Preface

Implementation and Integration of Information Systems in the Service Sector belongs to Advances in Information Systems in the Service Sector series book project. There are five sections and 19 chapters in this book.

SECTION ONE: SERVICE STRATEGY

Section one contains three chapters. In Chapter one, Markku Tinnila contributes “A Review of Service Frameworks Analyzing Strategic Repositioning: The Case of Bank Services.” Many service classifications have been proposed with a wide range of dimensions describing the essential features of services. However, no single framework has become generally accepted, unlike in manufacturing, where the Product-Process matrix has become a standard tool. The challenge lies with the great variety of different types of services, making it challenging to develop a unifying framework.

Strategic positioning is a tool for gaining competitive advantage in services, and there are many frameworks, typically matrices facilitating analysis of strategic position. This chapter has reviewed these frameworks, and analyzed how they evaluate and position different service types for developing a more comprehensive tool for service positioning. Most of the earlier frameworks classify services according to type, such as mass-, professional, customized, and self-services. The service matrices also focus on analyzing industries with drastic changes in industry structures, such as travel services, banking, and financing. Many studies also look into services with large variety within the industry, e.g. fast food chains and gourmet restaurants.

Banking has been almost a classic example in studies. Based on the review, the authors have recognized four main trends in banking services. They are the redistribution of branch office services to other channels, the de-coupling of front- and back-office processes for greater efficiency and variance management, digitalization and rise of self-services, and divergence of professional and automated mass services. All four trends are notable drivers in the transformation of banking services. Similar trends can be found in other industries too.

The analysis of banking services reveals some commonalities in frameworks. There is a great similarity in the banking examples used in matrices, such as consumer and corporate branch offices, professional services, personal banking and automated self-services. Accordingly, the banking service examples can be categorized into five generic examples covering most of the variety. The analysis of the generic examples facilitates the recognition of similarities in service dimensions used for positioning, which are accordingly classified into four types; personnel, time and customization related, as well as service structure and organization related dimensions. Combination of the generic examples and the four classes of dimensions results in recognizing the elements of a more generic positioning matrix.
In Chapter two, Lorraine S. Lee and Kirk D. Fiedler analyze “The Impact of Location-Aware Systems in Hospitals: A Tri-Core Perspective.” In this chapter, the authors focus on the impact of information systems in providing real-time or near real-time knowledge of location. With the advent of location-aware technology such as RFID frequently incorporated into supply chains to enhance efficiencies, this chapter examines the potential impact of location-aware systems in a specific service setting: hospitals. Hospitals in the United States represent one particular type of organization under increased pressure to improve effectiveness in both operational efficiencies and regulatory compliance. As such, they have been quick to incorporate location-aware systems into their processes in an effort to reduce costs and to serve patients more effectively and efficiently.

The study utilizes a qualitative, interview-based approach to understanding of the benefits associated with the increased information transparency made available with location-aware information systems. Specifically, this study examines a solution provider’s motivation in developing location-aware systems (potential benefits), as well as the actual benefits of location-aware systems on managing mobile assets in the hospital context. The authors draw upon the Swanson’s tri-core model of innovation as the theoretical framework in order to understand the diffusion of the location-aware innovations in hospitals. The tri-core model provides a framework for understanding the role innovations play in administrative, technical and operational effectiveness. Using the tri-core model, the authors examine how location-aware systems can be incorporated into the core processes, products, and services of the hospital.

The authors found several benefits in hospitals associated with location-aware systems as predicted by the tri-core perspective. For administrative processes, hospitals were found to be using location-aware systems to track maintenance records of devices. As part of process improvements, hospitals are using location-aware systems for real-time, asset management tracking, which is especially important for mobile equipment such as wheelchairs and infusion pumps. By using the tri-core perspective, the authors are also able to recommend other areas for future benefits in hospitals involving tighter integration with the core products and technology.

As indicated in this chapter, location-aware systems offer unique opportunities to the service sector, with the hospital setting offered as an example.

Abey Kuruvilla, Suraj M. Alexander, and Xiaolin Li present “A Study of the Cascading Effects of Ambulance Diversion among Hospitals” in Chapter three. The high utilization level of emergency departments (EDs) in hospitals across the United States and several other countries has resulted in the serious and persistent problem of ambulance diversion - the decision to redirect incoming ambulances to neighboring hospitals due to emergency department saturation. This inevitably results in higher utilization levels of the EDs at the neighboring hospitals, which leads to delays in emergency care, potential for patients’ clinical deterioration, and the increased likelihood of reaching ED saturation. The problem of ambulance diversion has been studied extensively, but solutions are mostly of a stop-gap nature. Also, the literature has shown a limited number of responses in terms of technical tools used to help avert the cascading effect of diversion. In this chapter the authors assess the cascading effect of diversion, using data from a specific metropolitan region and suggest that this problem can be prevented or mitigated with proactive measures, such as planning Emergency Medical Systems (EMS) transports.

