

Sunday, 8:00am - 9:30am

■ SA21

C - Room 18B, Level 4

Healthcare Modeling, Evaluation, and Optimization

Sponsor: Service Science

Sponsored Session

Chair: Behlul Saka, PhD Candidate, University of Arkansas, 4207 Bell Engineering Center, Fayetteville, AR, 72701, United States of America, bsaka@uark.edu

1 - Biologically Guided Intensity Modulated Radiation Therapy Planning Optimization

Behlul Saka, PhD Candidate, University of Arkansas, 4207 Bell Engineering Center, Fayetteville, AR, 72701, United States of America, bsaka@uark.edu, Ronald Rardin, Mark Langer

Biologically guided radiation therapy incorporates the biological responses of tissues to radiation or "sensitivities" changing over the course of the treatment. Updated information on tumor sensitivity over time invites adjusting radiation delivered across the treatment volume in order to yield more effective plans. We propose an optimization approach that adapts IMRT plans in response to the changes in the tumor sensitivity subject to both cumulative and per-session limits, and present some preliminary results.

2 - Models for Evaluation of Supply Chain Risk with Application to Health Care Management

Guangfu Zeng, University of Texas at Arlington, 1609 Lake Meade Dr., Allen, TX, 75002, United States of America, guangfu.zeng@mavs.uta.edu

Today's uncertain business environment requires supply chain managers to assess the degree of risk across a whole gamut of activities in a supply chain and develop suitable strategies to mitigate them. Our research will develop a new methodology in supply chain risk analysis, and build several quantitative models for evaluation of general supply chain risk, by using data envelopment analysis and rough set theory. We apply the risk evaluation models to health care supply chain risk management.

3 - Cardinal Scales for Health Evaluation

Charles Harvey, Professor, Retired, University of Houston, 5902 NW Pinewood Place, Corvallis, OR, 97330, United States of America, cmharvey1@earthlink.net, Lars ysterdal

Policy studies often evaluate health for an individual or for a population by using ordinal scales or expected-utility scales. This paper develops scales of a different type, commonly called cardinal scales, that measure changes in health. Also, we argue that cardinal scales provide a meaningful and useful means of evaluating health policies. Thus, we develop a means of using the perspective of welfare economics as an alternative to ordinalist and expected-utility perspectives.

4 - The Impact of EMR Capability on Hospital Performance

Wei Wu, University of Tennessee Knoxville, 329 Stokely Management Center, Knoxville, TN, 37996, United States of America, ww3@utk.edu, Bogdan Bichescu, Randy Bradley

There is limited evidence that Electronic Medical Record (EMR) systems lead to better hospital performance. There is increasing pressure on hospitals to adopt EMR systems, despite the lack of empirical evidence to support such investments. Using a sample of 130 hospitals that are in the upper echelon of EMR capabilities, we examine the impact of EMR on control-adjusted measures of hospital performance. Our findings have implications regarding the realistic impact of EMR on hospital performance.

■ SA22

C - Room 18C, Level 4

Technology and Service Optimization

Sponsor: Service Science

Sponsored Session

Chair: Tugrul Daim, Portland State University, P.O. Box 751, Portland, OR, 97224, United States of America, tugrul@etm.pdx.edu

1 - Decision Making Process for Off-shore Outsourcing IT Services and Software Development

Rosine Hanna, PhD Student, Portland State University, P.O. Box 751, Portland, OR, 97207, United States of America, rosine@pdx.edu

Several studies presented frameworks that focus on guiding decision makers in performing offshore outsourcing. Yet, none of these frameworks provided a systematic, methodical direction concerning how to implement the entire process of offshore outsourcing for information technology projects. The goal of this research is to present a framework of offshore outsourcing that incorporates the entire offshore outsourcing processes, relationship and risk management processes.

2 - Capability Maturity Model: The Case of Care Coordination and HIT Adoption

Nima A. Behkamin, Oregon Health & Science University, 3181 Southwest Sam Jackson Park Road, Portland, OR, United States of America, behkamin@ohsu.edu, David A. Dorr, Tugrul Daim

Adopting Health Information technology, especially to improve the quality of care management, has been a challenge for organizations. We adapt the Capability Maturity Model (CMMI) to the use of Health Information Technology (HIT) to better manage the care of patients with multiple chronic illnesses. We study the implementation of the Care Management Plus (CM+) model, a program intended to redesign primary care teams and health information technology use.

3 - Study of the Efficiency and Efficiency Patterns of the U.S. University Technology Commercialization

Jisun Kim, Portland State University, P.O. Box 751, Portland, OR, 97207-0751, United States of America, kimjisun73@gmail.com, Tugrul Daim, Timothy Anderson

The main purpose of this study is to provide better understanding of U.S. university technology commercialization (UTC) activity by evaluating the efficiencies of their practices and identifying efficiency changing patterns over time. The influencing factors are explored to understand their impact on the performances and define the characteristics of the patterns. The study also presents some significant time-lags observed among the technology transfer variables.

4 - Technology Roadmapping in the Energy Sector: Energy Efficiency in the Pacific NW

Tugrul Daim, Portland State University, P.O. Box 751, Portland, OR, 97224, United States of America, tugrul@etm.pdx.edu, Joshua Binus, Jisun Kim

This paper presents the process and the results of a regional roadmapping project. The project identified the market drivers, available and required products and services, available and required technologies and finally the gaps and the R&D programs to fulfill these gaps. The focus of the roadmap was energy efficiency in the Pacific NW. More than 20 organizations took part in the effort.

■ SA23

C - Room 18D, Level 4

Service Innovation in Developing Economies I

Sponsor: Service Science

Sponsored Session

Chair: JianQiang Hu, Professor, Fudan University, 670 GuoShun Road, Siyuan Building, Room 508, Shanghai, 200433, China, hujq@fudan.edu.cn

1 - Pricing, Capacity Decisions and Financing in Two-tier Service Systems

Pengfei Guo, Assistant Professor, Hong Kong Polytechnic University, Hung Hom, Hong Kong, Hong Kong - PRC, lgtpguo@polyu.edu.hk, George Zhang

There exist many two-tier service systems with a toll-free subsystem and a toll subsystem coexisting. We study the second-best price and capacity decisions for the toll subsystem with the consideration of self-financing constraint.

2 - The Impact of Government Intervention on Airline Operations in China

JianQiang Hu, Professor, Fudan University, 670 GuoShun Road, Siyuan Building, Room 508, Shanghai, 200433, China, hujq@fudan.edu.cn, Chenbo Zhu

In 2007, the Chinese aviation authority asked the five airlines with service between Shanghai and Beijing to form an express shuttle alliance so that their tickets could be interchanged. In this paper, we will study the impact of such government intervention on the competitiveness of the market and airline operations. We first investigate the existence of Nash equilibrium in such an environment. We then analyze how seat allocations, airfares, and revenues of the airlines will be affected.

3 - Provide Financial Risk Management as Service

Tie Liu, IBM Research - China, Bld19 Zhongguancun Software Park, Haidian, Beijing, 100193, China, liultie@cn.ibm.com

We present an innovative financial risk management service framework for small-media sized commercial banks which require quantitative risk management from Basel II accord. Risk calculation models and external data collection are two difficult issues for banks. We propose a SOA based system to deal with the challenges, where flexible computation support services are provided with a much less cost for banks, such as risk computation service, business logic service and data management service.

Sunday, 11:00am - 12:30pm

■ SB21

C - Room 18B, Level 4

Improving Healthcare Processes

Sponsor: Service Science
Sponsored Session

Chair: John Dulin, Concurrent Technologies Corp, 771 Fairdale Ct, Castle Rock, CO, 80104, United States of America, dulinj@ctc.com

1 - Standardization and its Implications for Service Quality - Evidence From German Hospitals

Roman Mennicken, Research Associate, University of Cologne, Albertus-Magnus-Platz, Cologne, 50923, Germany, mennicken@wiso.uni-koeln.de, Desdemona Hucke, Ludwig Kuntz

The impact of increasing standardization on quality in service delivery is unclear. We assess the level of standardization with variations in the service time of 70 German hospitals. In-hospital mortality for specific diagnoses is used to assess service quality. Using econometric analyses we identify a clear curvilinear relationship between service quality and level of standardization. While too much or too little worsens service quality, an optimum level can be achieved.

2 - Collaborative Healthcare using Medical Service Cyberinfrastructure

John Jung-Woon Yoo, Assistant Professor, Bradley University, 408 Morgan Hall, Peoria, IL, 61625, United States of America, jyoo@bradley.edu

Medical service providers are not active in sharing their services with other providers. Instead, they provide referrals, which often cause redundant services. In this talk, we define medical operations, examinations, or consultations as medical services and propose a cyberinfrastructure that can provide collaborative healthcare services, in which XML-based medical service description language plays an important role in defining medical services.

3 - Patient Impatience: Merging Process Analysis Techniques to Improve Healthcare Efficiency

John Dulin, Concurrent Technologies Corp, 771 Fairdale Ct, Castle Rock, CO, 80104, United States of America, dulinj@ctc.com, Dave Davis, Norm Reitter, Ashlee Knapp

If a patient's journey through a healthcare organization can be accurately modeled and analyzed with a clear vision of easing the restricting effects of limited funding, increased demand, and reduced resource availability, then various techniques can be effectively merged to establish a successful performance improvement plan. We will demonstrate a flexible general hospital model that we have developed for scenario-based comparisons using simulation software and real-world planning factors.

4 - Doctors, Health Care, and Management Science: Where do They Meet?

Steve Barrager, Publisher, BakerStreetPublishing.com, 2703 Broderick Street, San Francisco, CA, 94123, United States of America, publisher.bakerstreet@gmail.com

I am a highly trained management scientist with over thirty years of professional experience. Three years ago I was diagnosed with Multiple Myeloma, a rare bone marrow cancer. Thanks to modern medicine my cancer is now in almost complete remission. To prepare for this talk, I took my patient hat off and put my management scientist hat on. I interviewed several of my doctors. I asked them what my profession could do to help them. This talk summarizes what I learned.

■ SB22

C - Room 18C, Level 4

Improving Sales Productivity

Sponsor: Service Science
Sponsored Session

Chair: Yingdong Lu, IBM T. J. Watson Research Center, Yorktown Heights, NY, 10598, United States of America, yingdong@us.ibm.com

1 - Analyzing the Effectiveness of a Loyalty Program: A Case Study in Automobile Industry

Hyun-Jin Kim, Pohang University of Science and Technology, Pohang, Korea, Republic of, brightst@postech.ac.kr, Kwang-Jae Kim, Ryeok-Hwan Kwon

A loyalty program is now a popular marketing tool in various industries. It typically provides customers with loyalty incentives such as membership points redeemable for discounts or prizes and free additional services to induce customers' repurchase. However, its effectiveness is not always guaranteed. In this talk, we present how the structural equation modeling (SEM) can be used to measure and analyze the effectiveness of a loyalty program. A case study on the loyalty program of an automobile manufacturing company is also presented.

2 - Dynamic Modelling of Online Consumer Decision Making Process

K. Nadia Papamichail, Senior Lecturer in Information and Decision Systems, Manchester Business School, University of Manchester, Booth Street West, Manchester, M15 6PB, United Kingdom, nadia.papamichail@mbs.ac.uk, Sahar Karimi, Christopher Holland

In this paper a dynamic model of online consumer behaviour is proposed and tested using focus groups and video-based assessments of individual online users. A multi-sector approach is taken. The results suggest that purchase decision making on the Internet is highly dynamic. It is influenced by the interaction of consumers with their online environment. In addition, online research and purchase behaviour of customers, and the factors that affect their behaviour vary across different sectors.

