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Message from the founder of the AHP and ANP disciplines

Welcome to ISAHP2014 and welcome to Washington, DC! I imagine your days here will be busy ones. No doubt most of you come with notes on presentations you plan to make and notations about many panels and workshops you want to attend. Some will have plans for edited books and articles you want to discuss, ideas for collaborative research projects to be developed, dates for follow up conferences on particular themes, and numerous other professional concerns to pursue. As with other ISAHP meetings, almost everyone will come with lists of friends and colleagues to see and plans for sharing coffee or a meal. Many no doubt also come with keen interest in exploring the restaurants, museums (all public museums are free), music, cityscapes, shops, and other attractions that Washington, DC, has to offer. ISAHP2014 will follow in the tradition of the other ISAHP conferences; it will be a collage of interactions, catching up, discovery, debate, and enjoyment.



Thomas Saaty

Credit for the wealth of panels, workshops, and discussion groups; the scholarly books to be made available; and the lure of new ideas and insights must be shared widely, as ISAHP2014 is the work of many hands. Central among these, of course, are the ISAHP2014 Conference Chairman Enrique Mu, and the Program Co-Chairs, Birsen Karpak and Antonella Petrillo, and the many track chairs who have worked so hard to put a wonderful program together. Maestro Meetings and its personnel, led by Milagros Pereyra-Rojas, along Maria Soledad Cabezas, handled the organizational details of the meeting beautifully. Their skills and years of experience ensured that the planning and operation of the Symposium were as flawless as possible. The numerous scholars who have put time and

effort into planning panels and encouraging colleagues to present papers are the bedrock of a successful meeting and I especially express my appreciation to them. Throughout the past year the Grand Hyatt Hotel staff have been helpful and cordial in responding to ISAHP's many logistical needs. ISAHP2014 could not happen without the dedication and hard work of all these individuals.

It is my hope that among the many panels and other activities you have planned for yourself for ISAHP2014, you will make sure to attend the interesting plenary session at the start of each morning and also find time to drop by the Master's Students presentations on Monday. This Symposium promises to be rich with ideas and debates, and I hope it will leave all of you with new insights and refreshed enthusiasm and understanding of the Analytic Hierarchy Process and the Analytic Network Process for decision making and the many ways they have been applied in fields ranging from conflict resolution to supply-chain management. I look forward to seeing many of you in the meeting venues, the conference rooms, and the reception areas, and sharing with you your thoughts about ISAHP2014.

Thomas Saaty
Founder of the AHP and ANP disciplines

Message from the CEO Creative Decisions Foundation

We are pleased to welcome you to Washington, DC, for this very special ISAHP meeting. My husband, Thomas Saaty, the creator of the AHP/ANP, a theory of measurement that is often used in decision making, will turn 88 this summer. So this meeting, the 13th such International Symposium on the AHP, will be a very special celebration. Our thanks to all of you, our longtime colleagues and friends from around the world, who have helped spread his remarkable ideas so widely. It is our pleasure that the foundation we established, Creative Decisions Foundation, has been the primary supporter of this important meeting.



Rozann Saaty

Rozann Saaty
CEO Creative Decisions Foundation

Message from the Program Organizing Committee

Welcome to our ISAHP 2014 meeting! The theme for this symposium is “Beyond Decision Making” which refers to our idea that it is the time for AHP/ANP to get out of the toolbox of multi-criteria decision-making experts and to become the tool of everyday decision-makers. After all, this was the original intention of AHP/ANP creator, Dr. Thomas L. Saaty. A methodology that would help the world to be more rational when making decisions.

For this reason, ISAHP 2014 aspires to be the turning point for AHP/ANP to be accepted as the natural way of making rational decisions in all disciplines. Granted, we do not expect hierarchical thinking to be the only tool used by world decision-makers but rather the main organizing tool due to its intuitive simplicity and natural integration with other decision-making methods.

We have worked very hard to make this symposium a reality and we have counted with the enthusiastic collaboration of the whole AHP/ANP community. Not only the members of the organizing community (program and track chairs whose work has been the hardest) but also from AHP/ANP scholars and practitioners worldwide. Consistent with the theme of the



Enrique Mu



Antonella Petrillo



Birsen Karpak

symposium, we are pleased to report that approximately one third of our presenters are students. Furthermore, we have made a special effort to also involve master-level students, the next generation of AHP/ANP advocates, in this symposium.

Our efforts have been productive and we are confident that you will find new opportunities to participate, meet, and collaborate with other AHP/ANP colleagues among the approximately 200 expected ISAHP 2014 attendees. Enjoy the Symposium!

Birsen Karpak
Program Co-Chair

Antonella Petrillo
Program Co-Chair

Enrique Mu
Conference Chairman

Program Committee

Thomas L. Saaty
University of Pittsburgh
Honorary Founding Chairman

Rozann Saaty
Creative Decisions Foundation
Program Committee Senior Member

Enrique Mu
Carlow University
University of Pittsburgh
Conference Chairman

Birsen Karpak
Youngstown State University
Program Co-Chair

Antonella Petrillo
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Program Co-Chair

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Universitat Politècnica de
València, Spain

Josef Jablonsky,
University of Economics,
Czech Republic

Claudio Garuti,
Fulcrum Ingeniería Ltda. –
Ingeniería en Toma de
Decisiones, Chile

Fabio De Felice,
University of Cassino,
Italy

Navneet Bhushan,
Craffitti Consulting Private
Limited, India

Elena Rokou,
National Technical
University of Athens, Greece

Jennifer Shang,
University of Pittsburgh,
United States

Luis Vargas,
University of Pittsburgh,
United States

Özden Bayanzit,
Central Washington
University, United States

Füsun Ülengin,
Sabanci University Turkey

Mujgan Sagir Özdemir,
Eskişehir Osmangazi
University, Turkey

Ilker Topçu,
Istanbul Technical
University, Turkey

Orrin Cooper,
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United States

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Cracow University of
Economics, Poland

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Didit Herawan,
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International Islamic
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Malaysia

International Scientific Advisory Committee (cont.)

Josef Jablonsky,
University of Economics,
Czech Republic

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Mónica García Melón,
University of Valencia,
Spain

Emilio Esposito,
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“Federico II”, Italy

Karel Mls,
University of Hradec
Kralove, Czech Republic

Enrique Mu,
Carlow University,
University of Pittsburgh,
United States

Anna Ostrega,
Akademia Gorniczo-Hutni,
Poland

Elio Padoano,
University of Trieste, Italy

Leandro Pecchia,
University of Warwick,
United Kingdom

Antonella Petrillo,
University of Naples
"Parthenope" Italy

Rocío Poveda-Bautista,
Spain

Elena Rokou,
National Technical
University of Athens, Greece

International Scientific Advisory Committee (cont.)

Mujgan Sagir Özdemir
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Osmangazi University,
Turkey

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Università degli Studi di
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Ilker Topçu,
Istanbul Technical
University, Turkey

Fusun Ulengin,
Sabanci University Turkey

Sibs von Solms,
South Africa

Keyu Zhu (Andy),
China

Publication Opportunities

The following journals are offering the opportunity to fast track suitable papers accepted to the ISAHP2014 Symposium for academic publishing.

The International Journal of Production Economics

Annals of Management Science

International Journal of the Analytic Hierarchy Process

International Journal of Management and Decision Making

Papers will be screened, selected and recommended for publication to specific journals based on ISAHP2014 reviewer committee evaluation. Authors will be notified of the decision prior to submitting papers to journals.

Sponsors

Creative Decisions Foundation

The Creative Decisions Foundation was established by Thomas and Rozann Saaty to promote more rational decision-making by people. The Foundation sponsors education, research and software development in advanced methods of decision-making involving the AHP. Of particular interest are conflict resolution, group decision-making on societal issues by incorporating strength of preference rather than the yes-no traditional way of voting, purchasing and resource allocation decisions for private and governmental organizations, and decision-making over the internet.

creativedecisions.net

International Journal of Analytic Hierarchy Process

The International Journal of the Analytic Hierarchy Process (IJAHp) is an electronic journal published by the Creative Decisions Foundation about multi-criteria decision making using the Analytic Hierarchy Process (AHP) and Analytic Network Process (ANP). The IJAHp is published three times a year in an open-access format.

ijahp.org

LASA - University of Pittsburgh

LASA - University of Pittsburgh is the largest professional Association in the world for individuals and institutions engaged in the study of Latin America. With over 7,000 members, forty-five percent of whom reside outside the United States, LASA is the one Association that brings together experts on Latin America from all disciplines and diverse occupational endeavors, across the globe.

lasa.international.pitt.edu

Sponsors (cont.)

