitions, building of alliances, increased pace of product and service development, and marketing innovation. To succeed in this hyper competitive environment corporations are increasingly focusing on design, architecture, optimization, and management of their intra and inter organizational business processes. They are also looking for capabilities to dynamically monitor, change, integrate and fine tune inter- and intra-organizational processes in a very short period of time without significant efforts and involvement of their IT staff. Unfortunately, in this environment IT is often looked upon more as a road block than the enabler of change. One of the major reasons for this is the slow pace and high cost of integrating and changing IT applications. These problems are inherently rooted in the way IT applications are architected and designed.

Advances in component based development (CBD), Web Services technologies, and the concepts like Service Oriented Architecture (SOA) are significantly impacting the whole paradigm of application development. These technologies and concepts have significantly improved the interoperability at hardware, operating system, development language, and data levels. This allows radically different approaches and business models to be used for application architecture, design, and development. Started as a cost effective approach for integrating intra-firm and inter-firm applications, SOA is increasingly becoming an approach for architecting and developing applications using many vendor provided services. According to Gartner, by 2008, 80% of software development projects will be based on service-oriented architectures. Additionally, existing legacy applications and packaged applications are being re-factored and delivered as service-oriented business applications. Many major corporations are in the midst of implementing significant initiatives to re-architect their IT through service centric computing to help meet fast changing business requirements. This is expected to significantly change the application development approach from either custom application development or package implementation (including ERP) to more of a solution assembly approach. In this environment the central role of in-house IT is to be very closely aligned to business, help shape the corporate strategies and relationship with customers and suppliers, improve productivity through automation and control of operation and production environment using real time information, and determine system requirements based on business strategy.

In spite of the significant interest in the business community in architecting and designing applications for agility, the processes and methodologies for designing, architecting and developing such applications are in their infancy. Numerous interesting research issues related to application agility definitions, business value of agility, agility measurement, agile application development approaches, design models, project team organization, communication within and across project teams, and governance need to be addressed. Many additional issues related to organizational implementation, adoption, impact of these changes on IT organization and IT education need to be studied.

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In early 2006, we invited researchers to submit papers relating to the architecture and design for application agility. We received a total of 18 quality papers. We adopted the approach of developmental review. Each paper was reviewed by 3 reviewers who made constructive comments and provided ideas for improving the paper. After two to three rounds of extensive reviews and revisions, a total of 5 papers were accepted for the special issue. The special issue co-editors offer these papers to the community, with the hope that they will be useful and more importantly will instigate new research in this important area. In the following paragraphs, we provide a synopsis of papers and their contribution to research in architecture and design for application agility.

In the first paper, Setia, Sambamurthy, and Closs investigate the business value of agile applications. In extending the work of Melville and colleagues which found IT resources to enhance performance of business processes and in turn contribute to overall firm performance, these authors analyze IT' business value at the application level. Going beyond the integration efficiency in day-to-day operational performance, they focus on agile capabilities of applications. In developing a framework for organizational value creation from agile applications, the authors identify organizational fit, process assimilation, and network adoption as pre-requisites for realizing the value of agile supply chain applications. Based on theories in innovation, complementarities, network externalities, and technology structuration, a set of propositions for fit, assimilation, and network effects were developed. Two case studies in advanced planning and schedule systems were presented to support the propositions. This research contributes to our understanding on ways to more fully realize the business value of agile applications. Moreover, it heeds to the call for elaboration regarding the mechanisms of value creation through organizational IT adoption by proposing three factors—fit, assimilation, and network adoption as the antecedents to value creation using supply chain technology as an illustration. For managers, the proposed framework offers both a tool and an agenda to plan and leverage the value from IT investments. In sum, the authors posit that active managerial involvement hold key to realizing the greatest value from agile technologies.

In the second paper, Tallon employs the resource-based view to investigate how firms could configure IT resources to make them more agile, especially in light of environmental dynamism (i.e., market turbulence/stability). Generally, for firms operating in turbulent markets evidenced by rapid product obsolescence, short product lifecycles, high customer turnover, and price volatility, agility is expected to play a key role in the firm's survival in the long run. On the other hand, for those operating in more stable settings where product lifecycles, customer turnover, and pricing are relatively predictable, the relevance of agility is expected to be markedly less. In this research, the author focuses on two research questions: (1) is there a positive relationship between managerial and technical IT capabilities, and agility?; and (2) to what extent does growing environment dynamism positively moderate the link between each of these IT capabilities and business process agility? In using the resource-based view as the theoretical lens, the author posits that managerial IT capabilities based on IT-business partnerships, strategic planning, and ex-post IT project analysis lead to the development of technical IT capabilities associated with a flexible IT infrastructure which in turn drives agility. In analyzing data from matched surveys of IT and business executives in 241 firms, the author found that managerial and technical capabilities affect agility. In further testing of the proposed model for firms in stable settings, technical IT capabilities were found to be more important for agility than managerial IT capabilities, whereas in volatile settings, the opposite is true. Based on these findings, the author concludes that for firms in volatile markets, effective models of managerial IT governance hold key to greater agility.