Specifically, the authors use statistical analysis of diversion data from Kansas City to demonstrate that a hospital’s diversion status in a particular period affects the likelihood that other hospitals in the region could go on diversion in coming periods. They quantify this influence by evaluating the conditional probability of a hospital going on diversion given that another is already on diversion. Based on this analysis, they establish the strength of interactions among hospitals and the consequences of diversion among a
consort of hospitals. These effects are mutual, i.e. if one hospital’s diversion status affected another’s, then the reverse is also true. The intensity of interactions between hospitals is varied, some being stronger than others. This insight is extremely important, since the diversion status of any hospital in a region can signal the likelihood of impending diversion in every other hospital in the region. The model developed by the authors illustrates an approach to study the cascading effects of diversion among hospitals using data that is already being collected by a number of cities. This could help EMS systems and hospitals plan transports effectively. For instance, if a hospital senses an impending diversion status, it could alert EMS and other hospitals, which have strong diversion interactions with it, to direct transports and plan capacity. If a collection of hospitals in a region, as well as the EMS of the region are equipped with this information, the region itself could be better prepared to plan for transports and capacity. This would allow actions that could prevent the occurrence of diversion or mitigate the cascading effects of EMS diversion thereby improving the quality of healthcare delivery in a region.

SECTION TWO: SERVICE ADOPTION

Four chapters address Service Adoption in section two. In Chapter four, Yawei Wang, Francis A. McGuire, and Bin Zhou explore “The Influence of Travel Experience on Mature Travelers’ Quality of Life.” This study examines the influence of past travel experience on mature travelers’ quality of life. The unique perspective allows this study to contribute to both tourism literature and successful aging literature. It is a valuable empirical study, testing the interrelationship between travel behaviors and quality of life. A discussion on quality of life of mature travelers is not only important but also timely. First of all, mature tourism is the fastest growing travel market segment. The aging population reshapes the pattern of market demand. Secondly, the mature travel market has long been recognized as different/distinct, diverse and demanding. It is critical for travel professionals and promoters to understand what this aging segment really needs, for example, the types of benefits they expect or can actually obtain from their travel experience. Thirdly, quality of life has been studied widely in the field of aging and healthcare; however, there are very few studies have been conducted among mature travelers in the tourism field.

This chapter addresses the issue whether travel activities can improve mature travelers’ quality of life. It is always a challenging issue since the measurement of quality of life is not well defined in tourism literature. Authors used two factors to measure mature travelers’ quality of life, including overall life satisfaction and self-perceived health status. By analyzing a sample of 217 mature travelers with path analysis, this study confirms that satisfaction with leisure trips can positively impact the overall life satisfaction of those who engage in the travel experience. The results of this study also show that the number of leisure trips that respondents took in the previous year significantly contributes to their overall life satisfaction. The more frequently older adults travel, the more likely they are satisfied with their life in general. However, the duration or length of trips (number of days away from home during each trip) has no significant impact on travelers’ overall life satisfaction. These findings indicate that taking some short but frequent trips can be more beneficial than taking occasional but long-haul trips. Based on the findings from this study, the authors concluded with three major implications, including the importance of offering quality service and quality experience to mature travelers, promoting travel activities as life satisfaction enhancement among older adults, and designing short and themed trips for mature travelers.
In Chapter five, Bünnyamin Atici and Uğur Bati focus on “A Consumer Perception Research on the Subject of a New Technology in a Developing Dynamic Market: 3G Technology in Turkey.” The amount of demand for new products like 3G is related to adoption and spread of innovations. Research suggests that innovativeness is related to consumer behavior and characteristics. Research shows that new technologies like 3G are not evaluated by only its functional sides in the consumer perception since consumers also perceive symbolic sides to this type of technology. The researchers of the study were interested in whether 3G has a meaning beyond its functional value; thus, they wondered how this new technology is perceived by the Turkish consumer who expresses a dynamic market and how they realize their preferences, and their behaviors, their attitudes towards the new products and their personal characteristics determining such factors. To this end, this study measures the interests of the population that live in the urban area of Turkey and economically active and working for the 3G technology, their product purchasing criteria, product using habits, brand recognition levels, brand preferences, and tendencies for purchasing products and services in the near future.