3 - Relationship Between Consumer Valuation Distribution and Subscription Pattern in IT Services

Hyoduk Shin, Northwestern University, 2001 Sheridan Road, Evanston, IL, United States of America, hyoduk-shin@kellogg.northwestern.edu, Marius Florin Niculescu, Seungjin Whang

We present an analytical relationship between consumer valuation distribution and aggregate subscription pattern over time in the information technology services industry under network externalities. We build up a microeconomics model and a theory based on consumer utility to explain the observed subscription pattern. We illustrate our results empirically using historical data for mobile data services in the Japanese market.

4 - A Framework for Sales Force Productivity Profile Estimation

Mayank Sharma, IBM T. J. Watson Research Center, Yorktown Heights, NY, 10598, mxsharma@us.ibm.com, Moninder Singh, Aleksandra Mojsilovic

Salesforce productivity, defined roughly as the revenue potential of an employee, is an important metric in evaluating the profitability of a sales organization. Understanding and effectively managing sales productivity profiles would allow a business to improve its earnings without necessarily growing the salesforce. We present a framework for inferring the time-varying productivity profiles of the salesforce, based on the analysis of historical sales data from an ERP system.

■ SB23

C - Room 18D, Level 4

Service Innovation in Developing Economies II

Sponsor: Service Science
Sponsored Session

Chair: Janny Leung, CUHK, SEEM Dept, CUHK, Hong Kong, Hong Kong - PRC, janny@se.cuhk.edu.hk

1 - Handling Medical Emergency Situations in Developing Economy - An Innovative Workflow Model

Sreya Chattopadhyay, Doctoral Student, University of Rajasthan, J L Nehru Road, Gandhi Cricle, Jaipur, RJ, 302055, India, sreyaonline@gmail.com, Nilanjan Chattopadhyay

This article proposes a workflow model to prioritize critical patients in emergency situations. In developing countries, infrastructure cannot support sudden increase in demand of medical attention. This will integrate a unique easy-identifiable coding into the basic patient registration system in the hospital. The coding system helps in identifying the critical patients easily, passing on the information to a network and ensuring prompt treatment for critical patients.

2 - A Simulation Study on Patient Flows for a Hospital Emergency Department

Janny Leung, CUHK, SEEM Dept, CUHK, Hong Kong - PRC, janny@se.cuhk.edu.hk, Yong Hong KUO

In this talk, we present a staffing problem faced by the Accidents and Emergencies Department at Prince of Whales Hospital in Hong Kong. A simulation approach is adopted to analyze how the staffing decision impacts on the patient flows. Simulation techniques for incomplete data are also discussed.

3 - Prospective Surveillance of Healthcare Outcomes by False Discovery Rate Control

Yanting Li, Assistant Professor, Shanghai Jiaotong University, Dongchuan Road 800, Shanghai, SH, 200240, China, ytli@sjtu.edu.cn, Fugee Tsung

The statistical CUSUM charts have been envisaged as powerful tools for healthcare surveillance. We study the multiplicity problem caused by huge numbers of healthcare units under surveillance. Multiple Binomial and Poisson CUSUM charts incorporating False Discovery Rate control is proposed to tackle such a problem. The procedures for establishing the new control schemes are presented and their performance is evaluated. The methods for obtaining the p-values of the CUSUM statistics are provided.

Sunday, 1:30pm - 3:00pm

■ SC21

C - Room 18B, Level 4

Improving Healthcare Productivity

Sponsor: Service Science
Sponsored Session

Chair: Sagar Kamarthi, Associate Professor, Northeastern University, 360 Huntington Ave, Boston, MA, 02115, United States of America, sagar@coe.neu.edu

1 - Effective Management of the Quality and the Supply Chain Drivers in Healthcare Industry

Gangaraju Vanteddu, Assistant Professor, Southeast Missouri State University, One University Plaza MS 5815, Harrison College of Business, Cape Girardeau, MO, 63701, United States of America, gvanteddu@semo.edu

In this research an attempt has been made to study the relationship between the quality drivers and the supply chain drivers in healthcare industry. It is observed that the simultaneous control/management of the quality and the supply chain drivers will lead to a coherent approach that results in avoiding the duplication of effort and cost overruns because of the positive effect quality related goals and the necessary enabling factors will have on different supply chain drivers.

2 - Measuring Healthcare Productivity - From Processes to System Level

Antti Peltokorpi, Aalto University, P.O. Box 15500, Espoo, 15500, Finland, antti.peltokorpi@tkk.fi, Paulus Torkki, Vesa Kamarainen

Healthcare costs are rising rapidly. The current trend can be changed only by doing radical improvements in productivity at process, organization and system levels. In all levels, productivity consists of same elements: doing right things, doing things efficiently and at the right quality level. However, applications for productivity measurement should be different. This presentation demonstrates how to develop productivity measures for different levels and give some practical case examples.

3 - Five Facets of Healthcare Mass Customization

Sagar Kamarthi, Associate Professor, Northeastern University, 360 Huntington Ave, Boston, MA, 02115, United States of America, sagar@coe.neu.edu, Emanue Melachrinoudis, Abe Zeid

This paper presents five possible models of health care mass customization, namely, make to stock, assemble to order, make to order, engineer to order, and develop to order mass customization. In practice, health care mass customization requires a combination of these models to varying proportions depending on the focus and speciality of health care providers. The paper also presents the factors influencing each of these models.

■ SC22

C - Room 18C, Level 4

Service Operation Management

Sponsor: Service Science
Sponsored Session

Chair: Eunji Lim, Assistant Professor, University of Miami, University of Miami, Coral Gables, United States of America, lim@miami.edu

Co-Chair: Murat Erkoç, Assistant Professor, University of Miami, Miami, FL, United States of America, merkoc@miami.edu

1 - Simulation-based Optimization for Vehicle Routing Problems with Stochastic Demands and Travel Times

Yao Luo, University of Miami, 1251 Memorial Drive, Coral Gables, FL, 33146, United States of America, ly1987510@gmail.com, Eunji Lim

When dispatching vehicles to different locations, the uncertainty in demands or travel times has to be incorporated into one's operational decisions to prevent stock-outs or long travel times. We formulate the vehicle routing problem with stochastic demands and travel times as constrained simulation optimization, and propose an efficient method that converts the original problem to a minimax problem. We will discuss the potential impact of the proposed method and present numerical examples.

2 - Lumpy Demand Management with Pricing in the Service Sector

Murat Erkoç, Assistant Professor, University of Miami, Miami, FL, United States of America, merkoc@miami.edu, Salvador Romo-Fragoso

We consider a contractor who bids for proposals for "big deals" that are relatively long term service projects. The demand for such requests are lumpy and winning the proposals are contingent upon the price bids and available capacity. We investigate optimal pricing policies under a Markov Decision Process Model. Further we study demand acceptance policies and their impact on pricing when the contractor also carries out "regular jobs" that require short term commitments.

3 - Sustainable Capacity Management in Service Operations

Mehmet Bayram Yildirim, Associate Professor, Wichita State University, 1845 N Fairmount, Wichita, KS, 67260-0035, United States of America, bayram.yildirim@wichita.edu, Mehmet Barut, Timur Keskinurk

Utilization of a system, service or production, can be enhanced significantly by managing the capacity intelligently. In this study, we focus on improving the profitability of limited resources in service operations. Considering different customer segments we utilize revenue management concept in developing guidelines helping manager differentiate the incoming requests. The performance is benchmarked to classical fairness approach and compared to the optimum for effectiveness.

4 - Stochastic Inventory Model for Health Care Supply Chain Under Regular Demand and Surge Demand

Mingzhou Jin, Associate Professor, Mississippi State University, P.O. Box 9542, Mississippi State, MS, 39762, United States of America, mjjin@ise.msstate.edu, Md Roni

Irregular event such as natural disaster, multiple-car accidents, terrorist attacks, causes sudden huge demand for medicine in health care supply chain system. Hence, demand process in health care can be seen as a combination of regular demand and surge demand. This paper applies the level crossing theory to derive stationary distribution of the inventory level and furthermore heuristically develop the optimal inventory policy with regular order and emergency order.

■ SC23

C - Room 18D, Level 4

Panel Discussion: Modeling Inter-Cultural Service Encounters

Sponsor: Service Science
Sponsored Session

Moderator: Alexandra Medina-Borja, Assistant Professor, University of Puerto Rico at Mayaguez, II-205 Industrial Engineering Building, Mayaguez, PR, 00680, United States of America, alexandra.medinaborja@upr.edu

1 - Panel Discussion: Modeling Inter-cultural Service Encounters

Panelists: Alexandra Medina-Borja, Assistant Professor, University of Puerto Rico at Mayaguez, II-205 Industrial Engineering Building, Mayaguez, PR, 00680, United States of America, alexandra.medinaborja@upr.edu, William Hefley, Clinical Associate Professor, University of Pittsburgh, Katz Graduate School of Business, Mervis Hall, Pittsburgh PA 15260, United States of America, wehefley@katz.pitt.edu, Kalyan Pasupathy, Assistant Professor, University of Missouri- Columbia, United States of America, pasupathyk@health.missouri.edu, Paul Maglio, Clinical Associate Professor, University of Pittsburgh, Katz Graduate School of Business, Mervis Hall, Pittsburgh PA 15260, United States of America, wehefley@katz.pitt.edu, John Ruggiero, Edmund B. O'Leary Professor of Economics, University of Dayton, Department of Economics and Finance, 300 College Park, Dayton OH 45469-2251, United States of America, John.Ruggiero@notes.udayton.edu, Kostas Triantis, Professor, Virginia Tech, triantis@vt.edu

This panel presents a summary of a 2009 research workshop in Puerto Rico sponsored by NSF's Service Enterprise Systems. The goal of the workshop was to hasten the development of modeling frameworks that include inter-cultural considerations by fostering interdisciplinary research among a variety of fields, academic disciplines and technical clusters.

Sunday, 4:30pm - 6:00pm

■ SD21

C - Room 18B, Level 4

Modeling Healthcare Systems

Sponsor: Service Science
Sponsored Session

Chair: Greg Werker, University of British Columbia, 3869 W 18th Avenue, Vancouver, Canada, gwerker@gmail.com

1 - System of Systems and Service Systems as Complimentary Approaches for Healthcare Problems

Po-Ching DeLaurentis, Regenstrief Institute, Inc., 410 W. 10th St., Indianapolis, IN, 46202, United States of America, pcdelaur@iupui.edu, Dan DeLaurentis, Matt Burton, Brad Doebbeling

This talk considers key features of a system of systems and service systems in the context of healthcare service. We propose an integration of system of systems and service systems approaches yielding benefits in terms of both correct and complete representation of healthcare services and applicability of associated modeling tools for solving problems. We will show an initial mapping and an example of this integration in the context of an information intensive healthcare delivery system.

2 - A Multi-agent Supply and Demand Model of Health Providers and Patients

Greg Werker, University of British Columbia, 3869 W 18th Avenue, Vancouver, Canada, gwerker@gmail.com

Motivated by Vancouver's Downtown Eastside - a small geographic area with many health agencies providing mental health and addictions services - we propose a multi-agent model containing both competitive and cooperative elements. We use the model to find mechanisms that encourage system optimality and policies that enhance cooperative action.

■ SD22

C - Room 18C, Level 4

Organizing Service Development & Service Curriculum

Sponsor: Service Science
Sponsored Session

Chair: William Millhiser, Assistant Professor, Zicklin School of Business, Baruch College, The City University of New York, 55 Lexington Ave, Box B9-240, New York, NY, 10010, United States of America, william.millhiser@baruch.cuny.edu

1 - An Interactive Game to Learn Sustainability Engineering

Rodolfo Fernandez, The University of Texas at El Paso, 500 W. University Av., El Paso, TX, United States of America, refernandez@miners.utep.edu, Ricardo Meraz, Olivia Moreno, Heidi Taboada

In the present talk, a novel sustainability engineering game will be presented. The game was developed by undergraduate students as part of their final project in a newly developed Sustainability Engineering course. The main objective of the game is to provide an interactive way of teaching different sustainability concepts such as life cycle analysis, ethical consumerism and design for the environment.