Decision Lens

Decision Lens is a prioritization software solution for decision making in today's complex business environment. It provides easy-to-use software solutions to take the guesswork out of mission-critical enterprise planning, financial, IT and performance-related decisions.

decisionlens.com

Carlow University

Carlow University—formerly Mount Mercy College—was founded by the Sisters of Mercy to fulfill the city's need in providing a baccalaureate education to Catholic women. Today, Carlow engages its diverse academic community in a process of life-long learning, scholarship, and research. The University is dedicated to providing students with a learner-centered education, focusing on the individual.

carlow.edu

Youngstown State University

Youngstown State University, an urban research university, emphasizes a creative, integrated approach to education, scholarship, and service. The University places students at its center; leads in the discovery, dissemination, and application of knowledge; advances civic, scientific, and technological development; and fosters collaboration to enrich the region and the world.

ysu.edu

MaestroMeetings

MaestroMeetings is a non-profit organization that creates value by developing win-win agreements between non-profit academic organizations and the for-profit hotel and convention industries.

maestromeetings.org

Local Logistics

Registration

As in the past, all ISAHP participants and attendees must register; no exceptions can be made. Registration and check-in areas will be located in the Grand Hyatt Washington, Registration will take place at the Independence Level. ISAHP does not refund conference registration payment if a registrant is unable to attend the Symposium.

Check-in and Registration Hours

Sunday 29	12:00 pm – 8:30 pm
Monday 30	7:30 am – 5:00 pm
Tuesday 1	7:30 am – 3:00 pm
Wednesday 2	7:30 am – 3:00 pm

Registered Participants Check-in

For ISAHP2014, registered participants will receive their name badge, program book, conference certificate and other information at the time of check-in.

Participants are urged to give themselves ample time to check-in before their scheduled sessions. Individuals planning on attending the afternoon Sunday workshops should consider checking-in early on Sunday afternoon.

On-site Registration

Individuals registering on site should proceed to the On-Site Registration area to pay the required fees and receive their materials. MasterCard and Visa credit cards, checks written on U.S.-based banks and U.S. currency will be accepted.

Local Logistics (cont.)

Symposium

The Grand Hyatt Washington (1000 H Street NW Washington, DC, USA, 20001) is the site for ISAHP2014. All meetings and events will take place at the Independence and Constitution levels, except for the Gala Dinner.

Transportation to/from the Airport

Ronald Reagan Washington National Airport (DCA) is located about 5 miles south from the hotel. Bus, metro and taxi services are available to and from the hotel.

Additional airports: Washington Dulles International Airport (IAD) – 24 miles from the hotel, and the Baltimore/Washington International Thurgood Marshall Airport (BWI) – 33 miles from the hotel.

Gala Dinner

The Gala Dinner will take place on Tuesday July 1st. Transportation will be provided to and from the hotel to the dinner site (Odyssey boat). Dinner tickets will be provided upon check-in to all registered participants who either paid full registration or purchased individual dinners. ***Make sure you have your ticket prior to boarding the bus or you will not be able to participate in this event.***

Bus Schedule – Grand Hyatt Hotel
1000 H St NW, Washington, DC 20001

4:45 pm / 5:00 pm / 5:15 pm

Bus Schedule – Odyssey Port
600 Water St. SW Washington DC

10:10 pm / 10:20 pm / 10:30 pm

Program Highlights

Sunday | June 29

- 1:00p - 3:00p **ANP Sensitivity and Influence Analysis** (Bill Adams) - Super Decisions has different kind of sensitivity calculation called "ANP Row Sensitivity" developed by Bill Adams for Decision Lens Inc. This workshop will cover both the usage and interpretation of these calculations. *Registration fee: \$30.*
- 3:30p – 5:00p **Facilitating Group Decision Making** (Daniel Saaty) – This workshop will cover both theoretical questions facilitators may have and the psychological aspects of dealing with groups. *Registration fee: \$20.*
- 5:00p – 5:45p **Compatibility of AHP/ANP Vectors with Known Results** (Claudio Garuti) – presentation of a suggested new index of compatibility in weighted environments. How well do your derived priorities match some known results. *Registration fee: No Charge.*
- 6:00p – 8:00p **Welcoming Reception** - This is your opportunity to catch up with and meet colleagues in an informal atmosphere prior to the official beginning of the Symposium. *No charge.*

Program Highlights (cont.)

Monday | June 30

- 8:30a – 9:15a **Plenary Session I – ISAHP Program Officers** will officially open the Symposium. Tom Saaty will speak about some mathematics of the AHP, ANP and NNP.
- 11:00a – 12:30p **AHP in the Classroom and the Community: Carlow University – Uganda Initiatives** – Through this project, Master-level graduate students intend to show how utilization of the AHP methodology in the experiential learning process of MBA students taking a decision-making class may also provide the benefit of allowing to address a specific decision faced by Carlow University, related to faculty proposed initiatives in Uganda.
- 2:30p – 4:00p **YSU/Williamson College of Business Master Students, AHP in Decision Making** - In this session Youngstown State University, Williamson College of Business master students will present Application of AHP into three managerial decision making situations involving multiple quantitative and qualitative criteria.
- 4:30p – 6:00p **Graduate Presentations I** – Master-level graduate students will present their AHP/ANP applications in different contexts.
- 6:00p – 8:00p **Program Organizing Committee Reception** (By invitation only) – Informal gathering of the program organizing committee members, including members of the International Scientific Advisory.

Program Highlights (cont.)

Tuesday | July 1

8:30a – 9:15a **Plenary Session II** – Daniel Saaty will talk about AHP and Analytics

9:30a – 10:30a **Conflict Resolution – The Middle East Conflict: An Example of a Retributive Conflict** by Luis Vargas. This study is strongly related to Jerry Zoffer’s plenary on Wed., July 2. Highly recommended.

6:00p – 10:00p **Gala Dinner** (Tickets Required) – Official gala dinner and recognition ceremony.

Wednesday | July 2

8:30a – 9:15a **Plenary Session III**– Jerry Zoffer will talk about Revolution in Conflict Resolution – How AHP was applied to make tradeoffs in the Israeli/Palestinian conflict.

9:30a – 10:30a **AHP Theory and Methodology 6 – Measuring in Weighted Environments** by Claudio Garuti and **Many Hands Make Work Light or Not? A Novel Tool for Group Decision Making with ANP** by Elena Rokou

12:30p – 1:15p **Lunch and Closing Plenary Session IV** – Enrique Mu, conference chairman, will share meeting highlights and will officially close the symposium.

Acknowledgements

ISAHP 2014 is very grateful to all the sponsors and foundations that have provided financial and logistic support to make this meeting successful. I would like to thankfully acknowledge the support from the Creative Decision Foundation (CDF), Decision Lens, Carlow University, and Youngstown State University. CDF was instrumental for the financial support of this event. Without this support ISAHP2014 would not have been possible. Decision Lens was also a major sponsor while Carlow University and Youngstown State University provided support to allow participation of their students in the graduate (non-doctoral) student track.

ISAHP2014 would have not taken place without the incredible involvement and effort of the program organizing committee constituted by Rozann Saaty, Birsen Karpak and Antonella Petrillo. They have been crucial in the planning of the outstanding program that will provide many memorable academic discussions. Also, they were very pleasant to work with and we enjoyed every moment of our working together. However, no high-level planning would have been effective without the hard work of our track chairs that reviewed the record number of submissions. My heartfelt thanks to them. I also want to thank Elena Rokou for working countless hours managing the AHP/ANP contact databases that allowed us to reach a large number of potential participants.

Last but not least, many thanks to the Latin American Studies Association (LASA), whose conference planning unit MaestroMeetings (MM) was responsible for the symposium logistics, ranging from hotel negotiations to online submission and registration support. Milagros Pereyra, LASA executive director, was key in guiding the program organizing committee into the myriad of details and activities required to make ISAHP 2014 successful. Thanks also to Maria Soledad Cabezas and Carlos Bustamante, MM staff. Maria Soledad assisted participants with registration and hotel reservations while

Carlos, newly MM staff acquisition, lent his common sense, marketing experience and unexpected artistic talent to solve many different ISAHP2014 problems and needs.

Also, thanks to Tom Saaty, whose creation of AHP/ANP has helped improve decision-making. Without his creation, ISAHP 2014 would not even exist. Finally, thanks to all the AHP/ANP scholars, practitioners and students for your commitment to Tom's vision for making the world a more suitable place for sensible decisions.

On behalf of the AHP/ANP community, thank you all for your time and effort and my deepest gratitude to all of you for the opportunity to contribute to ISAHP 2014.

Sincerely,

Enrique Mu
ISAHP 2014
Conference Chairman

PROGRAM SCHEDULE

001. ANP Sensitivity and Influence Analysis

ISAHP

Workshop

1:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Presenter:

William Adams, Decision Lens Incorporated, U.S.

Session Organizer:

Enrique Mu, Carlow University, U.S.

002. Sunday afternoon break

ISAHP

Break

3:00 to 3:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

003. Facilitating Group Decision Making

ISAHP

Workshop

3:30 to 5:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Presenter:

Daniel Saaty, Decision Lens

Session Organizer:

Enrique Mu, Carlow University, U.S.

**004. Compatibility of AHP/ANP Vectors with
Known Results**

ISAHP

Workshop

5:00 to 5:45 pm

Grand Hyatt: Floor Independence Level - Independence DE

Presenter:

Claudio Garuti, Fulcrum Ingenieria, Chile

Session Organizer:

Enrique Mu, Carlow University, U.S.