The research is performed with the participation of 612 persons in 12 provinces of Turkey. The demographic characteristics belonging to the consumers who participate in the survey study, the reliability analysis results concerning the scale, t test, factor analysis, frequency analysis, correlation analysis, and variance analyses are performed in this chapter of the research. Keeping in mind that Turkey is a country in which the rate of using cell phone reached 92 percent, one of the critical results of the study is that neither age nor income level makes any difference concerning 3G. This is one aspect that future research should focus on. Another important finding is that while cell phones are being used for calling and texting (83 percent and 88 percent respectively), only about 47 percent of the participants benefit from Mobile TV feature of 3G and 42 percent from internet feature. In addition, while all of the participants defined 3G as video calling, only about half of them stated that they often use this feature. Future research should also investigate why consumers benefit from critical features of 3G cell phones they have. In conclusion, the findings of this study show that the dynamic Turkish consumer gives significant importance to this new technology as functional and symbolic.

Technology impacts every aspect of our lives and is an accepted part of our lives. Technologies in education offer many potential benefits. Many countries have already included the integration of technology into education in their agenda for educational development. The success of this integration depends mostly on the teachers. Teachers need to use technology effectively in classrooms. Their adoption is a major challenge for many countries. Serhat Kurt demonstrates “Technology Adoption and Educational Change in Turkey” in Chapter six. The purpose of this research was to examine technology adoption and the educational change process. This chapter found eight factors essential to technology adoption in countries that are heavily centralized and strongly affected by external forces (globalism etc.). These factors are communication, expertise capacity, minimal bureaucracy, continuous research, individual change and organizational change, peer schools, accountability, transparency, and owning the change: commitment.

In Chapter seven, Ebru Polat, Nuri Basoglu, and Tugrul Daim identify the “Effects of Adaptivity and Other External Variables on Mobile Service Adoption.” Technology Acceptance Model (TAM) is built on a significant amount of prior research and explores the acceptance of a system on the basis of 2 main measures: perceived usefulness and perceived ease of use. Each of these measures is influenced by other external variables which indirectly have impact on the adoption of technology. In this case the authors focus on services enabled by technologies. Advanced mobile devices have been changing the way we communicate and even live with their intelligent features and decision mechanisms. This study focused
on mobile service adoption by exploring factors impacting the adoption. Specifically, adaptivity, which may briefly be defined as intelligence of a system, is studied. Different prototypes with varying adaptivity were developed for this study. Potential users were interviewed using these prototypes. Results indicate that factors related to service characteristics are the main determinants whereas social factors seem not to have a contributory effect on mobile service adoption. Intermediaries, ease of use and usefulness not only have direct effect on service adoption but also have indirect effect now that they are dependent on most of the factors related to service characteristics and mediate effects of those factors on information systems acceptance. Adaptivity, flexibility, visual factors under service characteristics, and ease of use and usefulness under intermediaries category are the factors that are mostly highlighted by users. Further analysis of the derived variables, their percentages and user comments reveal that as ease of use is maintained in a mobile system more than usefulness, users focus on usefulness and vice versa. Hence, adaptivity as a factor that has an impact on both ease of use and usefulness should be implemented in a balance to enhance both equally. Results also indicate that visuality, effect of which usefulness and ease of use mediate, is a key in mobile adoption whether the system is intelligent or not. Besides, it was identified that adaptivity should not inhibit user control while increasing ease of use and usefulness.

The results of this study are relevant for both product developers and researchers. The initial framework identified through this analysis provides an effective process for developers to identify customer requirements and link them to the adoption of mobile devices that they are developing. On the other hand, the researchers could conduct further field studies in different geographies for different applications to validate and modify the results.