2 - Implementing Sustainability Engineering Principles Into the Undergraduate Engineering Curricula

Abril Vazquez, Research Assistant, The University of Texas at El Paso, 500 West University Avenue, El Paso, TX, 79902, United States of America, apvasquez@miners.utep.edu, Jose Espiritu

In the present talk, an overview of the curricula developed to teach a new Sustainability Engineering class will be presented. The course was team-taught by faculty from the Industrial, Manufacturing and Systems Engineering Department and the Mechanical Engineering Department. It was offered during the Spring 2010 semester as a technical elective course open to undergraduate students enrolled in the College of Engineering at The University of Texas at El Paso.

3 - Curriculum Development: Switching From Production to Service Operations Management

William Millhiser, Assistant Professor, Zicklin School of Business, Baruch College, The City University of New York, 55 Lexington Ave, Box B9-240, New York, NY, 10010, United States of America, william.millhiser@baruch.cuny.edu

We recently converted a core class from "Production & Operations Management" to "Service Operations Management." Why is this important at the largest AACSB-accredited business school? What aspects of services were included in the new syllabus? What was the outcome of the textbook selection process? How did we find consensus among instructors who deliver 28 sections to 2000 BBA students annually? In answering these questions, this will be an interactive session drawing upon audience experiences.

4 - How to Organize New Service Development?

Thomas Meiren, Head of New Service Development, Fraunhofer IAO, Nobelstr. 12, Stuttgart, 70569, Germany, Thomas.Meiren@iao.fraunhofer.de, Adrienne Schäfer, Lars Witel, Bo Edvardsson

New services are playing an increasingly important role in companies and often they are crucial for their future survival. In parallel, this raises the question about appropriate structures and processes for the successful development of new services. The presentation discusses current strategies and different organizational options for New Service Development and includes selected case studies as well as the results of an empirical study among 791 European companies.

■ SD23

C - Room 18D, Level 4

Panel Discussion: Introduction to Service Science Research InstitutesSponsor: Service Science
Sponsored Session

Moderator: Grace Lin, WRO & Columbia University, 9 Garey Drive, Chappaqua, NY, 10514, United States of America, gracelin.ny@gmail.com

1 - Panel Discussion: Introduction to Service Science Research Institutes

Panelists: Christoph Heitz, Professor, Zurich University of Applied Sciences, Rosenstrasse 3, Winterthur, 8401, Switzerland, heit@zhaw.ch, Roland T. Rust, Distinguished University Professor and David Bruce Smith Chair in Marketing, Robert H. Smith School of Business, 3451 Van Munching Hall, University of Maryland, College Park MD 20742-1815, United States of America, rust@rhsmith.umd.edu, Krishna Singh, SRII President & IBM Service Science Research Programs, IBM ALmaden Research Center, San Jose CA 95120, United States of America, KrisSingh@us.ibm.com

Representatives from selected Service Science related Institutes will discuss their visions, missions, and their views (or definitions) of Service Science. They will discuss their R & D activities, projects, and success stories.

Monday, 8:00am - 9:30am

■ MA21

C - Room 18B, Level 4

Service Systems and AnalyticsSponsor: Service Science
Sponsored Session

Chair: Abjijit Bost, abose1t@yahoo.com

1 - Service Design and the Insurance Puzzle: The Market of Luck?

Christina Aperjis, HP Labs, 1501 Page Mill Rd, Palo Alto, 94304, United States of America, christina.aperjis@hp.com, Filippo Balestrieri

We study the optimal contract design problem of a service provider operating in a heterogeneous market. Customers differ in terms of their preferences and their costs to be served, both of which are ex-ante unobservable to the service provider. An application is Computer-Accidental-Damage-Protection warranties, where customers differ in terms of risk preferences and exposure to damages. We focus on the "insurance puzzle" according to which ex-post risk and coverage are negatively correlated.

2 - Incorporating Customer Support Feedback in Product Development

Shantanu Bhattacharya, Associate Professor of Operations Management, INSEAD, 1 Ayer Rajah Avenue, Singapore, 138676, Singapore, shantanu.bhattacharya@insead.edu, Sameer Hasija

In this paper, we present a model of incorporating feedback from customer support organizations into the product development process of OEMs. In a double moral hazard framework, we characterize the structure of optimal contracts offered by the principal (OEM) and identify cases where renegotiation improves the profits of both firms. We also characterize options based contracts that are renegotiation-proof, and achieve the first best outcome.

3 - Analysis and Predictive Modeling on Talent Retention and Turnover in Service Operations

Jerry Shan, HP Labs, Palo Alto, CA, United States of America, jerry.shan@hp.com, Kay-Yut Chen, Pano Santos, Alex Zhang, Shailendra Jain, Maria-Teresa Gonzalez

Top talents in a company can keep performing at full speed, while turnovers in certain business operations can be abnormally high. What models and methods should we use in identifying the underlying drivers and forecast the attrition rate into the future? In this talk, we will present our modeling work to shed some lights on the question.

■ MA22

C - Room 18C, Level 4

Responsive Disaster and Emergency ManagementSponsor: Service Science
Sponsored Session

Chair: James Van Scotter, Associate Professor of ISDS, Louisiana State University, Department of Info Systems & Decision Science, 3191 Patrick Taylor Hall, Baton Rouge, LA, 70803, United States of America, jvanscot@lsu.edu

1 - Research Project "REPKA": Regional Evacuation - Planning, Control and Adaptation

Katharina Gerhardt, Dr., University of Kaiserslautern, Paul-Ehrlich-Str. 14, Room 438, Kaiserslautern, 67663, Germany, gerhardt@mathematik.uni-kl.de

A basic rescue measure in case of attacks and natural disasters is the evacuation of affected buildings and regions. We focus on the situation that occurs when a large crowd has already left a building and must then be brought further away to places that are rated safe. Mathematical optimization and simulation is used to develop practical evacuation plans for an entire region. Relief units are then able to run through multiple situations before a disaster actually occurs.

2 - Implementation of a Multiobjective Location Model for Emergency Vehicles on a Public Service Network

Oscar Javier Parra Ortega, Professor, Politécnico Granacolombiano, 57th Street #3-00 East, 18th Street #4-51 Apartment 402B, Bogotá, Colombia, oparraor@poligran.edu.co

This article describes an implementation of a modified MEXCLP location model, oriented to minimize the required number of vehicles, along with maximize the coverage of demand points in a public services network. Two mechanisms for the emergency vehicles location, and an extension for relocating are evaluated. Finally, a module for interconnect this implementation with GIS is proposed too.

3 - Distribution of Victims of a Mass Casualty Incident to Multiple Hospitals

Matthew Dean, University of New Orleans, 2000 Lakeshore Drive, New Orleans, LA, United States of America, mddean@uno.edu, Suresh Nair

Triaging victims of a mass casualty incident and subsequently transporting them to area hospitals provides a challenge to the disaster response team. We describe a model that takes into account multiple hospitals and their capacities, victim-specific care times, and transport availability depending on when and where it was dispatched.

4 - Barriers to the Effective Ad hoc Knowledge Networks in Disaster Response

James Van Scotter, Associate Professor of ISDS, Louisiana State University, Department of Info Systems & Decision Science, 3191 Patrick Taylor Hall, Baton Rouge, LA, 70803, United States of America, jvanscot@lsu.edu, Tung Cu, Suzanne Pawlowski

When disasters strike, ad hoc networks facilitate information sharing and coordination among responding organizations and help reduce losses. Unfortunately, differences in goals, control structures, and cultures pose barriers to inter-organizational coordination. We interviewed five panels of emergency responders and created cognitive maps reflecting their representations of the barriers. Results identify critical barriers and interdependencies.

■ MA23

C - Room 18D, Level 4

Complex Service ModelingSponsor: Service Science
Sponsored Session

Chair: Ruoyi Zhou, Sr. Research Manager, IBM Research, 650 Harry Road, San Jose, CA, 95120, United States of America, ruoyi@us.ibm.com

1 - Good Complexity and How to Design for It

Victor Tang, Research, Massachusetts Institute of Technology, 55 Deerfield Lane South, Plesantville, MA, 10570, United States of America, victang@alum.mit.edu

Complexity suffers from a bad reputation. But complexity is like cholesterol. There is good cholesterol and there is bad cholesterol. We want more of the good and less of the bad. We present classical principles and results from complexity theory and discuss their significance to service systems. Then we show how complexity can be very useful in the design of service systems. We welcome debate on this proposal.

2 - Modeling Complex Services

Ray Strong, IBM Research, Almaden Research Center,
650 Harry Rd, San Jose, CA, 95120, United States of America,
strong@almaden.ibm.com, Sechan Oh, Tobin Lehman, Anca Ivan,
Ruoyi Zhou, Ying Tat Leung

We describe a way to use aggregate data to improve the accuracy of predictive cost models for services offered by a service provider composed of a set of service delivery centers for which accurate aggregate cost data is available. The challenge is that the deals often involve multiple delivery centers and multiple kinds of service so that it is not easy to attribute delivery center costs to specific deals.

3 - Modeling the Dynamical Customer-provider Relationship as Center of Service Provisioning

Christoph Heitz, Professor, Zurich University of Applied Sciences,
Rosenstrasse 3, Winterthur, 8401, Switzerland, heit@zhaw.ch

The customer-provider relationship is the central element of any service provisioning. Any decision on starting, maintaining, or ending a service relationship is based on expectations on the future nature of this relationship, both from the side of the provider and of the client. Research fields such as game theory, marketing, or management decision support have elaborated this idea. We argue that any model for service systems has to describe the dynamics of the customer-provider relationship.

4 - Customer Experience in the Era of Economic Uncertainty

David Ding, Assistant Professor, University of Houston,
T2-230C, Technology II Building, Houston, TX, 77204,
United States of America, xding@central.uh.edu

This study examines how economic uncertainty affects customer experience with online financial services during the past recession. Specifically, the objective is to replicate the dual-layer experience model proposed by Ding et al. (2010). Our analysis sheds light on the shift in utilities and values associated with corresponding service system components during the past financial crisis.

Monday, 11:00am - 12:30pm**■ MB21**

C - Room 18B, Level 4

Smart Electricity Distribution

Sponsor: Service Science

Sponsored Session

Chair: Pawel Kalczynski, Professor, Cal State Fullerton, P.O. Box 6848,
Fullerton, CA, 92834, United States of America,
pkalczynski@fullerton.edu

1 - Connecting People to Electricity: Single Level and Multi-level Grid Network Design

Ayse Selin Kocaman, PhD Student, Columbia University,
500 West 120th Street, 918 S. W. Mudd Hall, New York, NY, 10027,
United States of America, ask2170@columbia.edu, Vijay Modi,
Tim Huh, Alex Zvoleff

We present methodologies to estimate the cost of energy infrastructure planning in rural areas. Our first heuristic provides a quick solution for the partial electrification problem where the grid can only connect pre-specified number of households. We provide another heuristic to design power distribution system which includes the placement of transformers between medium and low voltage lines. Proposed methods are applied to both simulated and real data obtained from satellite images of Africa.

2 - A Dynamic Model to Measure Risk in Electricity Markets

Reinaldo C. Garcia, Associate Professor, University of Brasilia,
Faculty of Technology, Engenharia de Produção, Brasilia, 70910-900,
Brazil, rcgarcia@unb.br, Javier Contreras, Virginia González

Electric companies make use of price prediction techniques to hedge against volatility. They can manage risk trading in spot and contract markets. Their objective is to decide how much to allocate in each market minimizing risk and maximizing profits. This work implements a dynamic model where the volatility is not constant along the time horizon. The model is tested with US electricity data and the results are compared with previous models.