005. Welcoming reception

ISAHP

Reception

6:00 to 8:00 pm

Grand Hyatt: Floor Constitution Level - Constitution A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

006. Plenary Session: Some Mathematics of the AHP, ANP and NNP

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

Thomas L. Saaty, University of Pittsburgh, U.S.

Session Organizer:

Enrique Mu, Carlow University, U.S.

007. AHP Methodology and Application

04 AHP Theory & Methodology

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

A GREY NUMBER APPROACH TO ESTABLISH JUDGMENT MATRIX IN AHP *Xiaojia Wang, School of Management, Hefei University of Technology, China; Jennifer Shang, University of Pittsburgh, U.S.*

EVALUATION OF REGIONAL INNOVATION IN CHINA USING AHP AND MAXIMIZING DEVIATION METHOD *Zhanglin Peng, School of Management, Hefei University of Technology, China; Shanlin Yang, School of Management, Hefei University of Technology, China; Xiaojia Wang, School of Management, Hefei University of Technology, China*

A GROUP AHP CONSENSUS REACHING MODEL FOR SUPPLIER SELECTION IN COLLABORATIVE PRODUCT DEVELOPMENT *Qingxing Dong, Central China Normal University, China; Keyu Zhu, Hefei University of Technology, China*

RESOLVING RANK REVERSAL IN CONSISTENT AND INDEPENDENT AHP MODEL *Keyu Zhu, Hefei*

University of Technology, China; Orrin Cooper, University of Memphis, U.S.; Shanlin Yang, School of Management, Hefei University of Technology, China

Session Organizer:

Keyu Zhu, Hefei University of Technology, China

Session Chair:

Keyu Zhu, Hefei University of Technology, China

008. Manufacturing

11 Manufacturing

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

HOW TO CHOOSE THE BEST BLEND USING AHP:
THE SIGNIFICANCE OF SENSORY EVALUATION
George A. Elmasides, SEKAP S.A., Greece

IMPROVING PERFORMANCE OF SME'S USING
SUPPLY CHAIN FRAMEWORK AND MULTI-
CRITERIA DECISION METHODOLOGY *Madani
Abdu Alomar, University of Windsor, Canada;
Zbigniew J. Pasek, University of Windsor, Canada*

INNOVATION CAPACITY AND POTENTIAL IN
INDONESIAN MANUFACTURING SECTOR *Novi
Maryaningsih, Bank Indonesia; Oki Hermansyah
Febrianto, Bank Indonesia*

MAX-PROD EIGENVECTORS AND CONSISTENCY
OF THE PREFERENCE MATRIX *Hana Tomášková,
University of Hradec Králové, FIM, Czech Republic;
Martin Gavalec, University of Hradec Kralove, Czech
Republic*

Session Organizer:

Martin Gavalec, University of Hradec Kralove, Czech
Republic

Session Chair:

Martin Gavalec, University of Hradec Kralove, Czech
Republic

009. Risk Analysis Study

14 Risk Analysis

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

AN INTEGRATED APPROACH FOR MANAGEMENT OF GLOBAL RISKS *Pawan Desai, None, India; Karthikeyan Iyer, Verchaska Infotech Private Limited, India*

MCDM APPROACHES IN PROPERTY INVESTMENTS: AN AHP MODEL FOR RISK ASSESSMENT *Chiara D'Alpaos, DICEA - University of Padova, Italy; Rubina Canesi, DICEA, University of Padova, Italy*

SOCIAL MEDIA RISK MANAGEMENT STRATEGY - APPLYING THE ANALYTIC HIERARCHY PROCESS *Kanwal Rai, Capgemini, India*

Session Organizer:

Chiara D'Alpaos, DICEA - University of Padova, Italy

Session Chair:

Chiara D'Alpaos, DICEA - University of Padova, Italy

010. Medical and Health Applications

23 Medical and Health Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

APPLICATION OF ANALYTICAL HIERARCHY PROCESS (AHP) MODEL TO DETERMINE PATIENTS PERCEPTION TOWARDS SERVICE QUALITY OF PUBLIC HOSPITALS IN NIGERIA *Emmanuel Olateju Oyatoye, University of Lagos, Nigeria; Bilqis Bolanle Amole, Department of Business Administration, University of Lagos, Nigeria; Sulaimon Olanrewaju Adebisi, Business Administration Department, Federal University of Agriculture, Nigeria*

THE APPLICATION OF ANALYTIC NETWORK
PROCESS IN HOSPITAL MANAGEMENT *Xiu Ning,*
Tsinghua University, China

USING ANALYTIC HIERARCHY PROCESS (AHP)
FOR ASSESSMENT OF NATIONAL HEALTH
INSURANCE SCHEME SERVICE DELIVERY IN
NIGERIA *Sulaimon Olanrewaju Adebisi, Business*
Administration Department, Federal University of
Agriculture, Nigeria; Olanrewaju Paul Olonade,
Institute of Operations Research of Nigeria, Nigeria

Session Organizer:

Xiu Ning, Tsinghua University, China

Session Chair:

Xiu Ning, Tsinghua University, China

011. Strategic Planning, Design and Implementation

05 AHP/ANP Mixed Methods, Optimization and
Applications

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

A MULTI-CRITERIA JOB EVALUATION METHOD
FOR A STATE BANK *Ezgi Aktar Demirtas, Eskisehir*
Osmangazi University, Turkey; Yeliz Buruk, Eskisehir
Osmangazi University, Turkey; Mujgan Sagir Ozdemir,
ESOGU, Turkey

AHP BASED GROUP DECISION MAKING – CASE
STUDY OF E-LEARNING IMPLEMENTATION IN
PRE-TERTIARY EDUCATION *Nina Begicevic Redep,*
University of Zagreb, Croatia; Blazenka Divjak,
University of Zagreb, Croatia

DESIGN AND PRIORITIZATION USING THE AHP
Thomas L. Saaty, University of Pittsburgh, U.S.;
Mujgan Sagir Ozdemir, ESOGU, Turkey; Nina
Begicevic Redep, University of Zagreb, Croatia

AHP MODEL FOR QUALITY ASSESSMENT OF

ARCHITECTURAL DESIGN *Tihomir Hunjak,*
University of Zagreb; Vjeron Strahonja, University of
Zagreb, Croatia

Session Organizer:

Nina Begicevic Redep, University of Zagreb, Croatia

Session Chair:

Tihomir Hunjak, University of Zagreb

012. Banking and Financial Applications

17 Banking and Financial Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson
Square

Participants:

ANALYTIC HIERARCHY PROCESS AS A RANKING
TOOL FOR DECISION MAKING UNITS *Josef*
Jablonsky, University of Economics, Czech Republic

DETERMINATION OF ESTABLISHING FACTORING
COMPANY'S LOCATIONS BY AHP ANALYSIS:
IMPLEMENTATIONS OF 3 MAJOR CITIES IN
TURKEY *Sadik Karaoglan,*
karaglan8912@gmail.com, Turkey; Mehmet Ilhan,
University of Usak, Turkey; Melek Ilhan, Uşak
Üniversitesi İ.İ.B.F. No:6, Turkey

DEVELOPMENT OF A DECISION MODEL TO
PRIORITIZING POTENTIAL FRAUD CASES FOR
INTERNAL INVESTIGATIVE PURPOSES *James*
Carroll, Carlow University, U.S.; Enrique Mu, Carlow
University, U.S.

PERFORMANCE EVALUATION OF COMMERCIAL
BANKS IN NEPAL USING AHP *Ashish Bhandari,*
Upveda Technology Pvt. Ltd and Institute of
Engineering, Nepal; Amrit Man Nakarmi, Tribhuwan
University, Nepal

Session Organizer:

Josef Jablonsky, University of Economics, Czech
Republic

Session Chair:

Josef Jablonsky, University of Economics, Czech Republic

013. Monday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

014. AHP Theory and Methodology 1

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

A CHI-SQUARE BASED APPROACH TO
CONSISTENCY EVALUATION OF
MULTIPLICATIVE PREFERENCE RELATIONS

Michele Fedrizzi, University of Trento, Italy

A FRAMEWORK OF A COMPREHENSIVE
UNCERTAINTY ANALYSIS OF THE AHP-
METHODOLOGY IN THE CONTEXT OF
ENVIRONMENTAL-DECISION-MAKING *Werner
Toth, University of Natural Resources and Life Sciences
& Vienna University of Economics and Business,
Austria; Bernhard Wolfslehner, European Forest
Institute, and University of Natural Resources and Life
Sciences, Austria; Harald Vacik, Institute of
Silviculture, University of Natural Resources and Life
Sciences, Vienna*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Werner Toth, University of Natural Resources and Life Sciences & Vienna University of Economics and

015. Risk Analysis Application

14 Risk Analysis

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

AHP FOR RECRUITMENT RISK MANAGEMENT IN R&D SECTOR *Rajinder Kaur Sokhi, Recruitment and Assessment Center, DRDO, India*