SECTION THREE: SERVICE MANAGEMENT AND OPTIMIZATION

Section three highlights Service Management and Optimization. It contains four chapters. Chapter eight, entitled “Service Management of Special Care Units: Lessons Learned in Manufacturing,” was written by Gad Vitner, Shirly Bar-Lev, Erez Nadir, Michael Feldman, and Shmuel Yurman. The chapter has a fruitful contribution to the service sector by conducting a comparison between manufacturing and service organizations. Research of various manufacturing management subjects has initiated early in the 20th century. Thus it would be wise to try and adopt ideas, methods, techniques, information systems and other managerial tools, developed in the manufacturing environment, in organizations providing services. The chapter uses the healthcare industry to illustrate what and how much these ideas may be implemented. Manufacturers’ efforts to improve their production processes can be transferred to healthcare, thus reducing a patient length of stay, providing a higher quality of care, maintaining hospital sustainability, and raising patients’ satisfaction. The chapter is based on the authors’ experience with implementing ISO 9001:2000 in a neonatal intensive care unit in a prominent public hospital in Israel. Comparing manufacturing and service organizations is both useful and valid even though service organizations differ from manufacturing organizations. Services may be defined as work units with a production process in which there is a direct interaction between customers and service providers, in which the output is intangible, almost impossible to store and has a considerable degree of variation. Various management aspects developed in manufacturing firms may be adopted in service firms: price as a competitive factor, productivity, quality, and strategy and technology development. Total quality philosophy can be usefully deployed in the service sector as it is in manufacturing. Employing quality management concepts, both manufacturing and service, will result in less reworking and less waste of manpower, material resources...
and the number of errors will be reduced. Total quality service denotes the implementation of TQM in service organizations. Dimensions of manufacturing quality management can be effectively used in service organizations. Services must be developed using processes similar to those used in the development of manufacturing products. It was demonstrated that not understanding customer requirements has been shown to be an overwhelming cause of product failure. As in manufacturing this also appears to be the main cause of failure in services. The chapter presents a successful implementation of management methods and techniques developed in manufacturing in a neonatal intensive care unit providing healthcare service to premature born babies.

Faramak Zandi and Madjid Tavana provide “A Strategic Benchmarking Process for Identifying the Best Practice Collaborative Electronic Government Architecture” in Chapter nine. E-governments services represent different levels of technological sophistication and administrative challenges. Several empirical studies have identified a dynamic progression in e-government sophistication from national to state to local governments. Generally, e-government initiatives at the national level have both the financial resources and the technical expertise to move toward more sophisticated systems while they have the least direct democratic control from citizens, businesses, and other government entities. However, during the past decade, more and more state and local governments have started to embrace e-government. The e-government architecture includes standards, infrastructure components, applications, technologies, business model and guidelines for electronic interactions among and between government organizations, and other consumers. Being a relatively new research area, e-government architecture and adoption strategies have not been widely discussed in the literature. Evaluating e-government is an important research agenda and the lack of formal methods for assessing best practice e-government architectures has led to a significant slowdown of e-government development at the national, state, and local levels. In addition, the current approaches to identifying best practice e-government architectures do not support comprehensive assessment and need to be further improved in order to give policymakers better evaluation frameworks to support their decisions. The evaluation of the e-government architectures can identify strengths, weaknesses, and best practices for both national and local integration. In this chapter, Zandi and Tavana present a strategic benchmarking process for identifying the best practice collaborative e-government architecture. They utilize the simple additive weighting method, real options analysis, and fuzzy sets to benchmark the best practice collaborative e-government architectures based on three perspectives: Government-to-Citizen (G2C), Government-to-Business (G2B), and Government-to-Government (G2G). The contribution of their proposed method is fourfold: (1) it addresses the gaps in the e-government literature on the effective and efficient assessment of the e-government architectures; (2) it provides a comprehensive and systematic framework that combines ROA with SAW; (3) it considers fuzzy logic and fuzzy sets to represent ambiguous, uncertain or imprecise information; and (4) it is applicable to international, national, regional, state/provincial, and local e-government levels. In conclusion, Zandi and Tavana stress that their contribution addresses yet a small part of the issues that are involved with e-government evaluation and conclude that ex-ante e-government evaluation as a discipline is at its infancy.

In Chapter ten, Shailesh Chandra, Chung-Wei Shen, and Luca Quadrifoglio perform “A Simulation Study to Derive the Optimal Cycle Length for Feeder Transit Services.” The colonias along the Texas-Mexico border are one of the most rapidly growing areas in Texas. Because of the relatively low-income of the residents and an inadequate availability of transportation services, the need for basic social activities for the colonias cannot be properly met. In order to have a better comprehension of the status quo of communities within these colonias, the authors examine the potential demand for an
improved transportation service as well as evaluate the capacity and optimum service time interval of a new demand responsive transit “feeder” service within one representative colonia, El Cenizo which is located in Webb County, TX, about 15 miles south of Laredo. They present a comprehensive analysis of the results of a survey conducted through a questionnaire survey to evaluate the existing travel patterns and the potential demand for a feeder service in El Cenizo.

Basic demographic data were collected as part of the survey to assess the current travel demand patterns, in the form of spatial and temporal distribution. The average household size was found to be 4.25, larger than the average of whole country (2.5) and the average number of private vehicles to be 1.13. Based on the survey, the authors have reported that approximately one-fourth of the households do not own any private vehicle. Travel distributions were found to be consistent with expectations, with a typical double peak temporal pattern and uniform spatial pattern.