3 - Aggregation Choices in Zonal Pricing in Electricity Markets

Mette Björndal, Professor, NHH, Helleveien 30, Bergen, 5045,
Norway, mette.bjorndal@nhh.no, Endre Björndal

Locational marginal prices constitute a well known benchmark for managing transmission capacity constraints in electricity markets. We study aggregation choices when simplifying nodal prices into zonal or area prices. We discuss two different aggregation concepts, which we call economic and physical aggregation, and their relation to optimal nodal prices. As an illustration we consider the approximations and simplifications of the present Nord Pool spot price algorithm.

4 - Optimal Dispatch of Thermal Generators

Pawel Kalczynski, Professor, Cal State Fullerton, P.O. Box 6848,
Fullerton, CA, 92834, United States of America,
pkalczynski@fullerton.edu, Dawit Zerom

A new discrete model for the optimal control of thermal generators is proposed to simulate the dispatch of any thermal generator operating in any deregulated electricity market using any price forecast. The model yields itself to powerful discrete optimization techniques and enables comparing price forecasts and bidding models using historical data. The results of this research may lead to better dispatch and bidding decisions and to an increase in profitability of thermal generators.

■ MB22

C - Room 18C, Level 4

Disruptive Event Management

Sponsor: Service Science

Sponsored Session

Chair: Evangelos Kaisar, Assistant Professor, Florida Atlantic University,
777 Glades Rd. Bldg. #36, Boca Raton, FL, 33431, United States of
America, ekaisar@fau.edu

1 - A Bi-criteria Measure to Assess Supply Chain Network Performance for Critical Needs

Qiang Qiang, Penn State University - Great Valley School of
Graduate Professional Studies, 30 E. Swedesford Rd, Malvern, PA,
19355, United States of America, qzq10@psu.edu

We develop a supply chain/logistics network model for critical needs in the case of disruptions. The objective is to minimize the total network costs, which are generalized costs that may include the monetary, risk, time, and social costs. The model assumes that disruptions may have an impact on both the network link capacities and on the product demands. Two different cases of disruption scenarios are considered.

2 - High-Resolution Logistics in Disaster Response: Modeling and Solution Algorithms

Abbas Afshar, University of Maryland, 1173 Glenn Martin Hall,
College Park, md, 20742, United States of America, afshar@umd.edu,
Ali Haghani

A mathematical model is proposed to describe several logistical aspects of responding to large-scale natural disasters. The model integrates multicommodity network flows and multimodal vehicle routing with multi-echelon facility location problem compatible with FEMA's supply chain structure. Also, an array of fast and efficient heuristic algorithms is proposed that makes the real-time implementation of the model possible.

3 - Catastrophic Event Planning and Response for Urban Areas Utilizing Dynamic Traffic Assignment and Departure Time

Evangelos Kaisar, Assistant Professor, Florida Atlantic University,
777 Glades Rd. Bldg. #36, Boca Raton, FL, 33431,
United States of America, ekaisar@fau.edu, William Degnan

Catastrophic event emergency planning has emerged as one of the most important operations management areas. Much of the successes of a response plan rely on the ability to maintain an operating transportation infrastructure. Traffic Assignment (DTA) techniques and a non-linear departure time slot allocation mathematical model ensuring infected populations receive treatment and/or vaccinations efficiently.

4 - Stock Optimization in Emergency Resupply Networks Under Stuttering Poisson Demand

Jie Chen, Ph.D., Cornell University, Rhodes 257, Ithaca, NY, 14850,
United States of America, jc562@cornell.edu, Peter Jackson,
John Muckstadt

We model a network of field service locations (FSL) that manage parts according to an (s-1,s) policy. FSLs get replenishments from a RSL. Excess FSL demand is routed to an emergency stocking location (ESL). Excess ESL demand is backordered. ESL to FSL leadtimes are assumed to be negligible compared to RSL-ESL resupply times. We show how to compute stock levels at FSLs and the ESL across all part types so as to minimize backorder and emergency resupply costs subject to a budget constraint.

■ MB23

C - Room 18D, Level 4

Exploring Information to Enable Smart Services

Sponsor: Service Science
Sponsored Session

Chair: Anca Ivan, IBM Research Almaden, 650 Harry Road, San Jose, United States of America, ancaivan@us.ibm.com

1 - Early Detection Methods Based on Medical Records for Improving Patient Outcomes and Enabling Targeted Care

Jakka Sairamesh, CEO and President, 360Fresh, Inc,
3600 West Bayshore Road, Suite 102, Palo Alto, CA, 94303,
ramesh@360fresh.com

We will present a novel early-warning method that predicts patients at risk of readmissions based on clinical rules, natural language processing techniques and predictive algorithms applied to risk factor embedded in electronic medical records. We will also discuss the effectiveness of the methods for targeted and improved Health care services.

2 - Analytics as a Service - A Paradigm for Enabling Universal Analytics

Ying Chen, Analytics as a Service, IBM Almaden Research Center,
650 Harry Road, San Jose, CA, 95120, United States of America,
yingchen@us.ibm.com, Jeffrey Kreulen

Although analytics is critical to today's enterprises, how to enable analytics universally in the business remains a challenge. Analytics as a Service (AaaS) tackles this problem by providing a web-based analytics service framework. It consists of composable analytics components and workflows that are orchestrated via a dynamic workbench to enable formation of new applications, integration into existing processes and applications, and customization.

3 - Sequence Effects in Service Bundles: Implications for Scheduling Optimization

Michael Dixon, PhD Candidate, Cornell University, G-80 Statler Hall,
Ithaca, NY, 14853, United States of America, mjd295@cornell.edu,
Gary Thompson, Rohit Verma

Past research has shown that the relative attractiveness of events and their sequence within a service encounter affect customers' repurchase behavior. In this paper we investigate the complexity of scheduling and assigning events to service bundles for maximizing repurchase by customers. The model formulation and scheduling approach is illustrated for a large performing art venue that organizes over 300 events every year.

Monday, 1:30pm - 3:00pm

■ MC21

C - Room 18B, Level 4

Sustainable Energy Services

Sponsor: Service Science
Sponsored Session

Chair: Trevor Hale, Associate Professor, University of Houston - Downtown, One Main Street, Houston, TX, 77002, United States of America, halet@uhd.edu

1 - Energy Arbitrage and Carbon Footprint Reduction with Grid-energy-storage Systems: An Initial Study

Trevor Hale, Associate Professor, University of Houston - Downtown,
One Main Street, Houston, TX, 77002, United States of America,
halet@uhd.edu, Kelly Weeks, Coleman Tucker

This effort presents a model for grid energy arbitrage integrating time-of-use (TOU) kilowatt-hour tariff rate schedules with relatively small (1-100 MWh capacity) grid-energy-storage (GES) systems. The specific questions under investigation are as follows: Is it economically sound to invest in a GES system and is the system at least carbon footprint neutral? This research will show that when such systems are managed judiciously, the answer to both questions is in the affirmative.

2 - Planning and Control of a Virtual Power Plant Consisting of a Large Set of Domestic Houses

Johann Hurink, University of Twente, P.O. Box 217,
Enschede, Netherlands, j.l.hurink@utwente.nl

To improve the energy efficiency and sustainability of electricity supply, during the last years new technologies have been developed. However, using them uncontrolled may waste parts of their potentials and may result in an instable grid. We present a general concept for planning and control of a large fleet of houses allowing the fleet to act as a VPP. Based on this, a three-step optimization methodology is proposed using offline prediction and global planning and online scheduling.

3 - Multi-objective Optimization for Transportation Problem Incorporating CO2 Emission Levels

Takashi Irohara, Professor, Sophia University, 7-1 Kioi-cho, Chiyoda-ku, Tokyo, 102-8554, Japan, irohara@sophia.ac.jp, Yudong Xue

The purpose of this study is to minimize both the transportation cost and CO2 emission during the transportation from overseas production base to domestic demand bases. In this study, Carrier choice, less-than carrier load and domestic transportation are considered as the three target areas. The model was formulated as a multi-objective optimization problem, which is solved by genetic algorithm.

4 - Interdependency Modeling as a Tool for Analyzing Resource Sustainability

Zachary Walchuk, University of Oklahoma, 320 W Duffy St.,
Norman, OK, 73069, United States of America,
zwalchuk@hickorytech.net, Kash Barker

As available supplies of high-demand resources such as oil and clean water begin to decrease, a variety of immediate and secondary effects will be seen in the economy. The Inoperability Input- Output Model can be used to model shortages in resource production and examine which interconnected industries will be most impacted. The model will allow decision makers to design systems which remain sustainable even as key resources are lost. Case studies illustrate the model's usefulness.

■ MC22

C - Room 18C, Level 4

Smart Energy and Utility Service - Smart Grids - Modeling and Optimization

Sponsor: Service Science
Sponsored Session

Chair: Wenjun Yin, Dr., IBM Research - China, Diamond building, ZGC Software Park, 8 Dongbeiwang West Road, Beijing, 100193, China, yinwenj@cn.ibm.com

1 - Building Engineered Complex System for Human Decision Making in the US Smart Grid

Moeed Haghnevis, Graduate Research Associate, Industrial Engineering PhD, Arizona State University, School of Computing, Informatics, and Decision Systems Engineering, 1249E., Spence Ave., Apt# 336, Tempe, AZ, United States of America, mhaghnev@asu.edu, Ronald G. Askin

In this research, an integrated method is developed to study emergent behavior and consequences of evolution and adaptation in complex systems. A descriptive model is developed to calibrate current structure of such systems and predict their future patterns. This study examines complexities in the structure of a decision network and behavior of characters as a result of connections and in correlation with the environment. The US Smart Grid demonstrates the applicability of the modeling approach.

2 - A Smart Load Shifting (SLS) Model Based on Time-pieces Topology Analysis

Jun Luo, IBM, Diamond, ZhongGuanCun Software Park, BeiJing, 100193, China, junluo04@gmail.com, XingBo Zhang, Wenjun Yin, XinJie Lv, Jin Dong, Hairong Lv

Dispatcher in power grid companies establishes power load transfer path based on overhaul plan to increase operational efficiency and keep the electricity sales level. Because of the dynamic, complex topology and numerous overhaul tasks, it's difficult to optimize the path. Through topology analysis on time pieces, Smart Load Shifting model based on GAs is proposed to find out the optimized load transfer path. The practice shows it operates effectively in a Chinese leading power company.

3 - An Optimization Model of Microgrid System

Ming-Che Hu, Assistant Professor, National Taiwan University, No 1, Sec 4, Roosevelt Rd, Taipei, 10617, Taiwan - ROC, mchu@ntu.edu.tw

This research formulates an optimization model to analyze microgrid system. In the model, microgrids provide energy locally and integrate distributed power generators and local renewable energy. Without long distance transmission, microgrids provide more stable power supply and higher reliability than the national power grid. Microgrids are able to improve energy utilization efficiency, take advantage of waste heat, and make greenhouse gas emissions reduction.

4 - Smart Micro Grid Energy Management System Integrated with Renewable Energies

Wenjun Yin, Dr., IBM Research - China, Diamond building, ZGC Software Park, 8 Dongbeiwang West Road, Beijing, 100193, China, yinwenj@cn.ibm.com

This paper describes an Advanced Micro Grid Energy Management System based on Analytics and Optimization technologies. It is composed of generation, storage and load systems. This smart system includes high-resolution weather forecasting, wind/solar power forecast, energy storage optimization, unit commitment, Electric Vehicle charging, load control, etc. We built a real-world simulation environment to enable better usage of renewable energy and load shifting performance.

■ MC23

C - Room 18D, Level 4

Risk Management in Services

Sponsor: Service Science
Sponsored Session

Chair: Victor Tang, Research, Massachusetts Institute of Technology, 55 Deerfield Lane South, Plesantville, MA, 10570, United States of America, victang@alum.mit.edu

1 - Stability of the Design of Experiments for Services

Genady Grabanik, Asst Professor, Department of Math and, Computer Science, Queens, NY, United States of America, genadyg@gmail.com, Larisa Shwartz, Yefim Haim Michlin

In the paper we explain how to design an experiment (DOE) for the service processes based on comparison estimation. The paper introduces SPRT test for the comparison estimation and analyzes the stability of the DOE under uncertainty due to variation in the input of the service. In addition we study the impact of the restricted SPRT on stability.