The motivation for the third paper by Sugumaran, Tanniru, and Storey comes from current challenges to selecting the right software components to meet an application requirement. Although agile development methodologies such as component-based development warrant developers and users to design and develop systems in a short period of time, finding the needed components has not always been easy. These authors present a knowledge-based framework to select and customize software components and demonstrate its value in deriving quality specifications, even in cases where developers are relatively inexperienced. Before presenting the framework, they provide a succinct summary of agile development methodologies, domain modeling, and component-based development. The methodology for the framework consists of three major steps: (1) knowledge-based retrieval of software components; (2) consistency checking of selected components; and (3) customization of components. They implement the framework in a prototype called System Analysis and Design Assistant (SADA) that provides suggestions to the developer by reusing higher-level domain knowledge and lower-level data object artifacts. Authors carried out an empirical study to validate component identification aspect of the framework. Seven hypotheses were developed which were then experimentally tested using the SADA prototype. Results supported all but one of hypotheses. The key contribution of their approach is to make software development with components more feasible and effective, thus facilitating greater agility in software development.

In the fourth paper, Surendra argues that current agile methodologies still do not offer a systematic approach to be adaptive to unpredictable and changing requirements and to incorporate customers into the systems development process. Specifically, he identifies one key limitation of the existing systems development methodologies as treating user requirements as being a fixed set that remain static during the remainder of the development process. To counter such inflexibilities of these methodologies, a group of methodologies termed agile development have emerged. These agile methodologies in theory are expected to adapt to rapid requirements changes by having short, iterative development cycles and by encouraging frequent, open communication with customers. The author contends that, however, these methodologies are still in the process of devising systematic approaches on how to be adaptive to unpredictable and changing requirements and how to incorporate customers into the systems development process. In this research, the author adopts the work of Cockburn, an agile systems development practitioner and Harvey and Myers, ethnographic researchers in information systems to illustrate how an ethnographic research process called Strip Resolution can be applied as a systematic complement to projects applying agile development principles. Strip resolution involves (1) breakdown of established understandings and taken-for-granted assumptions; (2) resolution of such breakdowns; and (3) construction of a coherent narrative. It is made up of five elements: *schema* (a conceptual abstraction that serves as the basis for human information processing), *strip* (data produced from the interpreter's observations, discussion with subjects, other interactions with the subjects, and the study of documents), *breakdown* (an instance in which the interpreter cannot understand the strip when he applies his current schema to a strip), *resolution* (process in which broken schemas are changed to develop new schemas), and *coherent* (ability to apply a schema to many related strips without resulting in a breakdown in the interpreter's understanding). Using data collected from a financial analysis department of a Fortune 100 company, the author demonstrates how the Strip Resolution process enabled developers to adapt to changing and unpredictable requirements and to incorporate customers in the system development process.

In the final paper, Gallagher and Worrell insist that business unit agility demands the ability to sense and respond to changes in local competitive environments, whereas organizational agility demands the ability to sense broader market opportunities and respond with changes that are organization-wide. They concede that managing enterprise agility is a multi-level organizational problem since actions at the business unit level affect the organizational level, and vice versa. At the business unit level, they consider an organization's ability to sense and quickly respond to local market-specific opportunities key to its ability to achieve business agility. At the organizational level, they consider the same organization's ability to sense and respond to broader market opportunities that may demand wholesale revisions to the design of their products and services, and therefore necessitate organization-wide system changes. To investigate how firms could achieve both business unit agility and organizational agility, they carried out a longitudinal case study of an insurance company. Results from the case study revealed that the company was more effective at sensing and responding to changes in the environment at the business unit level, but less effective at sensing and responding at the organizational level. Using the platform logic as a theoretical lens, authors analyze this case and offer insights into how multi-unit organizations can manage system design at the organizational and business unit level, thereby supporting agility through the development of effective organization and governance mechanisms.

In sum, these research papers highlight the importance of agility to organizations and demonstrate significant research opportunities in the emerging field. It is our hope that readers will find articles in this special issue to be interesting and stimulating.