Using the survey questionnaire, the authors have also aimed to understand the potential appreciation for a new demand responsive shuttle transit service and found that more than three-fourths of the respondents are willing, at least likely, to use a hypothetical new shuttle feeder service within their community. Subsequently, simulations were carried out to estimate the capacity of the proposed service for El Cenizo in MATLAB R2008b. The results from the simulation analysis showed that a single shuttle would be able to comfortably serve 150 passengers per day, which corresponds to about 8% of the total daily demand in El Cenizo. This percentage is approximately double the national transit usage average of the commuters in the United States. The authors, however, expect that the transit usage would be above average for colonias because of the poverty level (less private cars) and because of the more desirable demand responsive characteristic of the proposed service. Further, the optimal headway between consecutive departures from the terminal using simulations was found to be between 11-13 minutes for best demand responsive service quality. Thus, the exploratory study performed by the authors serves as a first step towards improving transportation services within these growing underprivileged communities, especially for those with demographics and geometry similar to their target area of El Cenizo.

In Chapter 11, Chien-Yen Chang and Ting-Wei Chang show “The Development of Parameters and Warning Algorithms for an Intersection Bus-Pedestrian Collision Warning System.” Pedestrian crossing safety is a major concern for traffic service and management at intersections. According to the traffic accident statistics in some studies, a high percentage of fatal accidents involve pedestrians crossing the street at intersections. This implies that intersections are high-risk locations for pedestrians. Although traffic engineers usually design pedestrian phases in the signal timing plans at intersections to improve pedestrian crossing safety, some intersections in rural areas cannot be signalized due to installation costs and vehicle delay issues. Therefore, protecting pedestrians who are crossing the roads from vehicle-pedestrian collisions at unsignalized intersections has become an important issue for traffic engineers and government authorities. For the bus driving at intersections, it is more important to mitigate bus-pedestrian collisions because an accident involving a bus and a pedestrian often causes severe injuries to the pedestrian. On the other hand, the rapid development of intelligent transportation systems (ITS) which apply advanced communication and information technologies to transportation management and traffic systems has made it possible to improve crossing safety for pedestrians at unsignalized intersections.

The authors in the study present an innovative design of an intersection bus-pedestrian collision warning system based on active communication and automated detection technologies. The layout of the collision warning system is clear and practical for developing important parameters, including the warning timing for the bus driver, the shortest distance between the pedestrian detector and the curb, the shortest distance between the vehicle speed detector and the collision point, the warning timing for
the pedestrians, and the locations of variable message signs. Considering some safety risks and limitations of data collection in real-car testing or field investigation, the authors conduct a designed driving simulation with inherent flexibility and safety characteristics to investigate bus drivers’ responses to unexpected pedestrians crossing unsignalized intersections or signalized intersections during a green light interval and then develop the parameters. The experimental design process can also be a good example for other advanced traffic systems in the development of human factor related parameters. In addition to the parameters, the experimental results also highlight some characteristics of bus driving behavior at intersections, such as quickly reacting to emergency situations and braking suddenly in the emergency situations without early warnings, bus drivers really pay attention to the warning messages, etc. It confirms the applicability of the warning system. Finally, a basic warning algorithm and two improved warning algorithms are also developed to provide warning rules for the system. The conceptual design, parameters, and warning algorithms should provide a useful base in the further development of the warning system.

SECTION FOUR: SERVICE MODELING AND IMPLEMENTATION

Section four contains four chapters. Xutao Du, Chunxiao Xing, Lizhu Zhou, and Ke Han analyse “Modeling Control Flow in WS-BPEL with Chu Spaces” in Chapter 12. More and more business enterprises, governmental agencies, universities and other organizations provide their services on the Internet. Complex services can be achieved by orchestrating or composing smaller ones. WS-BPEL is the de facto standard for Web service compositions and is supported by major software vendors such as IBM, Microsoft and Oracle. The logical correctness and reliability of WS-BPEL processes are important for both the service providers and consumers.

This chapter presents a Chu spaces semantics of typical control flow of WS-BPEL including fault handling and link semantics. BPEL-CF is proposed as a simplification of this subset of WS-BPEL. For the compositional modeling of BPEL, the authors present a Chu spaces process algebra. This algebra allows faults to be thrown at any point of execution and take link-based synchronization into consideration. The chapter gives the abstract syntax of BPEL-CF, the semantic algebra, and the valuation functions for computing the Chu spaces denotations of BPEL-CF programs.