2 - Risk and Service Deployment Planning

Larisa Shwartz, Researcher, IBM T.J. Watson Research Center, 19 Skyline Dr, Hawthorne, NY, United States of America, lshwart@us.ibm.com, Genady Grabanik

The paper discusses the effects of uncertainty on managing business processes which have dependencies on common human and computing resources. We estimate resources required to maintain a given level of risk and a number of processes which may be hosted by available resources under given level of risk. Research presented in this paper addresses a number of scenarios. The examples include management on demand process deployments and Event processes management for the Business Continuity provider.

3 - The Effects of Cost Structure on Dynamic Server Allocation Policies in Service Centers

Hoda Parvin, 1205 Beal Ave, Ann Arbor, MI, 48105, United States of America, hoda@umich.edu, Matthew Philson, Mark Van Oyen

Despite much research on how to properly staff and operate service centers, the impact on efficiency of individual system factors such as cost structure and deadlines is not clear. We analyzed these effects and developed a new routing/scheduling algorithm. A simulation model using real-world data was used to test the results.

4 - The Vertical Integration Evolution of Sustainability Focused Companies

Kingsley Reeves, University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, FL, 33620, United States of America, ozan79@gmail.com, Ozan Ozcan, Fethullah Caliskan

In this study, firstly, we compared the recently developed vertical integration measurement methods and selected the most accurate one. Secondly, we measured the vertical integration level of sustainability focused companies (SFCs) and compare this with their non-sustainability-focused competitors and found that in some industries SFCs are more vertically integrated than their counterparts. Finally, we measured and observed the organization-structure evolution of SFCs over a period of time.

Monday, 4:30pm - 6:00pm

■ MD21

C - Room 18B, Level 4

Carbon Emission Analysis in Energy Industry

Sponsor: Service Science
Sponsored Session

Chair: Yidong Zhang, PhD Candidate, University at Buffalo, 308A Bell Hall, Amherst, NY, 14226, United States of America, yz46@buffalo.edu

1 - Decomposition of Energy-related CO2 Emission in China: 1997-2004

Yong Xue, School of Management, Xi'an Jiaotong University, Mailbox 1889, No.28 Xianning West Road, Xi'an, Shaanxi, 710049, China, xueyong08@gmail.com, Lei Meng, Ju'e Guo

This paper undertakes a structural decomposition analysis of the historical change in energy-related CO2 emission in China during the period 1997 -2004. The result shows that, to harmonize the economic growth and CO2 emission reduction, it is important to enhance energy efficiency and further enforce policies on structural change of final demand and renewable energy substitution.

2 - Smart Grids and Wind Integration: Evaluating Impacts on Emissions and Costs

Subhamoy Ganguly, Doctoral Student, Leeds School of Business, University of Colorado at Boulder, UCB 419, Boulder, CO, 80309, United States of America, Subhamoy.Ganguly@colorado.edu, Stephen Lawrence

This paper evaluates the interplay of smart grids and wind-energy penetration on carbon emissions and generating costs. A mixed-integer linear program is used to model the generator dispatch decisions of a utility. Our analysis shows that at low wind penetration, advanced grid capabilities will result in modest cost savings, while emissions may in fact increase. However, at higher penetrations of wind, advanced grid capabilities will enable significant reductions in both emissions and costs.

3 - Analysis of Carbon Capture in Industrial Clusters

Vibeke S. Nørstebø, Research scientist, SINTEF Applied Economics, S.P. Andersen 5, Trondheim, 7465, Norway, vibeke.s.norstebo@sintef.no, Kjetil Midthun, Thor Björkvoll

We present an analysis of investment and operation of a carbon capture plant capturing CO2 from multiple sources in an industrial cluster. The cluster uses natural gas for power production and as raw material in industrial processes. Exhaust gas from the processes has different CO2 concentration and optimal investment and operation of a carbon capture plant depend on both exhaust volume and CO2 concentration. The basis for the analysis is a technical economic modeling of the cluster processes.

4 - Long Term CO2 Sequestration System Modeling

Yidong Zhang, PhD Candidate, University at Buffalo, 308A Bell Hall, Amherst, NY, 14226, United States of America, yz46@buffalo.edu, Mark H. Karwan

In this study, a comprehensive mathematical programming model is proposed to evaluate the full economic impact of a regional carbon capture and storage system integrated with the electricity production from coal-based plants. Computational experiments for different scenarios are used to validate this model necessitating algorithmic development for large-scale cases.

■ MD22

C - Room 18C, Level 4

Supply Chain/Electronic Hub and Outsourcing Services

Sponsor: Service Science
Sponsored Session

Chair: Gene Hahn, Assoc. Professor, Salisbury University, 1101 Camden Ave, Salisbury, MD, 21801, United States of America, edhahn@salisbury.edu

1 - A Comparative Analysis of Supply Chain/Electronic Hubs

Amer Karim, Northwestern University, McCormick School of Engineering, Evanston, IL, United States of America, akarim@u.northwestern.edu, Ahmad Karim

Effective organization of a company's supply chain is one of the most important factors in succeeding in the global economy. In recent years, electronic hubs have received great attention, providing buyers and suppliers alike with a mean of structuring and streamlining their supply chains in order to create maximum efficiency. In the near future, online marketplaces are expected to rapidly move toward becoming full service providers, letting e-commerce take over the entire supply chain.

2 - Reverse Offshoring of Services: The New Wave of Emerging Offshorers

Gene Hahn, Assoc. Professor, Salisbury University, 1101 Camden Ave, Salisbury, MD, 21801, United States of America, edhahn@salisbury.edu, Kraiwinee Bunyaratavej

Offshore outsourcing of services accelerated at the end of 1990s in developed countries. Recently, developing countries have begun to increasingly offshore services, both to developed countries and to other developing countries. Yet, to date little attention has been paid to the emergence of this reverse offshoring. The focus of this research is on the determinants of reverse offshoring of services and we investigate what drives firms from developing countries to offshore services.

3 - Switching Costs and Information Technology: The Case of IT Outsourcing

Christian Peukert, Ulm University, Helmholtzstr. 20, Ulm, 89081, Germany, christian.peukert@uni-ulm.de

Micro data from US credit unions for 1999 to 2009 reveals that with more than 98 percent, outsourcing has been by far the preferred mode of IT provision. However, the average credit union only sticks with the same vendor for 4 years. This paper empirically investigates determinants of the decision to switch suppliers. Moreover we provide evidence for the existence and magnitude of switching costs. The estimates suggest that average switching costs account for 3 percent of annual expense.

■ MD23

C - Room 18D, Level 4

Business Performance Management and Services Science

Sponsor: Service Science
Sponsored Session

Chair: Ko-Yang Wang, kyw@us.ibm.com

1 - Improving Business Performance and Business Agility with BPM Technology

Ko-Yang Wang, kyw@us.ibm.com

In this talk, we will describe the recent advances in Business Process Management (BPM) technology in Services Science and how they are used to improve the business performance and business agility by enabling actionable, adaptive business processes and rules.

2 - Human Centric Business Process Management

Alan Godfrey, IBM, United States of America, alan.godfrey@us.ibm.com

Human-centric business process activities which enables business to handle exceptions to predefined business rules or unexpected events and support decision making are critical to the business performance. In this talk, we will discuss the human centric business process management and some techniques to quickly model and visualize the process activities in easy to understand graphical models, identify and add performance monitoring check-points, enable the run-time environment for executing the process and monitoring the performance, and then use the performance results to rapidly improve the processes.

3 - Best Practices in BPM for Business Agility

Leah Pope, IBM, United States of America, leah.pope@us.ibm.com

Modern Business Process Automation tools can be used to enable Rapid Process Development and Automation, thereby enabling organizations to respond to environmental and business changes much quicker and in ways that are more scalable. We will discuss some BPM use cases and best practices and describe how they help to improve an organization's performance and agility.

4 - Business Rules Management

Alessandro Campioli, IBM, United States of America, ale.campioli@us.ibm.com

With the rapidly changing business conditioners, many companies found that their IT are too inflexible to keep up with their rapidly changing business needs. Well designed Business Rules Management Systems (BRMS) can support the business people and application designers to centrally define and manage sophisticated rule sets that control key aspects of the business outside the IT applications but interacting with them to support efficient rules execution. It also provides support for testing and impact assessment of rule changes thereby enables business people to manage and update the business rules without the need to go through time consuming IT application release process.

Tuesday, 8:00am - 9:30am

■ TA21

C - Room 18B, Level 4

Energy Services

Sponsor: Service Science
Sponsored Session

Chair: Carlos Paternina-Arboleda, Associate Professor, Universidad del Norte, Km 5 via Puerto Colombia, Barranquilla, Colombia, cpaterni@uninorte.edu.co

1 - Cooperation Model in a Echelon of the Supply Chain using Game Theory

Luceny Guzman, Assistant Professor, Universidad del Norte, Km 5 via Puerto Colombia, Barranquilla, Colombia, lguzman@uninorte.edu.co, Carlos Paternina-Arboleda

This work presents a cooperative optimization model between marketers in a supply chain using a game theory approach. The goal is to determine if cooperation improves competition. Results are generated through the design and implementation of a computer tool and they are very appealing and show true practical benefits to introduce to the market.

2 - Efficient Stochastic Programming for Sensor Placement in Advanced Power Systems

Adrian Lee, Central Illinois Technology and Education Research Institute, 2312 Connie Drive, Springfield, IL, 62704, United States of America, ajlee@citeri.org, Urmila Diwekar

The problem of selecting the placement of a network of sensors in an IGCC power system, subject to budget constraints is formulated as a stochastic, nonlinear optimization problem, where variability exists in the system model and sensor measurements. Fisher information is introduced as a metric of observability to determine the optimal location of on-line sensors.

3 - Portfolio Analysis of Electricity Markets with Transmission Constraints—A Game-Theoretic Approach

Zhi Zhou, Argonne National Laboratory, 9700 South Cas Ave, Bldg 221, Argonne, IL, 60439, United States of America, zzhou@anl.gov, W. K. Victor Chan

We use an agent-based approach and a nonlinear complementarity approach to model an electricity market as a game. We investigate how the transmission capacity and portfolios of generation companies affect their bidding strategies under both monopoly and non-monopoly markets. By comparing the simulation results and the results from the theoretical mathematical model, we establish conditions for generation companies to prefer a coordination strategy over a non-coordination one.

4 - Heuristic Methods for Dynamic Economic Dispatch

Ingrida Radziukyniene, student, University of Florida, 303 Weil Hall, Gainesville, FL, 32611, United States of America, ingrida@ufl.edu, Panos Pardalos

Dynamic economic dispatch plays an important role in power system operation, which is a complicated nonlinear constrained optimization problem. Several heuristic methods are applied to solve this problem. The comparison of feasibility and effectiveness of applied approaches is presented.

■ TA22

C - Room 18C, Level 4

Models of Service Co-creation

Sponsor: Service Science
Sponsored Session

Chair: Ralph Badinelli, Professor, Virginia Tech, Department of Business Information Technology, Virginia Tech, Blacksburg, VA, 24061, United States of America, ralphb@vt.edu

1 - Scaling of Service Networks: Accumulation, Networking, and Eco-system

Cheng Hsu, Professor, Rensselaer Polytechnic Institute, Dept of Industrial and Systems Eng'g, 110 8th Street, Troy, NY, 12180-3590, United States of America, hsuc@rpi.edu, W. K. Victor Chan

Service productivity can be facilitated by resources accumulation and reuse; both of which can be considered as the goals of scaling for service. Analytically, the scale of co-creation is a function of the connections among customers, providers, and service production factors in the service network. The new hyper-networks model presented here describes the nature of such connections in especially Internet-based enterprises, and hence provide a new explanation for service scaling.