RISK ASSESSMENT AND MANAGEMENT DURING DEVELOPMENT OF GAS TURBINE ENGINE SUB-SYSTEMS *Parthasarathi Hans, Gas Turbine Research Establishment, Bangalore, India; S Ramachandra, Gas Turbine research Establishment, Bangalore, India; PN Srinivasamurthy, Gas Turbine research Establishment, Bangalore, India; Bashishtha kumar Jha, Gas Turbine research Establishment, India*

RISK ASSESSMENT IN DEVELOPMENT OF LEAN ARCHITECTURE FOR CONTROL SYSTEM OF AERO ENGINE *Bashishtha kumar Jha, Gas Turbine research Establishment, India; S Ramachandra, Gas Turbine research Establishment, Bangalore, India; PN Srinivasamurthy, Gas Turbine research Establishment, Bangalore, India; Parthasarathi Hans, Gas Turbine Research Establishment, Bangalore, India*

Session Organizer:

Rajinder Kaur Sokhi, Recruitment and Assessment Center, DRDO, India

Session Chair:

Rajinder Kaur Sokhi, Recruitment and Assessment Center, DRDO, India

016. Evaluation Methodology in Terms of Quality

12 Quality and Safety

Panel

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

POWER QUALITY EVALUATION MODEL FOR
ELECTRIC CUSTOMER BASED ON ANALYTIC
HIERARCHY PROCESS *Buhm Lee, Chonnam
National University, Korea; Kyoung Min Kim,
Chonnam National University, Korea*

EVALUATION OF NURSING EDUCATION FOR
STUDENTS BASED ON ANALYTIC HIERARCHY
PROCESS *Sangsuk Kim, Chung-Ang University, Korea*

A STUDY ON THE PRIORITY CHANGEOVER AND
INTERACTION OF SOFTWARE QUALITY
FACTORS USING THE AHP/ANP *Min-Suk Yoon,
Chonnam National University, Republic of Korea;
Lingyu Hao, Chonnam National University, Korea*

Session Organizer:

Min-Suk Yoon, Chonnam National University, Republic
of Korea

Session Chair:

Buhm Lee, Chonnam National University, Korea

017. Medical and Health Study

23 Medical and Health Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

OPTIMIZING HEALTH CARE DELIVERY SERVICES
IN NIGERIA: USING THE ANALYTIC NETWORK
PROCESS (ANP) *Stephen Gbenga Fashoto,
Redeemer's University, Nigeria*

CHOOSING A BUYING OPTION FOR DIABETES
MEDICAL DEVICES USING THE
SUPERDECISIONS SOFTWARE *Martha Merrill,
University of Pittsburgh, U.S.*

Session Organizer:

Martha Merrill, University of Pittsburgh, U.S.

Session Chair:

Martha Merrill, University of Pittsburgh, U.S.

018. Optimization & Real Life Applications 1

05 AHP/ANP Mixed Methods, Optimization and Applications

Panel

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

THE RATIONALITY OF PUNISHMENT –

MEASURING THE SEVERITY OF CRIMES: AN
AHP-BASED ORDERS-OF-MAGNITUDE

APPROACH *Thomas L. Saaty, University of
Pittsburgh, U.S.; Mujgan Sagir Ozdemir, ESOGU,
Turkey; Jennifer Shang, University of Pittsburgh, U.S.*

A TWO-PHASED MULTIOBJECTIVE MODEL FOR A
SERVICE SYSTEM -AN APPLICATION FOR A
TOURING COMPANY *Gulcin Bektur, Eskişehir
Osmangazi University, Industrial Engineering
Department, Turkey; Mujgan Sagir Ozdemir, ESOGU,
Turkey*

A TWO-PHASED SOLUTION METHODOLOGY FOR
CAPACITATED MULTI VEHICLE ROUTING
PROBLEM WITH TIME WINDOW AND
CUSTOMER PRIORITIES A CASE FOR
PHARMACY ROUTING *Mujgan Sagir Ozdemir,
ESOGU, Turkey; Yeliz Buruk, Eskişehir Osmangazi
University, Turkey; Ezgi Aktar Demirtas, Eskişehir
Osmangazi University, Turkey*

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Mujgan Sagir Ozdemir, ESOGU, Turkey

019. AHP in the Classroom and the Community: Carlow University-Uganda Initiatives

24 Graduate Students (master, non-doctoral)

Panel

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - McPherson
Square

Participants:

CARLOW UNIVERSITY - UGANDA INITIATIVE I:
AN AHP BENEFIT/COST ANALYSIS *Diana Nsemo, MBA - Carlow University, U.S.; Nora Suehr, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

CARLOW-UGANDA INITIATIVE II: AN AHP BOCR
DECISION ANALYSIS *Bethany Dorney, Carlow University, U.S.; Beth Kallenborn, Carlow University, U.S.; Douglas Edward Morgan, Carlow University, U.S.; Shannon Stefan Robertson, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

CARLOW-UGANDA INITIATIVE III: MULTIPLE
BOCR TEAM PERSPECTIVE INTEGRATION
Kristen Faust, Carlow University, U.S.; Nidhi - Shukla, Carlow University, U.S.; Joanne M. Kavulick, Carlow University, U.S.; Sheila Rawlings, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.

CARLOW-UGANDA INITIATIVE IV: CASE STUDY
OF USING AHP AT THE UNDERGRADUATE
LEVEL *Cynthia Mari Busin Nicola, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Nora Suehr, Carlow University, U.S.

020. Monday lunch

ISAHP

Lunch

12:30 to 2:30 pm

Grand Hyatt: Floor Independence Level - Independence

FGHI

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

021. AHP Theory and Methodology 2

04 AHP Theory & Methodology

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

AN INTEGRATED MODEL BASED ON AHP AND
MAXIMIZING DEVIATION METHOD AND ITS
APPLICATION *Zhanglin Peng, School of
Management, Hefei University of Technology, China;
Shanlin Yang, School of Management, Hefei University
of Technology, China; Xiaojia Wang, School of
Management, Hefei University of Technology, China*

AHP MODIFICATION FOR DECISION MAKING
UNDER UNCERTAINTY *Alexander Vladimirovich
Bochkov, LLC NIlgazeconomika, Russia; Nikolay
Nikolaevich Zhigirev, LLC NIlgazeconomika, Russian
Federation*

AHP PRIORITIES AND MARKOV-CHAPMAN-
KOLMOGOROV STEADY-STATES
PROBABILITIES *Stan S. Lipovetsky, GfK Custom
Research North America, U.S.; W Michael Conklin,
GfK Custom Research North America, U.S.*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Stan S. Lipovetsky, GfK Custom Research North
America, U.S.

022. Government & Politics 1

02 Government & Politics

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

APPLICATION OF A DECISION SUPPORT SYSTEM
BASED ON THE ANALYTIC NETWORK PROCESS
TO IMPROVE STATE PROGRAM OF MEDICINES
SOCIAL ASSISTANCE *Daria Ivanovna Onischenko,*
Student, Russia; Vasilij Grigorjevich Sinuk, Russian
Federation

CATTLE BUSINESS DEVELOPMENT STRATEGY IN
THE REGENT OF BULUKUMBA, SOUTH
SULAWESI PROVINCE *Machmud Achmad, Bogor*
Agricultural University, Indonesia

GETTING LOCAL GOVERNMENT ONBOARD:
PRIORITIZING DECISIONS RATIONALLY *Ellen*
Szarleta, Indiana University NW, U.S.

ANALYTIC HIERARCHY PROCESS IN LOCAL
GOVERNMENT DECISION MAKING: POLAND
Jacek Strojny, Rzeszow University of Technology,
Poland; Anna Prusak, Cracow University of
Economics, Poland

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Ellen Szarleta, Indiana University NW, U.S.

023. Quality and Safety

12 Quality and Safety

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

ENAV TOP 5 IMPROVEMENT AREAS *Lorenzo Vacca,*
ENAV, Italy; Maurizio Mancini, ENAV, Italy

IDENTIFYING AND RANKING THE CRITICAL SUCCESS FACTORS OF CHALLENGES IN PROVIDING QUALITY EDUCATION BY THE MALAYSIAN PRIVATE HIGHER LEARNING INSTITUTIONS *Rafikul Islam, International Islamic University Malaysia; Azilah Anis, Universiti Teknologi Mara, Malaysia; Anisah Abdullah, International Islamic University, Malaysia*

INTEGRATING HSE QUALITY SYSTEMS USING A HAZARDS PRIORITY REPORT BASED ON THE AHP METHODOLOGY *Diego D'Urso, University of Catania, Italy; Antonio Giuseppe Latora, University of Catania, Italy; Lucio Compagno, Dipartimento di Ingegneria Industriale - Università di Catania, Italy*

Session Organizer:

Ozden Bayazit, Central Washington University, U.S.