In Chapter 13, Debmalya Biswas and Krishnamurthy Vidyasankar introduce “Optimal Compensation for Hierarchical Web Services Compositions under Restricted Visibility.” Over the years, the notion of transactions has become synonymous with providing fault-tolerance, reliability and robustness to database systems. The idea then is to extend the same transactional guarantees to new and evolving paradigms, such as Web services. To achieve this, the transactional mechanisms need to be adapted to the distinguishing characteristics of Web services, mainly composability, long-running nature, and privacy and security concerns. Composability refers to the ability to form new composite services by combining the functionalities of existing (component) services. The existing services may themselves be composite, and this leads to a hierarchical composition. Due to their long-running nature, compensation based mechanisms are usually preferred to provide transactional guarantees for Web services.

Initial efforts in this direction have been able to address the composability and long-running nature aspects to some extent, for instance the WS-Transaction specification. However, these approaches do not consider the practically relevant scenario where component services of a composition are provided by
different organizations, each having privacy and security constraints with respect to sharing execution logs local to their site. The WS-Transaction specification of a centralized coordinator having visibility over all execution logs across organizational borders is no longer valid in this context.

The authors have developed a graph-based hierarchical visibility model Sphere of Visibility to capture the visibility each provider has of other providers’ attributes in the composition. A hierarchical composition is represented with nodes denoting Web services and edges denoting the parent-child relationship of a service invoking another service. In such systems, for two nodes X and Y in a hierarchy, whether X can see Y, that is, X has visibility over Y’s attributes, depends on (i) X wishing to see Y, (ii) Y wishing to be seen by X, and (iii) other nodes not objecting to X seeing Y. In the current context, the attributes are the execution logs relevant for compensation, and the visibility constraints relate to privacy and security concerns. The chapter also identifies the dual properties Coherence and Correlation that relate the spheres of different nodes in special ways. The authors use this characterization to arrive at a set of feasible compensation options under available visibility.

Note that, in the event of a failure, a service can be compensated by the provider who executed the service or by a different provider. Multiple compensation options may also be possible for a composite service both at the same level and at different levels of the hierarchy. Some options may compensate just the execution of an individual service whereas some others may also compensate the executions of some other services invoked by that service. Each compensation option has a cost associated with it. This chapter analyzes the various compensation options under restricted visibility and describes methods to arrive at an optimal compensation option. To summarize, the authors consider the challenging problem of providing transactional (compensation) guarantees for Web services compositions in a multi-organization context. The authors make significant contributions in designing a visibility model and algorithms to determine optimal compensation options respecting privacy, security and cost constraints in a hierarchical composition.

In Chapter 14, Shijun Liu, Yong Zhang, and Xiangxu Meng present “Towards High Maturity in SaaS Applications Based on Virtualization: Methods and Case Study.” Software as a Service is a new service delivery model, which has the advantage of on-demand using, no maintenance cost and easy to extend. SaaS is changing the way people using software and the way independent software vendor (ISV) providing software. On the other hand, with the rapid development of distributed computing, parallel computing, grid computing, cloud computing and the popularization of virtualization and utility computing, SaaS is facing many challenges and chances.

A well-designed SaaS application is generally distinguished by mainly three qualities: scalability, configurability, and multi-tenant efficiency. But to reach the high level of maturity, several problems must be solved. Firstly, to scale a SaaS application to an arbitrarily large number of customers, the number of servers, storages and instances on the back end must could be increased, decreased or migrated as necessary to match demand, without requiring additional re-architecting of the application. Secondly, to provide high configurable to a SaaS application means not only the individual customized interface but also the functions and data structures. Moreover, how to custom is different if the instance is described from different scratch lines. Multi-tenant-efficient means changes or fixes to a SaaS application can be rolled out to thousands of tenants as easily as a single tenant, which depends on an apparent, distributed and liable hosting environment.

The solution of these problems requires a new framework and technology, where virtualization technology could be used. The authors did an excellent work in this chapter and made other main contributions in SaaS research area and other endeavors. In their chapter, the authors investigate the issue of
high level maturity in SaaS models, introduce proposes a high level maturity in SaaS applications based on virtualization technologies, in which the hardware virtualization focuses on providing the flexible on-demand hosting environment, the application virtualization used to meet the scalable application deployment requirements and data virtualization solves data integration and unified data access problems to ensure multi-tenant efficiency. On the basis of above research, this chapter develops a prototype system to verify the related work under the background of supplier relationship management (SRM) service. A case study of a SaaS application for supply business in automobile industry is introduced with the discussion of approaches to higher level maturity model.