2 - Redesign of Automobile After-Sales Service Systems

Robin Qiu, Professor, Penn State University, 220 L, Main Building,
The Penn State University, Malvern, PA, 19355,
United States of America, robinqiu@psu.edu

Using the fundamentals of Service Science, we look into the following tasks: defining a generic computational model; identifying mechanisms for the people-centric interactions during the operations (i.e., value co-creation processes); and exploring methods to create transformative actions (i.e., redesign) for continuous service improvement.

3 - Dynamic Collaborative Processes

Morvarid Rahmani, UCLA Anderson school of management, B501
UCLA Anderson School of Management, Box 951481,
Los Angeles, CA, 90095-1481, United States of America,
morvarid.rahmani.2013@anderson.ucla.edu, Guillaume Roels,
Uday Karmarkar

In this talk, we introduce a dynamic model for collaboration. Two agents collaborate on a project with finite deadline; at any point in time, they can decide to collaborate, work solo, or stop the project. Modeling the problem as a dynamic game, we characterize the structure of the equilibrium. We find that collaboration is absorptive and that the game dynamics lower the overall quality of the project.

4 - Models of Service Technology Functions

Ralph Badinelli, Professor, Virginia Tech, Department of Business
Information Technology, Virginia Tech, Blacksburg, VA, 24061,
United States of America, ralphb@vt.edu

This paper posits a framework for mathematical models of service systems. Each service process with a network of processes that make up the system is modeled in terms of a technology function. The technology function describes the integration of resource inputs and their transformation into resource outputs. Resource integration is modeled in terms of constraints that ensure the mutual adjustment of resource commitments from the agents involved in the service process.

Tuesday, 11:00am - 12:30pm**■ TB21**

C - Room 18B, Level 4

Renewable Energy - Analysis and Optimization

Sponsor: Service Science
Sponsored Session

Chair: Lev Virine, Lead Analyst, Ziff Energy, 1117 Macleod Tr. S.E.,
Calgary, AB, Canada, lev.virine@ziffenergy.com

1 - Decision Analysis in Energy Industry: When Gas Power Generation Can Be Replaced by Renewables?

Lev Virine, Lead Analyst, Ziff Energy, 1117 Macleod Tr. S.E., Calgary,
AB, Canada, lev.virine@ziffenergy.com

The presentation includes the analysis of options for meeting electricity needs based on multiple criteria, including capital and operating cost, other environmental impact, subsidies, social impact, and others. The alternatives include improving efficiency of gas and coal power generation, nuclear power, and renewables. The comparative analysis of multiple models was performed. The analysis of the integrated model demonstrated gradual increase of gas power generation and some renewables.

2 - Exploring Biofuels and Technology Changes to the US Vehicle Fleet

Xirong Jiang, Senior consulting decision analyst, Lumina Decision
Systems, Inc, 26010 Highland Way, Los Gatos, CA, 95033,
United States of America, xirong@lumina.com, Max Henrion,
Costa Samaras, Surya Swamy

A variety of technology and policy developments will radically transform the US vehicle fleet over the next 40 years. We illustrate the use of ATEAM (Analytical Transportation Energy Assessment Model) to understand how these changes are likely to interact and their effects on transportation costs, greenhouse gas emissions, and oil imports.

3 - Storage Capacity Optimization for Renewable Energy Integration with Electric Grid

Feng Gao, Dr., IBM Research - China, Building19, Zhongguancun
Software Park, 8 Dongbeiwang West Rd, Haidian District, Beijing,
100193, China, gfgao@cn.ibm.com, Wenjun Yin, Jin Dong,
Haifeng Wang

This paper considers a storage capacity optimization model in which different storage devices are used to stabilize overall power output of renewable energy resources integrated with the electric grid, and the cost of storage devices is minimized. The output power of renewable energy resources, such as that of a wind farm, is modeled as a stochastic process; and different feasible storage charging policies are studied for diverse grid integration requirements.

4 - A Multi-commodity Flow Approach for Biomass/Biofuel Supply Chain Design

Heungjo An, PhD Student, Texas A&M University, TAMUS 3131,
College Station, TX, 77843-3131, United States of America,
Heungjo.An@gmail.com, Wilbert Wilhelm

This paper formulates a multi-commodity production/distribution model to design the second-generation (e.g., cellulosic) biofuel supply chain from farms to customers. A time-staged network flow structure represents the unique aspects of the biofuel industry as a mixed integer program. A decomposition approach based on column generation is employed to deal with large-scale instances with test examples based on the Central Texas region.

■ TB22

C - Room 18C, Level 4

Optimizing Service Productivity

Sponsor: Service Science
Sponsored Session

Chair: Roland T. Rust, Distinguished University Professor and David
Bruce Smith Chair in Marketing, Robert H. Smith School of Business,
3451 Van Munching Hall, University of Maryland, College Park, MD,
20742-1815, United States of America, rrust@rhsmith.umd.edu

1 - Optimizing Service Productivity

Roland T. Rust, Distinguished University Professor and David Bruce
Smith Chair in Marketing, Robert H. Smith School of Business, 3451
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Ming-Hui Huang

Theory, supported by empirical research, shows that at any given time there is an optimal level of service productivity, but that the optimal level increases over time due to the advance of technology. The theory predicts conditions under which service productivity should be higher or lower, and results in testable empirical propositions, tested using data from over 700 service companies in each of two different time periods. The empirical analysis supports the theory.

2 - Multicriteria Decision Models in Service Producing Systems

Adiel Almeida, Professor, Federal University of Pernambuco,
Recife-PE, Brazil, almeidaatd@gmail.com

This paper presents some characteristics related to the process of building decision model which are related to service producing system in contrast with the manufacturing producing system. The main aspect explored is related to the multiple objectives characteristics of both kind of producing systems. It is shown the role played by multicriteria decision methods in service producing system, with some practical applications.

Tuesday, 1:30pm - 3:00pm**■ TC21**

C - Room 18B, Level 4

Resilient Power Distribution

Sponsor: Service Science
Sponsored Session

Chair: Alexandre Street de Aguiar, Assistant Professor, Pontifical Catholic
University of Rio de Janeiro - Electrical Engineering Department,
Marques de São Vicente 225, L401, DEE., Rio de Janeiro, RJ, 22451900,
Brazil, street@ele.puc-rio.br

1 - Improving the Resilience of Power Distribution Systems to Hurricanes

Suraj Chanda, Texas A&M University, TAMU 3128, College Station,
TX, 77843, United States of America, chandasuraj37@gmail.com,
Alex Sprintson, Emily Zechman

Power distribution systems are essential for providing lifeline services during hurricanes and other catastrophic events. This talk presents a methodology for improving the resilience and survivability of such systems. In particular, we develop algorithms for hardening the power distribution infrastructure and allocating backup resources subject to budget constraints. Our objective is to improve a city-wide fragility curve of the number of affected customers as a function of the wind speed.

2 - A Heuristic Method for Grid Outage Plan Optimization

Qiming Tian, Dr., IBM Research - China, Diamond building, ZGC Software Park, Beijing, 100193, China, tianqim@cn.ibm.com, XingBo Zhang, XinJie Lv, Wenjun Yin, Jin Dong, Jun Luo

Grid outage plan for equipment maintenance, customer installation or network upgrades is important for operation management of utility companies. In this paper, multiple objectives and complex constraints of outage plan are modeled and a heuristic method is proposed to optimize them. A system has been built for a Chinese provincial grid and the result shows the method can help to improve grid reliability, workload balance and planning efficiency.

3 - A Method to Detect and Solve Confliction Between Equipment Outage and Power Supply Guarantee

Hairong Lv, IBM Research - China, Diamond building, ZGC Software Park, Beijing, 100193, China, lvhr@cn.ibm.com, Qiming Tian, Wenjun Yin, Feng Jin, Jin Dong, XingBo Zhang

Utility companies need to perform outages for equipments maintenance while guaranteeing power supply for important users. There are usually conflictions between equipment outages and power supply guarantee because of complex grid topology and operation mode. In this paper, these conflictions are detected with a method based on topology analysis, and then some of them are solved by operation mode adjustment with a genetic algorithm based method.

4 - A Robust Optimization Approach for the Unit Commitment Problem with n-K Security Criterion

Alexandre Street de Aguiar, Assistant Professor, Pontifical Catholic University of Rio de Janeiro - Electrical Engineering Department, Marques de São Vicente 225, L401, DEE., Rio de Janeiro, RJ, 22451900, Brazil, street@ele.puc-rio.br, Fabricio Oliveira, Jose Manuel Arroyo

This work shows recent developments on the contingency-constrained unit commitment problem. The proposed model takes into account a general n-K security criterion, in which demand must be supplied under any contingency state comprising the simultaneous failure of up to K generation units. The robust counterpart provides an efficient formulation in which a combinatorial set of contingencies is avoided. Case studies validate the model superiority over the contingency-dependent formulation.

TC22

C - Room 18C, Level 4

Sustainable Value Chains

Sponsor: Service Science
Sponsored Session

Chair: Tony Cox, President, Cox Associates, 503 Franklin Street, Denver, CO, 80218, United States of America, tcoxdenver@aol.com

1 - Towards the Creation of Sustainable Value Chains

Julia Wolf, Assistant Professor for Sustainability in Logistics and Supply Chain Management, European Business School, Soehleinstrasse 8, Wiesbaden, 65201, Germany, julia.wolf@ebs.edu

This research deepens our understanding of Sustainable Supply Chain Management (SSCM) by deriving a model of SSCM from three qualitative case studies of from the automotive industry. This model conceptualizes SSCM as a combination of the number of business processes covered, the number of tiers in a supply chain involved and the breadth of sustainability dimensions covered (consideration of economical, ecological and social elements). It uncovers major antecedents and performance outcomes.

2 - Making Sustainability More Sustainable in a Risky World

Tony Cox, President, Cox Associates, 503 Franklin Street, Denver, CO, 80218, United States of America, tcoxdenver@aol.com

Trying to develop more sustainable approaches to production, use, and protection of resources in an uncertain world may backfire, reducing the wellbeing and capabilities of future generations. This can happen if planned and actual system responses differ, or if sustainability undermines flexibility. We discuss how to use risk analysis to make sustainability less dangerous, by hedging against uncertainties and focusing on total benefits produced over the uncertain lives of scarce resources.

3 - Building Relational Capital in Environmental Manufacturing to Substitute Vertical Integration

Ozan Ozcan, Graduate Assistant, USF University of South Florida, 4202 E. Fowler Avenue, ENB118, Tampa, FL, 33620, United States of America, oozcan@mail.usf.edu, Kingsley Reeves, Deniz Ozcan

In this study, we will examine the collaboration of sustainability focused companies with their first and second tier suppliers to understand if they have an organizational structure that is a substitute (or at least complementary) to a pure vertically integrated organizational structure. We will employ social network analysis to investigate the relationship between sustainability focused companies and their suppliers that helps foster knowledge, technology, and personnel transfer.

4 - Water Reuse Planning and Management: A System Dynamics Approach

Fuzhan Nasiri, Postdoctoral Associate, Yale University, New Haven, CT, United States of America, fuzhan.nasiri@yale.edu, Julie Zimmerman

Water reuse decision making, within an integrated water supply management framework, is a complex process linked to water quantity, quality and pricing aspects with benefits ranging from water savings to energy and material recovery. This study proposes a system dynamics approach to model and analyze the water-reuse process in an urban setting, in the Great Lakes region, with respect to future scenarios of population and climate change.