Session Chair:

Rafikul Islam, International Islamic University Malaysia

024. Medical Decision Making and Tools

23 Medical and Health Applications

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

ANP AND DEMATEL FOR SIX SIGMA PROJECT SELECTION AND EVALUATION PROCESS IN A COLOMBIAN HOSPITAL *Miguel Angel Ortiz Barrios, Universidad de la Costa, Colombia; Heriberto Alexander Felizzola Jiménez, Universidad de la Salle, Colombia; Santiago Nieto-Isaza, Universidad de la Costa, Colombia*

INCORPORATING PRECLINICAL AND CLINICAL KNOWLEDGE AND EXPERIENCE TO EVALUATE DRUG DEVELOPMENT PROJECTS USING THE ANALYTIC HIERARCHY PROCESS *A. Lawrence Gould, Merck Research Laboratories, U.S.; Rajesh Krishna, Merck Research Laboratories, U.S.; Anis Khan, Medimmune, Inc., U.S.; Jeffrey Saltzman,*

AstraZeneca R&D, U.S.

LOCATION OF PREHOSPITAL CARE BASIS
THROUGH COMBINED FUZZY AHP AND GIS
METHOD *Lorena Pradenas, Universidad de
Concepción, Chile; Marco Tiznado, Universidad de
Concepción, Chile*

Session Organizer:

Claudio Garuti, Fulcrum Ingenieria, Chile

Session Chair:

Claudio Garuti, Fulcrum Ingenieria, Chile

025. Optimization & Real Life Applications 2

05 AHP/ANP Mixed Methods, Optimization and
Applications

Panel

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

AN AHP MODEL BASED SUPPLY CHAIN
NETWORK DESIGN *Gurkan Ozturk, Anadolu
University, Turkey*

A TWO STEP MCDM METHODOLOGY TO MAKE
EFFECTIVE SUPPLIER SELECTION AND AN
EXAMPLE *Mehmet Alegoz, Anadolu University,
Turkey*

A REAL LIFE MULTI OBJECTIVE COURSE
TIMETABLING MODEL WITH ANP AND CONIC
SCALARIZATION *Zehra Kamisli Ozturk, Anadolu
University, Turkey; Mujgan Sagir Ozdemir, ESOGU,
Turkey; Erdener Ozcetin, Anadolu University, Turkey;
Nergiz Kasimbeyli, Anadolu University, Turkey;
Mehmet Alegoz, Anadolu University, Turkey*

MULTI CRITERIA DECISION MAKING FOR
CUSTOMER SATISFACTION IN WAREHOUSE
MANAGEMENT *Zehra Kamisli Ozturk, Anadolu
University, Turkey; Refail Kasimbeyli, Anadolu
University, Turkey*

Session Organizer:

Zehra Kamisli Ozturk, Anadolu University, Turkey
Session Chair:
Zehra Kamisli Ozturk, Anadolu University, Turkey

**026. YSU/Williamson College of Business
Master Students, AHP in Decision Making**

24 Graduate Students (master, non-doctoral)

Panel

2:30 to 4:00 pm

*Grand Hyatt: Floor Independence Level - McPherson
Square*

Participants:

BEST PLANT LOCATION FOR A MANUFACTURING
COMPANY: AN ANALYTIC HIERARCHY
PROCESS APPROACH *Sayantoni Dey, Youngstown
State University, U.S.; Stephen Bosela, Youngstown
State University, U.S.; Jakub Waksmundzki,
Youngstown State University, U.S.*

SELECTION OF THE MOST ATTRACTIVE
EMERGING MARKET FOR A BUSINESS TO
ENTER AMONG THE COUNTRIES TURKEY,
RUSSIA, INDIA, AND CHINA: AN ANALYTICAL
HIERARCHY APPROACH *Matthew A Kuhns,
Youngstown State University, U.S.; David Lucas,
Youngstown State University, U.S.; Lyndi Schrecengost,
Student - Author, U.S.; Philip Nicholas Tizio,
Youngstown State University, U.S.*

COMPARING THE EMERGING MARKETS OF
BRAZIL, INDIA AND CHINA: WHO'S THE BEST?
Matthew Huston, Youngstown State University, U.S.;
Jennifer Roberts, Youngstown State University, U.S.;
Jason Ferguson, Youngstown State University, U.S.

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.

Session Chair:

Ramesh Dangol, Youngstown State University, U.S.

027. Monday afternoon break

ISAHP

Break

4:00 to 4:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

028. Improving Supply Chain Activities by Advancing and Teaching AHP Applications

10 Supply Chain Management

Panel

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

COMBINING SUBJECTIVE AND OBJECTIVE
CRITERIA FOR EVALUATING SUPPLIERS USING
AHP AND DEA *Seong-Jong Joo*, *Central Washington
University-Des Moines, U.S.*; *Ozden Bayazit*, *Central
Washington University, U.S.*

A NEW APPROACH TO THE USE OF A
MEASUREMENT SCALE FOR ANALYTIC
HIERARCHY PROCESS *Young Lee*, *Busan
Development Institute, Korea*

TEACHING ANALYTIC HIERARCHY PROCESS TO
SUPPLY CHAIN STUDENTS *Seong-Jong Joo*,
Central Washington University-Des Moines, U.S.

Session Organizer:

Seong-Jong Joo, *Central Washington University-Des
Moines, U.S.*

Session Chair:

Seong-Jong Joo, *Central Washington University-Des
Moines, U.S.*

029. Government & Politics 2

02 Government & Politics

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

EVALUATION OF BANDUNG CITY GOVERNMENT STRATEGIC PROGRAMS IN ECONOMICAL EFFORTS TO STRENGTHEN AND INCREASE THE ABILITY OF PUBLIC PURCHASING POWER: A REVIEW OF PUBLIC POLICY ANALYSIS *Bayu Kharisma, Department of Economics University Padjadjaran Bandung, Indonesia*

SHOULD THE CITY OF PITTSBURGH AND ALLEGHENY COUNTY CONSOLIDATE THEIR INFORMATION TECHNOLOGY SERVICES? *Enrique Mu, Carlow University, U.S.; Howard A Stern, Carlow University, U.S.*

THE CORRELATION BETWEEN MAJOR CRITERIA OF AHP FOR GOVERNMENT R&D PROGRAM IN KOREA *Dong-Guen Kim, Korea Institute of S&T Evaluation and Planning (KISTEP)*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Dong-Guen Kim, Korea Institute of S&T Evaluation and Planning (KISTEP)

030. Corporate Social Responsibility

08 Corporate Social Responsibility

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

A COMBINED AHP-DELPHI APPROACH TO ASSESS THE SOCIAL RESPONSIBILITY DEGREE OF EQUITY MUTUAL FUNDS *Monica Garcia-Melon, Universitat Politecnica de Valencia, Spain; Tomás Gómez-Navarro, Universitat Politècnica de Valencia, Spain; Blanca Pérez-Gladish, University of Oviedo, Spain; Paz Mendez-Rodriguez, University of Oviedo, Spain*

MEASURING THE ATTRACTIVENESS OF
SOCIALLY RESPONSIBLE ASSET INVESTMENTS
*Antonella Petrillo, University of Naples "Parthenope",
Italy; Fabio De Felice, University of Cassino and
Southern Lazio, Italy*

INDUSTRY RISK ASSESSMENT IN BRAZIL WITH
THE AHP *Bernardo Brazao Rego Mello, BNDES,
Brazil; Luiz Flavio Autran Monteiro Gomes, Ibmec, Rio
de Janeiro, Brazil; Sergio Augusto Novis Filho,
BNDES, Brazil*

STRATEGIC PLANNING AND RESOURCE
ALLOCATION FOR A SUSTAINABLE
DEVELOPMENT IN A DEVELOPING COUNTRY
Claudio Garuti, Fulcrum Ingenieria, Chile

Session Organizer:

Orrin Cooper, University of Memphis, U.S.

Session Chair:

Bernardo Brazao Rego Mello, BNDES, Brazil

031. Renewable Energy Applications

25 Miscellaneous

Panel

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

MULTICRITERIA APPROACH FOR EVALUATION
OF MODE OF HYDROPOWER DEVELOPMENT IN
NEPAL *Lila Nath Bhattarai, Nepal Electricity
Authority, Nepal*

PRIORITIZING HYDROPOWER DEVELOPMENT
USING ANALYTICAL HIERARCHY PROCESS – A
CASE STUDY OF NEPAL *Rana Pratap Singh, BOKU,
Austria*

FRAMEWORK FOR SUSTAINABILITY
ASSESSMENT OF RENEWABLE ENERGY
PROJECTS IN NEPAL *Ram Prasad Dhital, Institute of
Engineering, Nepal; Parakram Pyakurel, Alternative
Energy Promotion Center, Nepal; Tri Ratna
Bajracharya, Centre for Energy Studies, Institute of*

Engineering, Tribhuvan University, Nepal; Rajendra Shrestha, Mechanical Engineering Department, Institute of Engineering Tribhuvan University, Nepal
DIFFUSION OF ANALYTIC HIERARCHY PROCESS IN NEPAL: OVERVIEW FOR THE PERIOD OF 2003 - 2013 *Shashi Bhattarai, Knowledge Holding International, Nepal*

Session Organizer:

Shashi Bhattarai, Knowledge Holding International, Nepal

Session Chair:

Shashi Bhattarai, Knowledge Holding International, Nepal

032. AHP/ANP Mixed Methods, Optimization and Applications 1

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

A DYNAMIC METHODOLOGY ON DETERMINING THE MOST APPROPRIATE DUE DATE ASSIGNMENT MODELS FOR JOB SHOP SCHEDULING *Serafettin Alpay, Eskisehir Osmangazi University, Turkey*

ALIGNMENT OF LEAGILE STRATEGIES WITH OFF-SITE MANUFACTURING: APPLICATION OF ANP IN AUSTRALIAN HOUSING SUPPLY *Sherif Mostafa, University of South Australia, Australia; Jantane Dumrak, International Institute of Business and Information Technology, Australia*

AN AHP MODEL TO DESIGN MOBILE APPLICATIONS *Emre Cimen, Anadolu University, Turkey; Gurkan Ozturk, Anadolu University, Turkey*

AN INTEGRATED DEMATEL-ANP APPROACH IN RENEWABLE ENERGY RESOURCES SELECTION

Gülçin Büyüközkan, Galatasaray University, Turkey;
Sezin Güleriyüz, Galatasaray University, Turkey

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chairs:

Emre Cimen, Anadolu University, Turkey

Sezin Güleriyüz, Galatasaray University, Turkey

033. Graduate Presentations

24 Graduate Students (master, non-doctoral)

Panel

4:30 to 6:00 pm

*Grand Hyatt: Floor Independence Level - McPherson
Square*

Participants:

AHP BASED DECISION MODEL FOR APPRAISING
RESIDENTIAL REAL ESTATES IN AN
ABSTRACTED ZONE *Secil Kavas, Istanbul Technical
University, Turkey; Ilker Topcu, Istanbul Teknik
Universitesi, Turkey*

AN EMPIRICAL EVALUATION OF M-PAYMENT
BUSINESS MODELS USING ANALYTIC
HIERARCHY PROCESS AND SENSITIVITY
ANALYSIS *Abid Ali, International Islamic University
Islamabad, Pakistan*

COGNITIVE MAPS AND AHP FOR SUPPLIER
SELECTION IN A PRIVATE HIGHER EDUCATION
INSTITUTION *Ana Lucia Pegetti, University of São
Paulo, Brazil; Jesse D'Assuncao Rebello de Souza
Junior, University of São Pulo, Brazil*

SELECTING THE FIELD HOSPITAL PLACE FOR
DISASTERS: A CASE STUDY IN ISTANBUL
Nazanin Vafaei, İstanbul Teknik Üniversitesi, Turkey

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Ilker Topcu, İstanbul Teknik Üniversitesi, Turkey

034. Program Organizing Committee

Reception

ISAHP

Reception

6:00 to 8:00 pm

Grand Hyatt: Constitution DE

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

035. Plenary Session: AHP and Analytics

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

Daniel Saaty, Decision Lens

Session Organizer:

Enrique Mu, Carlow University, U.S.

036. Conflict Resolution

01 Conflict Resolution

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

CONTINUAL ENGAGEMENT APPROACH
THROUGH GIS-MCDA: CONFLICT RESOLUTION
OF LOGGERHEAD SEA TURTLE BYCATCH IN
MEXICO *Luis Antonio Bojórquez-Tapia, LANCIS
UNAM, Mexico*

THE MIDDLE EAST CONFLICT – AN EXAMPLE OF
A RETRIBUTIVE CONFLICT *Luis G Vargas,
University of Pittsburgh, U.S.*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Luis G Vargas, University of Pittsburgh, U.S.

037. Industrial Engineering Applications 1

09 Industrial Engineering

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

IDENTIFYING THE CRITERIA AND THEIR PRIORITIES FOR LOCATING BANK BRANCHES IN TURKEY *Ayfer Başar, Istanbul Technical University, Turkey; Ozgur Kabak, Istanbul Technical University, Turkey; Ilker Topcu, Istanbul Teknik Universitesi, Turkey*

THE NONLINEAR NATURE OF PREFERENCES, ITS IMPACT ON THE SENSITIVITY AND EFFECTIVENESS OF MULTIPLE CRITERIA ALTERNATIVES *Rafael Sarkisyan, Moscow State University of Railway Engineering, Russian Federation; Aleksandra Masalida, Moscow State University of Railway Engineering, Russia; Elena Kobetc, Moscow State University of Railway Engineering, Russia*

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chairs:

Elena Kobetc, Moscow State University of Railway Engineering, Russia

Ilker Topcu, Istanbul Teknik Universitesi, Turkey

038. Performance and Simulation Application

20 Performance and Simulation

Paper Session

9:30 to 10:30 am

Grand Hyatt: Independence B

Participants:

A DECISION SUPPORT TOOL TO SUPPORT INNOVATIVE AND STRATEGIC PROCESSES *Antonella Petrillo, University of Naples "Parthenope", Italy; Fabio De Felice, University of Cassino and Southern Lazio, Italy; Leandro Pecchia, University of Warwick, UK*

EVALUATING ACADEMIC PERFORMANCE OF DEPARTMENTS IN ENGINEERING FACULTY OF A UNIVERSITY USING FUZZY DELPHI AND TOPSIS *Oguz Toragay, Gazi University, Turkey; Murat*

*Arikan, Gazi University Industrial Engineering
Department, Turkey*

SMARTER STREETS EASIER ACCESS VIA
PERCEPTION *irene doosuur Mngutyo, Benue State
University, Makurdi, Benue State, Nigeria.; Ajene A
Ajene, Benue State University*

Session Organizer:

Antonella Petrillo, University of Naples "Parthenope",
Italy

Session Chair:

Antonella Petrillo, University of Naples "Parthenope",
Italy

039. Group Decision Making

25 Miscellaneous

Panel

9:30 to 10:30 am

Grand Hyatt: Independence C

Participants:

AGGREGATING PAIR-WISE COMPARISONS GIVEN
IN SCALES OF DIFFERENT DETAIL DEGREE
*Vitaliy V. Tsyganok, Institute for Information Recording
of National Academy of Sciences of Ukraine; Oleh V.
Andriichuk, Institute for Information Recording of
National Academy of Sciences of Ukraine*

CONSISTENCY IMPROVEMENT IN COMBINATORY
SPANNING TREE ENUMERATION METHOD *Sergii
Kadenko, Institute for Information Recording of the
National Academy of Sciences of Ukraine*

GROUP DECISION MAKING WITH THE AHP/ANP –
AN OVERVIEW OF APPROACHES TO
AGGREGATION OF JUDGMENTS AND
PRIORITIES *Anna Florek-Paszowska (Greda),
Cracow University of Economics, Poland; Anna
Prusak, Cracow University of Economics, Poland;
Piotr Stefanow, Andrzej Frycz Modrzewski, Cracow
University College, Poland*

Session Organizer:

Anna Florek-Paszowska (Greda), Cracow University of

Economics, Poland

Session Chair:

Anna Florek-Paszowska (Greda), Cracow University of
Economics, Poland

040. Marketing Applications 1

18 Marketing Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

A LINEAR PROGRAMMING APPROACH
DETERMINING EMINENT DRIVERS OF
CUSTOMER BASED BRAND EQUITY IN
SPORTSWEAR INDUSTRY *Richa Singh, Birla
Institute of Management Technology, India; Veenu
Sharma, Birla Institute of Management Technology,
India; Gokulanda Patel, Birla Institute of Management
Technology, India*

A STUDY OF THE ACCEPTANCE OF WEARABLE
TECHNOLOGY FOR CONSUMERS-AN ANP
PERSPECTIVE *Chiau-Ching Chen, Department of
Management Sciences, Tamkang University, Taiwan;
Hsu-Shih Shih, Dept. of Management Sciences,
Tamkang University, Taiwan*

DETERMINATION OF PROMOTIONAL STRATEGY
FOR ORGANIZATIONS IN THE NIGERIAN
INSURANCE INDUSTRY USING THE AHP
MODEL *Bolajoko Nkeminim Dixon-Ogbechi,
University of Lagos, Nigeria; Sikuade Oladimeji Jagun,
Sol Simon Investments Ltd, Nigeria; Salome
Oghenechuko Ighomereho, Redeemer's University,
Nigeria; Rahim Ajao Ganiyu, University of Lagos,
Nigeria; Elizabeth Marie Haran, Salem State
University, U.S.*

DETERMINATION THE SIGNIFICANCE LEVEL OF
FACTORS THAT ARE AFFECTING YOUNG
CONSUMERS' PURCHASING PREFERENCES BY
AHP *Mufit Aydin, Usak University, Turkey; Mustafa*

*Hotamışlı, Afyon University, Turkey; Yasir Altintop,
Ahmetli Vocational HS, Turkey*

Session Organizer:

Bolajoko Nkeminim Dixon-Ogbechi, University of
Lagos, Nigeria

Session Chair:

Bolajoko Nkeminim Dixon-Ogbechi, University of
Lagos, Nigeria

041. AHP/ANP Mixed Methods, Optimization and Applications 2

05 AHP/ANP Mixed Methods, Optimization and
Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

ANALYTIC NETWORK PROCESS FOR DECIDING
DISASTER RECOVERY PROGRAM IN
YOGYAKARTA INDONESIA *Ignatius Luddy Indra
Purnama, Department of Industrial Engineering,
Universitas Atma Jaya Yogyakarta Indonesia; Ririn
Diar Astanti, Department of Industrial Engineering,
Universitas Atma Jaya, Indonesia; Hery Hery,
Departemen Perindustrian, Perdagangan dan Koperasi
Kabupaten Sleman Provinsi DIY, Indonesia; Mujgan
Sagir Ozdemir, ESOGU, Turkey*

ANP ROW SENSITIVITY AND THE RESULTING
INFLUENCE ANALYSIS *William Adams, Decision
Lens Incorporated, U.S.*

APPLICATION OF MCDM METHODS FOR A GROUP
OF NONHOLONOMIC MOBILE ROBOTS TO
DETERMINE THE BEST ROUTE AND THE MOST
SUITABLE ROBOT *Mujgan Sagir Ozdemir, ESOGU,
Turkey; Alpaslan Yufka, Anadolu University, Turkey*

APPLYING AHP AND RATING MODEL FOR
PRIORITIZING IRAN PROVINCES AND
ESTABLISHMENT OF SOLAR WOOD DRYING

Majid Azizi, University of Tehran, Iran; Nemat Mohebbi, University of Tehran, Iran

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Ignatius Luddy Indra Purnama, Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta Indonesia

042. Environmental Application

06 Environmental Application

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

ANALYTIC HIERARCHY PROCESS TO ASSESS TECHNOLOGICAL SYSTEM IN WATER TREATMENT PLANTS *Claudio Macuada, USACH, Chile; Astrid Maria Oddershede, usach, Chile*

APPLYING THE ANALYTIC HIERARCHY PROCESS TO OIL SANDS ENVIRONMENTAL COMPLIANCE RISK MANAGEMENT *Izak Johannes Roux III, P. Eng, Walden University, Canada*

DECISION-MAKING POLICIES FOR THE SALGADO RIVER BASIN, CEARÁ – BRAZIL *Francisco de Assis Vilar Sobreira Júnior, Universidade Regional do Cariri, Brazil; Rodolfo José Sabiá, Universidade Regional do Cariri, Brazil; Anna Flávia de Oliveira Lima, Universidade Regional do Cariri, Brazil; Valerio Salomon, Sao Paulo State University, Brazil; Fernando Augusto Silva Marins, UNESP - Sao Paulo State University, Brazil*

ENVIRONMENTAL DECISION MAKING – A HYBRID APPROACH *Saroj Koul, OP Jindal Global University, India; Rakesh Verma, National Institute of Industrial Engineering (NITIE), India*

Session Organizer:

Monica Garcia-Melon, Universitat Politècnica de Valencia, Spain

Session Chair:

Monica Garcia-Melon, Universitat Politecnica de
Valencia, Spain

043. Tuesday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

044. AHP Theory and Methodology 3

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

AN ANALYSIS OF THE PROCESS IN DERIVING

FURTHER BENEFITS OF AN AHP MODEL

Chakradhar Iyyunni, L&T Institute of Project

Management, India; Viraj Trivedi, Faculty of

Technology, CEPT University, India; Vittal S

Anantatmula, Western Carolina University, U.S.

ASSESSMENT OF ENERGY EXPENDITURE OF

WORKERS BY USING 'AHP': A CASE STUDY OF

PROCESS INDUSTRY *Harwinder Singh, Guru Nanak*

Dev Engineering College Ludhiana, India; Amandeep

Singh, Department of Industrial & Production

Engineering, National Institute of Technology, India;

Paramjit Singh Bilga, Guru Nanak Dev Engineering

College, India; Lakhwinder Singh, Department of

Industrial & Production Engineering, National Institute

of Technology, India

CONSISTENCY IN THE CONTEXT OF AHP: HALF

FRIEND, HALF FOE *Adriana Agapie, Bucharest*

University of Economic Studies, Romania

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Harwinder Singh, Guru Nanak Dev Engineering College
Ludhiana, India

045. Industrial Engineering Applications 2

09 Industrial Engineering

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

A NEW OFFERING FAHP AND FTPSIS APPROACH,
PRODUCTIVITY INDEXES IRANIAN CENTRAL
IRON ORE COMPANY *Rasoul Motakiaee, Master in
Management Science, Iran*

AN AHP, ANP DECISION SUPPORT APPROACH FOR
THE PRIORITISATION AND SELECTION OF
"RESTORATION" AND "IMPROVEMENT"
PROJECTS WITHIN AN INDUSTRIAL
ENVIRONMENT *Jean M. B. Khalil, Dr., Egypt*

CREATING VALUE WITH BUSINESS ANALYTICS
EDUCATION *Ozay Ozaydin, Dogus University,
Turkey; Fusun Ulengin, Sabanci University, Turkey*

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chair:

Ozay Ozaydin, Dogus University, Turkey

046. Performance and Simulation Study

20 Performance and Simulation

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Independence B

Participants:

CONSISTENCY OF EXPERT-BASED PREFERENCE
MATRICES *Martin Gavalec, University of Hradec
Kralove, Czech Republic; Karel Mls, University of*

Hradec Kralove, Czech Republic

OPTIMAL CONSISTENT APPROXIMATION OF A PREFERENCE MATRIX *Richard Cimler, University of Hradec Kralove, Czech Republic; Martin Gavalec, University of Hradec Kralove, Czech Republic; Karel Mls, University of Hradec Kralove, Czech Republic*

COMPARISON ACCURACY – IMPLICATIONS FOR DERIVING PRIORITIES AND CONSISTENCY *William Charles Wedley, Simon Fraser University, Canada*

Session Organizer:

William Charles Wedley, Simon Fraser University, Canada

Session Chair:

William Charles Wedley, Simon Fraser University, Canada

047. Theory and Application of the Analytic Hierarchy Process

25 Miscellaneous

Panel

11:00 to 12:30 pm

Grand Hyatt: Independence C

Participants:

A HYBRID DIAGNOSIS PROCEDURE FOR OPTIMIZING THE SPECIFICATION OF BTO PRODUCTS *Yuji Sato, Graduate School of Management, Chukyo University, Japan*

RELATIONSHIP BETWEEN THE ANALYTIC HIERARCHY PROCESS AND WEIGHTED SUMMATION *Yoichi Iida, Tokyo University of Science, Japan*

AN ALGEBRAIC REPRESENTATION FOR COMPARISON METHODS OF AHP *Takafumi Mizuno, Meijo University, Japan*

APPLICATION OF ANALYTIC HIERARCHY PROCESS FOR STRATEGIC PLANNING AND IMPLEMENTATION AT NEPALESE

UNIVERSITIES AND COLLEGES *Prabal Sapkota,*
Kathmandu University, Dhulikhel, Kavre, Nepal

Session Organizer:

Yuji Sato, Graduate School of Management, Chukyo
University, Japan

Session Chair:

Yuji Sato, Graduate School of Management, Chukyo
University, Japan

048. Marketing Applications 2

18 Marketing Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

DETERMINING CONSUMER'S CHOICE AMONG
VARIOUS INSURANCE POLICIES: AN
ANALYTICAL HIERARCHICAL PROCESS
APPROACH *Emmanuel Olateju Oyatoye, University of
Lagos, Nigeria; Rukayat Yetunde Folorunso, UBA,
PLC, Nigeria*

DETERMINING CONVENTION PLANNERS'
PERCEPTIONS OF CONVENTION HOTEL
SELECTION CRITERIA BY ANALYTIC
HIERARCHY PROCESS *Meryem Akoglan Kozak,
Anadolu University, Turkey; Cagil Hale Ozel, Anadolu
University, Turkey; Emre Ozan Aksoz, Anadolu
University, Turkey*

ENHANCING THE SALES PROCESS USING
ANALYTIC NETWORK PROCESS *Fariborz Y.
Partovi, Drexel University Philadelphia, U.S.; Cynthia
A. Conway, Drexel University, U.S.*

EVALUATING SUBSCRIBERS PREFERENCE FOR
SERVICE ATTRIBUTES OF MOBILE
TELECOMMUNICATION IN NIGERIA USING
ANALYTIC HIERARCHY PROCESS (AHP)
*Sulaimon Olanrewaju Adebisi, Business Administration
Department, Federal University of Agriculture,
Nigeria; Emmanuel Olateju Oyatoye, University of*

Lagos, Nigeria; Bilqis Bolanle Amole, Department of Business Administration, University of Lagos, Nigeria

Session Organizer:

Fariborz Y. Partovi, Drexel University Philadelphia, U.S.

Session Chair:

Fariborz Y. Partovi, Drexel University Philadelphia, U.S.