Chapter 15 entitled “Identifying Services in Procedural Programs for Migrating Legacy System to Service Oriented Architecture” was written by Masahide Nakamur, Hiroshi Igaki, Takahiro Kimura, and Kenichi Matsumoto. In order to support legacy migration to the service-oriented architecture (SOA), this chapter presents a pragmatic method that derives candidates of services from procedural programs. In the SOA, every service is supposed to be a process (procedure) with (1) open interface, (2) self-containedness, and (3) coarse granularity for business. Such services are identified from the source code and its data flow diagram (DFD), by analyzing data and control dependencies among processes. Specifically, first the DFD must be obtained with reverse-engineering techniques. For each layer of the DFD, every data flow is classified into three categories. Using the data category and control among procedures, four types of dependency are categorized. Finally, six rules are applied that aggregate mutually dependent processes and extract them as a service. A case study with a liquor shop inventory control system extracts service candidates with various granularities.

SECTION FIVE: SERVICE OPERATION AND INFRASTRUCTURE

Section five contains four chapters. Frank Wolf, and Bahaudin G. Mujtaba develop “Sustainability in Service Operations” in Chapter 16. Achieving industrial sustainability is a desirable goal on grounds of environmental stewardship, corporate fiscal solvency and public health. Drs. Wolf and Mujtaba’s research links the well known but rarely practiced concept of triple bottom line reporting, to specific sustainability measurements for each of the public reporting domains of Profit, People, and Planet. With sustainability defined as a state in which the current generations’ needs are met without jeopardizing the next generations’ needs, it is clear that that this is a path of continuous improvement. The measurements of Profit relate to solvency and leverage among others. The measurements for People relate to equity and learning, while those for Planet relate to CO\textsubscript{2}, H\textsubscript{2}O, and remediation. Given that industrial sectors are quite unique in their operations, culture and resource needs, Drs. Wolf and Mujtaba discuss special sustainability measurement considerations for utilities, transport, real estate, wholesale, information technology, professional services, retail, finance, education, health, entertainment, food and accommodations and government. For each industrial sector those companies leading the way are identified. The authors’ recommendation is for trade associations to embrace this framework and to pursue progress in sustainability at the enterprise level on behalf of their membership. Trade associations are well positioned to aggregate these data for reporting sustainability progress at the industrial sector level without involving government. The chapter concludes with a framework for the development of an industry-wide sustainability index combining sustainability measurements into one number. Individual year-to-year percent changes in operating profit or average wage increases, employee training expenses, or quantities of water use reductions, are combined into one number such that a reference year has a value
of 100. Progress or absence of progress from that reference point onward can then be quantified. Also, shortcomings can be identified for managerial intervention. Measurement always has to precede actions!

Hypothetically, a common approach to measuring sustainability has many winners. For corporations and shareholders it pays good returns when operating costs are lowered. In addition, transparency in public environmental reporting leads to customer approval and employee motivation plus market confidence. That in turn may increase productivity when favorable results are reported. Finally, with a trade association endorsed sustainability measure, enterprises will have a constructive yardstick to compete on. The history of modern industrial sustainability is discussed from the point of Ms. Carson’s publication of “Silent Spring.”

In Chapter 17, Alexandre Ferreira Oliveira and Luiz A. Joia search “Call Center Operational Performance Indicators and Customer Satisfaction: An Explanatory-Exploratory Investigation.” Despite the relevance of the call center industry, there is a lacuna in academic literature in correlating the relationship between operational performance indicators used by call centers and customer satisfaction. Some prescriptive paths are singled out in call center manuals – books that analyze call center operations and management – specifying a set of operational indicators that need to be monitored to achieve excellence in customer service. Thus, this chapter contributes to the technical literature, answering the following research question: Which call center operational performance indicators have any bearing on customer satisfaction? This question is relevant as there is no consensus on this point in the academic world. With this in mind, three operations of one of the leading companies in the Brazilian call center outsourcing market were analyzed and a methodological approach based on surveys as well as stepwise multiple linear regressions was developed and applied in order to achieve the objective of this chapter.

Based on that, this chapter presents a series of managerial implications for the call center outsourcing market in that it diverts the focus exclusively from the items traditionally accompanied, such as Service Level and Talk Time. It reveals the importance of the perception on the part of the customer of the total call time, as well as the ability to resolve problems on the part of the agent. Thus, alternative call center operational performance indicators, due to the ease in obtaining them and their adequate explanation level, could be used to monitor call center performance in relation to customer satisfaction. These indicators could be used to establish remuneration brackets for the agents or even for the outsourced companies. In this way, if the level of satisfaction were to reach a given level, together with the ability to resolve problems and perception of time, the agents and outsourced companies would receive additional remuneration. This practice, on an ongoing basis, would tend to reinforce the image attribute, thereby positively impacting the perception of quality of service of the company. Lastly, government regulatory agencies have set quality targets for the provision of service in the call centers, which stipulate the level of service as an indicator that must be met. In line with this, the unveiled alternative indicators could be used by companies because, as seen in this chapter, they are far better parameters for assessing customer satisfaction with the call center than the traditional indicators.