Tuesday, 4:30pm - 6:00pm**TD21**

C - Room 18B, Level 4

Customer Service Management in Energy & Utility Industry

Sponsor: Service Science
Sponsored Session

Chair: Adiel Almeida-Filho, Assistant Professor, Federal University of Pernambuco, Cx Postal 7471, Recife, PE, 50.630-971, Brazil, atalmeidafilho@yahoo.com.br

1 - The Cost of New Electricity Generation

Seth Borin, Graduate Research Assistant, Georgia Institute of Technology, 402-B Georgia Ave SE, Atlanta, GA, 30312, United States of America, sborin3@gatech.edu, Todd Levin, Valerie Thomas

Future demand for electricity can be met with a range of technologies and fuels as well as with energy efficiency and demand management approaches. Most studies use site specific point estimates for costs using methodologies that are not replicable or do not allow straightforward comparisons between technologies. The approach taken here is to provide a transparent and verifiable analysis based mainly on recent data provided to public utility commissions by electric utilities.

2 - Response-time-focused Supply Chain Design for the Energy and Utilities Industry

Yanjia Zhao, Mr., Tsinghua University, Department of Automation, Tsinghua University, Beijing, 100084, China, zhaoyj@mails.tsinghua.edu.cn, Minmin Qiu, Hongwei Ding, Jin Dong

The Energy and Utilities (E&U) industry has become more and more important nowadays due to the increasing demand for electricity and growing environmental concerns. With the development of smart grids, the energy system has become a large and complicated network, whose performance and security highly depend on the on-time delivery of maintaining equipments. In this work, we formulate an E&U supply chain as an MIP and propose a simulation-based optimal design to guarantee the on-time responses.

3 - A Multi-criteria Model for a Liquefied Petroleum Gas Distributor Customer Relationship Management

Adiel Almeida-Filho, Assistant Professor, Federal University of Pernambuco, Cx Postal 7471, Recife, PE, 50.630-971, Brazil, atalmeidafilho@yahoo.com.br, Ana Paula Costa, Marcos Felipe Sobral

Liquefied Petroleum Gas (LPG) is a fossil fuel used in the production chain of different market segments and it is an important component in the national energy matrix. The process of classifying consumers by LPG distributors is a strategic task and subjected to a set of criteria that need to be observed. This work presents a multi-criteria model to deal with the task of classifying clients in a LPG distribution company allocating the portfolio of clients to a set of ranked classes.

■ TD22

C - Room 18C, Level 4

Joint Session Service/ Supply Chain: Manufacturing vs. Service Operations

Sponsor: Service Science/ Supply Chain
Sponsored Session

Chair: Sechan Oh, IBM Research, 650 Harry Road, San Jose, United States of America, seoh@us.ibm.com

Co-Chair: Yanchong Karen Zheng, PhD Candidate, Stanford University, Huang Engineering Center 338C, 475 Via Ortega, Stanford, CA, 94305, United States of America, yczheng@stanford.edu

1 - A Process Analysis of Global Trade Management: An Inductive Approach

Yanchong Karen Zheng, PhD Candidate, Stanford University, Huang Engineering Center 338C, 475 Via Ortega, Stanford, CA, 94305, United States of America, yczheng@stanford.edu, Alex Thompson, Warren Hausman, Hau Lee, Graham Napier

We develop a detailed process model of the China-US trade process to study the benefit of implementing advanced information technologies in a global trade setting. We collect data on estimated task time reductions for each process step. Estimated profits increase by 28% and 10% for exporters and importers, respectively, under conservative assumptions.

Wednesday, 8:00am - 9:30am

■ WA21

C - Room 18B, Level 4

Carbon Reduction Policy Analysis

Sponsor: Service Science
Sponsored Session

Chair: Brian Jacobs, Assistant Professor, Michigan State University, Supply Chain Mgt Dept, N349 North Business Complex, East Lansing, MI, 48824-1122, United States of America, jacobsb@bus.msu.edu

1 - Investment Planning for Electricity Generation Expansion Under CO2 Emission Reduction Policies

Dong Gu Choi, Georgia Institute of Technology, 765 Ferst Drive, NW, Atlanta, GA, 30332, United States of America, doonggus@gatech.edu, Valerie Thomas

As electricity demand increases and existing power plants age, electricity generators decide on supply technologies for new investment. This talk addresses the effects of CO2 emission reduction policies on the investment decision of an electricity generating firm. A dynamic programming model, incorporating policy uncertainty, is developed for technology investment choice.

2 - China's Regional CO2 Emissions: Characteristics and Emission Reduction Policies

Lei Meng, Xi'an Jiaotong University, Box 1875, No.28 Xianning West Road, Xi'an, 710049, China, mleeng@gmail.com, Yong Xue, Ju'e Guo

This paper analyzes the characteristics of regional CO2 emissions in China, using province level panel data from 1997 to 2007. The results show that there're remarkable regional disparities among eastern coastal, midland and western areas. In view of uneven regional development and reverse distribution of energy resources and consumption, the CO2 emission reduction policies need customized combination of tax, price, investment and transfer payment to meet the actual situation in various areas.

3 - Shareholder Value Effects of Voluntary Emissions Reductions

Brian Jacobs, Assistant Professor, Michigan State University, Supply Chain Mgt Dept, N349 North Business Complex, East Lansing, MI, 48824-1122, United States of America, jacobsb@bus.msu.edu

Recent empirical evidence has demonstrated that the stock market reacts negatively to firm announcements of voluntary emissions reductions. In this work, we study how certain contextual factors influence the market reaction. Factors include the type of emission (regulated or unregulated), firm and industry characteristics, energy prices, and whether the firm's announcement was standalone or part of a government or NGO initiative.

4 - Optimal Fuel Conversion Strategy of Power Plant Under Different Carbon Policies

Xiaohua Wu, Rensselaer Polytechnic Institute, 903 Peoples Ave Apt 3, Troy, NY, 12180, United States of America, wux4@rpi.edu, Aparna Gupta

The carbon policy will accelerate the fuel type conversion process. In this paper, a general model of optimizing the long term fuel conversion strategy of a generator under different carbon policies is built and analyzed. The stochastic price evolutions of fuels, electricity and carbon emission are modeled to identify the impact of market fluctuations. Key decision factors are optimized to achieve the generator's best economic performance and create a framework to assess policy impact.

■ WA23

C - Room 18D, Level 4

Optimization in the Service Sector

Sponsor: Service Science
Sponsored Session

Chair: Ada Barlatt, Assistant Professor, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, abarlatt@uwaterloo.ca

1 - Public School's Meal Program: Finding the Best Cost-effective Menu

Betzabe Rodriguez, Assistant Professor, University of Puerto Rico at Mayaguez, Call Box 9000, Mayaguez, PR, 00681, Puerto Rico, betzabe.rodriguez@upr.edu, Magaly Gonzalez

Meal's assortment highly affects the operational costs in the supply chain for the Puerto Rico School's Meal Program (PRSM). The government must comply with nutritional and service requirements while balancing delivery frequencies and transportation costs. We have developed a mathematical formulation for the operational costs of the food supply chain, with the objective to find a low cost meal's assortment for the PRSM.

2 - Applying Value-at-Risk and Conditional Value-at-Risk to the Selective Newsvendor

Arleigh Waring, University of Michigan, 1205 Beal Ave, Ann Arbor, MI, 48109, United States of America, awaring@umich.edu

The selective newsvendor considers a single product firm that sells to several different markets in a single selling season. The firm decides which markets to serve and the total inventory to procure a priori. We evaluate the selective newsvendor using two common risk measures: Value-at-Risk and Conditional Value-at-Risk. We show the optimal order quantity and describe a selection criterion for the markets to serve and then compare the inherent tradeoffs between the two methods.

3 - Evaluating Tradeoffs in Implementing Alternative Workweek Schedules

Ada Barlatt, Assistant Professor, University of Waterloo, Department of Management Sciences, 200 University Avenue West, Waterloo, ON, N2L3G1, Canada, abarlatt@uwaterloo.ca, Juan Vera

Climate change, 24/7 retail outlets, and technological advances have led to changes in the way people work. Around the globe, employees are switching to from the traditional 9AM to 5PM schedule to alternative workweek (AWW) schedules. In this presentation we will discuss the models developed to evaluate the tradeoffs between the benefits (e.g., increased operating hours) and the concerns (e.g., facilitating employee communication) in implementing AWW schedules.

Wednesday, 11:00am - 12:30pm**■ WB21**

C - Room 18B, Level 4

Green Supply Chain ManagementSponsor: Service Science
Sponsored SessionChair: Vipul Jain, Assistant Professor, Indian Institute of Technology Delhi, Department of Mechanical Engineering, Indian Institute of Technology Delhi, New Delhi, 110016, India, vjain@mech.iitd.ac.in**1 - A Green Approach to Supplier Selection**Amit Kumar, Research Scholar, Indian Institute of Technology, Department of Mechanical Engineering, Delhi, New Delhi, India, akumar@icfi.com, Vipul Jain

As the climate change movement gathers momentum, there's a pressing need to assess suppliers based on their environmental performance along with other criteria. This paper proposes a comprehensive approach based on Data Envelopment Analysis with Carbon Footprint monitoring. The approach applies to heterogeneous suppliers and incorporates region specific emission compliance standards as well. Overall, it encourages suppliers to go green and cut down their emissions to survive the competition.

2 - Carbon Footprint, Information Disclosure, and Shareholder PressureChien-Ming Chen, UCLA Institute of the Environment, La Kretz Hall, Suite 300, Box 951496, Los Angeles, CA, 90095, United States of America, cmchen@ioe.ucla.edu, Charles Corbett, Magali Delmas

This study examines the causal relationship between corporate carbon efficiency, voluntary information disclosure, and shareholder's pressure for greener business practices. Our analysis draws on the newly compiled direct and supply chain emission inventories of over 1000 public companies in North America. In the presentation we will present our preliminary findings.

3 - Evaluation and Management on Logistics Carbon EmissionXiao Qing Wang, IBM Research, Building 19 Zhongguancun Software Park, Beijing, China, xqwangxq@cn.ibm.com, Jin Dong, Hongwei Ding, Minmin Qiu, Wei Wang

Logistics carbon emission management is addressed and carbon emissions from several key operational stages in logistics industry are studied and evaluated. A general logistics carbon emission evaluation framework considering different transportation modes, different warehouses and different carry modes is proposed. Carbon emission evaluation methods on transportation, storage and carry operational stages are presented.

4 - Measuring Carbon Emissions From Intermodal Freight OperationsAnthony Craig, PhD Candidate, MIT, 77 Massachusetts Ave, E40-222, Cambridge, MA, 02139, United States of America, tcraig@mit.edu, Edgar Blanco, Yossi Sheffi

Estimating the carbon emissions from intermodal shipments is difficult for shippers due to limited information and the complexity of intermodal operations. The structure of the rail network, terminal locations, and relative efficiency of rail and drayage operations all impact the actual emissions. Using data from an intermodal freight operator we compare the calculated carbon emissions for a set of shipments with the results obtained from popular carbon estimation methods.

■ WB22

C - Room 18C, Level 4

Workforce ManagementSponsor: Service Science
Sponsored SessionChair: Foad Iravani, University of California-Los Angeles, Anderson School of Management, 110 Westwood Plaza, Los Angeles, CA, 90095, United States of America, iravani@anderson.ucla.edu**1 - Skill Mix and Cross-Training in Professional Service Firms**Vincent Hargaden, PhD Student, Rensselaer Polytechnic Institute, Industrial & Systems Engineering Dept, 110 8th Street, Troy, NY, 12180, United States of America, hargav@rpi.edu, Jennifer Ryan

A comprehensive mixed integer programming model has been developed for the workforce planning process in professional service firms. We will present results from the model which show the impact of skill mix, skill capability levels and cross-training on key performance metrics such as project completion rates, staff utilization and profit.

2 - A Hiring Plan Model for Call Center ManagementTao Huang, Progressive Insurance, 6300 Wilson Mills Rd, Mayfield Village, OH, 44143, United States of America, Tao_Huang@progressive.com, Janet Dolohanty, Steve Callitsis

We have developed a hiring plan model for call center management. The model identifies locations and schedules for the hiring need defined by the capacity planning and staff-on-hand while taking into account site specific monetary variables and nonmonetary constraints. The model outputs the optimal combination of schedules that minimizes hiring cost and specifies the agents required to improve the peak-hour service level performance.