In Chapter 18, Tugrul Daim, Marius Brand, and Linda Lin stress “Service Platform Development: Comparison of Two E-Services Platforms.” Service platforms such as eBay and Google offer a vast range of products that might have certain aspects in common. Yet, the two firms are not too similar. On the one hand, there is eBay with its transaction and real-time expertise. On the other hand, Google thrives on its search engine capabilities, its advertising experience, and a reputation for free products. This study provides a view on e-services, different perceptions of product platforms, their respective components and peculiarities. Then, Google’s and eBay’s product platforms are introduced and explained. Finally, two applications of the platforms mentioned Google Checkout and PayPal Express Checkout, will be
compared and systematically linked to their mother company’s product platforms. The outcomes of this work, together with the practical example of Google Checkout versus PayPal Express Checkout, give managers some indications on how to run their services enterprise efficiently and react to changes quickly. However, as it can be seen at eBay, a platform strategy has to be aligned with the company-wide growth strategy. If a company’s goal is to expand from the inside, by developing and launching new offerings regularly, the management’s commitment to implementing and using a product platform has its merits. Then, all – or at least the vast majority of – products show similarities, are easier to put together and provide synergies. The platform approach, originally developed for products, then modified for services, can be used for Internet services as well. In this context, the concept of reusability is even more important, as well as a database system that integrates customer information and transactions company-wide. The two main protagonists in this chapter, Google and EBay, were analyzed in respect of their ability to make use of their inherent product platforms. Google does a better job at subsuming all of its products under one main structure. It also connects each product’s strengths more efficiently and therefore creates more synergies. Finally, Google is more active at rolling out new innovative products at a faster pace. EBay, on the other hand, has a very diversified product portfolio which has been created mainly by acquisitions. Many of its products have individual databases and styles. Synergies are exploited partly; however, some ventures such as Skype were failures in terms of integration. Google wins the platform battle.

In Chapter 19, Takeshi Kurosawa, Denis Bolduc, Moshe Ben-Akiva, Akiya Inoue, Ken Nishimatsu, and Motoi Iwashita accomplish a “Demand Analysis by Modeling Choice of Internet Access and IP Telephony.” In this study, the authors contribute to the modeling of demand for telecommunications by evaluating and estimating the market share of fiber-optic Internet connection, which is becoming the major player in broadband services, paying specific attention to IP telephony. This analysis is relevant since demands in Japan for broadband Internet access and IP telephony have increased dramatically in recent years. In fact, according to official sources, as of September 2009, there were 30.9 million users of broadband Internet access and 20.9 million of IP telephony.

The authors made an excellent work in deriving a comprehensive choice model of Internet access line and IP telephony, composed of three inter-related sub-models and for which awareness of IP telephony was integrated. The top model concerns the choice of the type of Internet access. The second level model predicts IP telephony awareness, and the bottom level model considers the choice of IP telephone service conditional on awareness and type of Internet Access. The most suitable parameters for the model were determined by using an original market research survey conducted in Japan during 2004 with stated-preference choice experiments of both Internet access and IP telephony. In addition, perceptual data was used to define a latent variable representing consumers’ awareness, which enters as explanatory variable in the choice model. For doing so, the authors employ the Integrated Choice and Latent Variables methodology and show that it leads to an improved specification of discrete choice with greater explanatory power. The methodology requires the estimation of an integrated multi-equation model composed of a discrete choice model and of structural and measurement equations that permit to link the latent variables to observed indicators and explanatory variables. The integrated model is estimated using a full information maximum likelihood approach, in which the likelihood function involves multi-dimensional integrals. Then, application of the model is performed by using the estimated model to predict the choices of the survey respondents under different scenarios for the values of the attributes. Scenario Simulation enabled the authors to measure how future choices may differ from those observed in the survey.
The results of the unique combined model indicate that increasing awareness has the potential to dramatically increase the penetration of IP telephony. The results also indicate a great variability in price sensitivity across income groups for the choices of Internet access line and IP telephony. The fiber optic share is shown to change with a change in its own monthly usage charge, indicating that market share gains are possible through reduced usage fees.

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