3 - The Soft Resource Allocation ProblemFoad Iravani, University of California-Los Angeles, Anderson School of Management, 110 Westwood Plaza, Los Angeles, CA, 90095, United States of America, iravani@anderson.ucla.edu, Sriram Dasu, Reza Ahmadi

We propose optimization models for workforce allocation in a leading software company that produces tax software. Every year, the firm struggles with a high workload imposed by changes in tax forms announced by the IRS. In this competitive market, any delay in the release of the product leads to significant losses. We develop models for organizing and staffing the development activities to meet the deadline at the lowest cost.

■ WB23

C - Room 18D, Level 4

Municipal Waste Management, Analytics and OptimizationSponsor: Service Science
Sponsored SessionChair: Heng Cao, CTO for Business Analytics & Optimization, IBM China Research Center, A2/F, Diamond, Zhong Guang Cun Software, Haidian District, Beijing, 100193, China, hengcao@us.ibm.com**1 - Decision Support System for Municipal Solid Waste Collection using Forecasting and Optimization**Tianzhi Zhao, IBM Research - China, Diamond Building A, ZGC Software Park, 8 Dongbeiwang West Road, Beijing, 100193, China, zhaotzhi@cn.ibm.com, Jun Zhang, Jin Dong, Heng Cao, Wenjun Yin

Municipal solid waste management (MSWM) is becoming a major issue facing cities around the world due to rapid urbanization and growth of population. In this paper, an analytics based decision support system is proposed for MSWM. The system model is composed of two components, one for waste generation prediction, another one for collection vehicle routing optimization. A GIS application is integrated into the system to provide route information to as well as map out the outputs from the model.

2 - Disturbance Analysis Model for the Maintenance Plan of Power GridFeng Jin, Dr., IBM Research - China, Building 10, 399 Keyuan Road, Pudong, Shanghai, 201203, China, jinfsh@cn.ibm.com, Hairong Lv, Jun Luo, Wenjun Yin, Jin Dong, Qiming Tian

To keep the maintenance plan of power grid stable, especially to avoid chain-reaction, a probability model is proposed to analyze the effected plans once a plan is disturbed by various factors. In this model, we consider not only the traditional variation of start time, but also the variation of process time and workload under the complex grid topology. A case in a typical Chinese power company is studied to validate the model. The result shows the plan change rate is greatly reduced.

3 - An Effort Estimation Model in Project Delivery using Hidden Setup CostSaeed Bagheri, IBM T J Watson Research Center, 1101 Kitchawan Road, Yorktown Heights, NY, 10598, United States of America, sbagher@us.ibm.com, Nianjun Zhou, Krishna Ratakonda

We discuss the relationship between delivered projects and required effort. In particular, we analyze the logarithmic model and its shortcomings in required effort estimation for large projects. We introduce the hidden setup cost and its related linear model and explain how its existence leads to the above behavior in logarithmic models. Our proposed model facilitates effort estimation for project delivery in services and manufacturing. We illustrate this, using projects in software development.

Wednesday, 1:30pm - 3:00pm

■ WC21

C - Room 18B, Level 4

Service Contract and Incentive Design

Sponsor: Service Science

Sponsored Session

Chair: Hermann Jahnke, Professor, Bielefeld University, Universitaetsstrasse 25, Bielefeld, 33615, Germany, hjahnke@wiwi.uni-bielefeld.de

1 - After-sales Contract Analysis for Service Supply Chains

Dong Li, Rotterdam School of Management, Erasmus University, P.O. Box 1738, Rotterdam, Netherlands, dli@rsm.nl, Yugang Yu, Nishant Mishra, Xinguo Ming

The multiple types of contract of the service supply chain may cause conflicting incentives. We use a game-theoretic frame to model the behavior of a service supply chain, and compare the different type of contracts and show that how the parameters affect the optimal solutions. We also find out that the inefficiency can be coordinated with a revenue-sharing performance based contract.

2 - Incentive Design in Industrial Product Service Systems:

A Simulation Study

Partha Datta, Assistant Professor, IIM Calcutta, Diamond Harbour Road, Joka, Calcutta, 700104, India, parthapriya.datta@gmail.com

Powerful incentives and risks are normally used in industrial service contracts to transfer risks to measure compliance with performance measures. This paper studies the uncertainty in service delivery driven by the agreed contract type and incentive mechanism using agent based discrete event simulation model under multiple scenarios.

3 - Lower Price Limits for Flat-fee Service Contracts Under Risk

Hermann Jahnke, Professor, Bielefeld University, Universitaetsstrasse 25, Bielefeld, 33615, Germany, hjahnke@wiwi.uni-bielefeld.de, Jan Thomas Martini

Many manufacturers of capital equipment offer services under flat-fee service contracts. We address the determination of lower price limits for such contracts. Under these contracts, the service providers assume part of the customer's risk. We focus on the impact this risk has on price limits. Our modeling tool, almost stochastic dominance, allows us to examine decision making under risk without precisely knowing the decision makers' risk preferences as well as a multi-person decision context.

4 - Towards a Theory of Service Improvisation

Enrico Secchi, Clemson University, 128 Cochran Rd. Apt. 1, Clemson, SC, 29631, United States of America, esecchi@clemson.edu, Aleda Roth

This paper examines the role of improvisation in the context of service delivery systems. Drawing from organizational improvisation literature and service operations and marketing, we develop antecedents and consequences of service improvisation. First, we define the concept of service improvisation. Second, we highlight the importance of the interplay between planning and execution. Finally, we develop a theoretical link between service delivery and the emergence of service innovations.

■ WC22

C - Room 18C, Level 4

Service System Design and Effectiveness

Sponsor: Service Science

Sponsored Session

Chair: Adelina Gnanlet, Assistant Professor, California State University, Fullerton, 800 N. State College Blvd, Dept of Mgmt, Fullerton, CA, 92832, United States of America, agnanlet@fullerton.edu

1 - Impact of Labor and Capacity Flexibilities on Quality and a Financial Performance of Hospitals

Adelina Gnanlet, Assistant Professor, California State University, Fullerton, 800 N. State College Blvd, Dept of Mgmt, Fullerton, CA, 92832, United States of America, agnanlet@fullerton.edu, Muge Yayla-Kullu, Chris McDermott

To reduce costs and meet variable demand, service firms frequently cross-train employees and use flexible capacity in capital intensive service firms. Higher cross-training is cost-effective but may not provide adequate quality of service due to learning effects. Flexible capacity may not be conducive to provide highest level of quality for certain demand segments. We determine the effects of cross-training and flexible capacity on quality and financial performance of hospitals.

2 - Impact of Task Complexity on Productivity in Professional Services

Anil Akpınar, IE Business School, C/ Maria de Molina 12, Madrid, 28006, Spain, aakpinar.PhD2010@alumno.ie.edu, Fabrizio Salvador

In this paper we explore the effect of task complexity on the flexibility efficiency trade-off in knowledge worker productivity. Using a longitudinal data from one of the largest multinational technology and consulting firm, we provide empirical evidence that while specialization and variety jointly drives productivity, their effects are quite distinct for varying levels of task complexity.

3 - More with Less - Service Resource Scheduling by Time Capacitated Splits

Pasi Porkka, Assistant Professor, Aalto University School of Economics, P.O. Box 21220, Helsinki, Fin-00076, Finland, porkka@hse.fi

The balancing of resource time used for production or services and for capacity consuming set-ups is critical for the realistic planning of high capacity utilization. We combine the allocation of shared resources, the time-based splitting of tasks and variable set-ups in mobile service operations. The potential for substantial capacity time savings is demonstrated. Extensions and solution approaches for realistic applications are discussed.

4 - The Impact of Service Quality Variation on Service Quality, Operational Efficiency, and Performances

Hong-il Kim, PhD Candidate, Korea University Business School, Anam-dong, Seongbuk-gu, Seoul, 136-701, Korea, Republic of, itlime@korea.ac.kr, Hosun Rhim, Shijin Yoo, Daeki Kim

We investigate how service quality variation affects service quality, operational efficiency, and business performances. Data of branch operation in a retail bank is collected. Perceived service quality of customers is surveyed with SERVERPF questionnaire. HLM (Hierarchical Linear Modeling) and DEA (Data Envelopment Analysis) are used.

■ WC23

C - Room 18D, Level 4

Service Management and Virtual Enterprise

Sponsor: Service Science

Sponsored Session

Chair: Munish Goyal, Research Staff Member, IBM Research, AC2 L1, ISB, GACHIBOWLI, Hyderabad, AP, 500032, India, mungoyal@in.ibm.com

1 - Value Based Dynamic Resource Allocation in a Service Cloud

Munish Goyal, Research Staff Member, IBM Research, AC2 L1, ISB, GACHIBOWLI, Hyderabad, AP, 500032, India, mungoyal@in.ibm.com, M Rammohan Rao

Cloud computing is a pool of virtualized computer resources which can be dynamically added or removed in response to changing business demands while meeting service level agreements at the minimal energy or operational cost. In this work, we develop relative value based dynamic resources allocation strategies where a unit of resource is allocated to a customer request with the highest value above the energy value threshold at any time. Algorithm is supported with numerical results.

2 - Negotiation Based Completion Risk Management for Virtual Enterprise

Min Huang, Professor, Northeastern University, Box 135#, Northeastern University, Shenyang, 110004, China, mhuang@mail.neu.edu.cn, Hongyu Jiang, W.H. Ip, Qing Wang, Xingwei Wang

In the view of the distribution feature of decision-making in a virtual enterprise, a novel decision-making framework based-on negotiation is proposed for the completion risk management of VE. Under this framework, according to the characteristics of the problem, the evaluation mechanism of the owner is designed based on PERT, and then the concession tactic is proposed. The example analysis shows that this framework can achieve effective risk management.

3 - Service Parts Inventory Control Under Obsolescence

Cerag Pince, PhD Candidate, Erasmus University, Burg. Oudlaan 50, Rotterdam, 3000 DR, Netherlands, pince@few.eur.nl, Rommert Dekker, Hans Frenk

We consider a single location inventory system of a slow moving item where Poisson demand rate drops to a lower level at a known future time. Under the assumptions of full backordering and fixed lead time, we incorporate obsolescence into a one-for-one policy with the option to reduce the base stock level in advance. We show that when obsolescence can be foreseen, early adaptation of base stock levels leads to important savings.

Wednesday, 3:30pm - 5:00pm**■ WD22**

C - Room 18C, Level 4

Service System Development

Sponsor: Service Science

Sponsored Session

Chair: Ari P.J. Vepsalainen, Professor, Aalto University School of Economics, Department of Business Technology, P.O. Box 21220, Helsinki, 00076, Finland, ari.vepsalainen@hse.fi

1 - Functional Selection of Business Processes - Who Works for the Market?

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The analysis of the functional needs of different communities and market processes highlights the full market potential of service development. With extreme functional specialization, companies and workers will be providing narrower service to increasing number and variety of market activities and communities. Our case studies illustrate the working conditions of functional selection and the potential co-evolution of private, public and commercial institutions.

2 - Dynamic Policies in Knowledge-Based Service System with Feedback Information

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We propose a modeling framework of a knowledge based service system with an information feedback mechanism. The feedback system provides information regards correctness of the agent's decisions. With help from the feedback system, the agent adjusts processing strategies to deal with information crises that can change the state of arrival customers. Besides the optimal strategy, we examined several heuristics and found one effective policy with a simple threshold design.

3 - A Simulation Based Framework for Service Facility Internal Layout Design

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Service facilities, including bank branches, supermarkets, etc. are closely related to our lives. Whereas, it is a difficult task to make decisions on how to design internal layout and configuration for them. In this paper, we propose a service facility internal layout optimization framework as well as how to model the system into a multi-agent system. Then, a bank branch scenario from real world is adopted to demonstrate the methodology and implementation.