049. AHP/ANP Mixed Methods, Optimization and Applications 3

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

CHOOSING THE SUITABLE METHODE OF KNOW-HOW TRANSFER FROM UNIVERSITIES TO INDUSTRY BASED ON AHP TECHNIQUE *Amin Jahangiri Nia, Author, Iran; Somayeh Sahebi, Islamic Azad University, Iran; Zeinab Sahebi, Author, Iran*

DEVELOPMENT OF DEMATEL AND ANP METHOD FOR THE PLANNING PROCESS OF AMPHIBIOUS OPERATION *Raha Ahmadi, Sekolah Tinggi Teknologi Angkatan Laut, Indonesia; Yudy Arie Bintoro, STTAL, Indonesia*

ERP SOFTWARE SELECTION MODEL USING ANALYTIC NETWORK PROCESS *Andre Surya Lesmana, Universitas Atma Jaya Yogyakarta, Indonesia; Ririn Diar Astanti, Department of Industrial Engineering, Universitas Atma Jaya, Indonesia; The Jin Ai, Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta, Indonesia*

EVALUATION OF THE EXCHANGE PROGRAMS BY USING ANALYTIC HIERARCHY PROCESS *Bahar Celik, Dumlupınar University, Turkey; Ozden Ustun, Dumlupınar University, Turkey; Derya Deliktas, Dumlupınar University, Turkey*

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

The Jin Ai, Department of Industrial Engineering,
Universitas Atma Jaya Yogyakarta, Indonesia

050. Environmental Management in Protection Area

06 Environmental Application

Paper Session

11:00 to 12:30 pm

*Grand Hyatt: Floor Independence Level - McPherson
Square*

Participants:

AN ANP APPROACH FOR THE STAKEHOLDER
ANALYSIS IN PARTICIPATORY
ENVIRONMENTAL MANAGEMENT. THE CASE
OF SPANISH WETLAND LA ALBUFERA *Pablo
Aragonés-Beltrán, Universitat Politècnica de València,
Spain; Monica Garcia-Melon, Universitat Politecnica
de Valencia, Spain*

COMBINING AHP GROUP ANALYSIS AND GIS IN
VULNERABILITY ASSESSMENT OF PROTECTED
AREA IN VIETNAM *Huong Quynh Nghiem,
University of Greifswald, Germany*

MODELLING DECISION MAKING IN THE
MANAGEMENT OF NATIONAL PARKS *Monica
Garcia-Melon, Universitat Politecnica de Valencia,
Spain; Tomás Gómez-Navarro, Universitat Politècnica
de Valencia, Spain; Maria Blanca Fernández-Viñé,
Universidad Metropolitana de Caracas, Venezuela;
Diego Díaz-Martín, Universidad Metropolitana de
Caracas, Venezuela*

INFLUENCE OF PERCEPTION ON THE USE OF
NEIGHBOURHOOD PARKS IN MAKURDI *irene
doosuur Mnguty, Benue State University, Makurdi,
Benue State, Nigeria.*

Session Organizer:

Pablo Aragonés-Beltrán, Universitat Politècnica de

València, Spain
Session Chair:
Pablo Aragonés-Beltrán, Universitat Politècnica de
València, Spain

051. Tuesday lunch

ISAHP

Lunch

12:30 to 2:00 pm

Grand Hyatt: Floor Independence Level - Independence

FGHI

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

052. AHP Theory and Methodology 4

04 AHP Theory & Methodology

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

CONSTRUCTING HIGHLY CONSISTENT PAIRWISE
COMPARISON MATRICES IN ANALYTIC
HIERARCHY PROCESS (AHP) *Sahika Koyun, Yildiz
Technical University, Turkey; Vildan Cetinsaya Ozkir,
Yildiz Technical University, Turkey*

DEPENDENT AND INDEPENDENT CLUSTER
COMPARISONS IN THE SUPERMATRIX *Orrin
Cooper, University of Memphis, U.S.; Guoqing Liu,
University of Pittsburgh, U.S.*

DYNAMIC AVERAGING PROCESS FOR
INCOMPLETE INFORMATION CASE *Masaaki
Shinohara, Nihon University, Japan*

EFFECTIVENESS OF AHP IN THERMAL COMFORT
ASSESSMENT THROUGH PASSIVE DESIGN
ALLOCATION IN TROPICAL SCHOOL OFFICES
*Chan Siew Chong, INTI International University,
Malaysia*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Orrin Cooper, University of Memphis, U.S.

053. Industrial Engineering Applications 3

09 Industrial Engineering

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

AN INTEGRATED RANKING PROCEDURE FOR
REPLACEMENT DECISIONS OF CRITICAL
MEDICAL EQUIPMENTS *Tugba Efendigil, Yildiz
Technical University, Turkey*

APPLICATION OF THE METHOD AHP FOR
REDUCTION OF THE FINE IN
TELECOMMUNICATION COMPANIES *Rodrigo
Araújo Pereira, Pontificia Universidade Católica de
Campinas, Brazil*

EVALUATION OF MANAGEMENT CONTROL
SYSTEMS IN TACTICAL- OPERATIONAL
LEVELS: AHP APPLICATION *Alina Díaz-Curbelo,
Universidad Central "Marta Abreu" de Las Villas,
Cuba; Michaerlys Marrero-Oviedo, Universidad
Central "Marta Abreu" de Las Villas, Cuba; Jhully
Paulin Martínez Giraldo, Researcher, Colombia*

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chair:

Alina Díaz-Curbelo, Universidad Central "Marta Abreu"
de Las Villas, Cuba

054. Fuzzy AHP

03 Fuzzy AHP Approach

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Independence C

Participants:

DETERMINATION OF THE IMPORTANCE OF THE
PROBLEMS IN ENTREPRENEURSHIP BY FUZZY
AHP - APPLICATION WITH FUZZY TOPSIS *ONUR
Kurtçu, Sakarya University, Turkey; Esra Tekez,
Sakarya University, Turkey*

FUZZY AHP MODEL FOR THE DETERMINATION
OF THE LOCATION OF THE NAVAL BASE
(STUDY OF THE MARITIME SECURITY AND
DEFENSE SYSTEM IN INDONESIA) *Raha Ahmadi,
Sekolah Tinggi Teknologi Angkatan Laut, Indonesia*

OBJECT-ORIENTED PROGRAMMING LANGUAGE
SELECTION USING FUZZY AHP METHOD *Seyed
Hajir Lesani, Atilim University, Turkey; babak
Daneshvar rouyendegh (B. Erdebilli), Atilim University,
Turkey*

PRIORITIZATION OF SUPPLIER SELECTION
CRITERIA IN BATIK INDUSTRY: A FUZZY-AHP
APPROACH *Aries Susanty, Department of Industrial
Engineering, Diponegoro University, Indonesia*

Session Organizer:

Jennifer Shang, University of Pittsburgh, U.S.

Session Chair:

Seyed Hajir Lesani, Atilim University, Turkey

055. Strategic Applications and Innovation

19 Strategic Applications

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

INTRODUCING A STRATEGY FOR SELECTION OF
FLOWING SYSTEMS USING HYBRID SWOT-AHP
METHOD *Kamran Afsahi, Zanzan University, Iran*

M&A AND PARTNERING AS EXTERNAL
CORPORATE GROWTH STRATEGIES – AN
AHP/ANP-BASED DECISION TOOL *Axel
Rossdeutscher, External Ph.D. candidate / WL BANK,
Germany*

USING ALIGNMENT WITH CORPORATE
STRATEGY FOR THE SELECTION OF A PROJECT
PORTFOLIO BASED ON ANP *Monica Garcia-Melon,
Universitat Politecnica de Valencia, Spain; Rocío
Poveda-Bautista, Universitat Politècnica de València,
Spain*

USING ANP TO DESIGN A LIVING SYSTEM LIKE
BALANCED OPERATING MODEL FOR
INTANGIBLE SERVICES *Angela Minzoni,
laboratoire génie industriel/ECP, France; Éléonore
Mounoud, Ecole Centrale Paris; Majid Fathizahraei,
Multimedia University, Malaysia*

Session Organizer:

Rocío Poveda-Bautista, Universitat Politècnica de
València, Spain

Session Chair:

Rocío Poveda-Bautista, Universitat Politècnica de València, Spain

056. AHP/ANP Mixed Methods, Optimization and Applications 4

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

INTEGRATING THE ANALYTIC HIERARCHY PROCESS METHODOLOGY INTO THE PROCEDURES OF DECISION MAKING IN GOVERNMENTAL AGENCIES *Asma M Bahurmoz, King Abdulaziz University, Saudi Arabia*

NUTRITIONAL DIAGNOSIS USING AHP WITH THE GARUTI INDEX COMPARED WITH DRIS METHODOLOGY: A CASE STUDY *Victor Gabriel Valenzuela, Universidad Técnica Federico Santa María, Chile*

LEADING INNOVATIVE TEAMS USING ANP *Sam Sharp, Numerix Pty. Ltd., Australia; Mark Long, Numerix Pty. Ltd., Australia*

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Asma M Bahurmoz, King Abdulaziz University, Saudi Arabia

057. Environmental and Strategic Assessment

06 Environmental Application

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

COMPARATIVE ASSESSMENT OF DISPOSABLE
PLATES FROM THE USER AND POLICY
PERSPECTIVE *Soumya Jain, Indian Institute of
Technology Bombay (IIT-B), India; Anand B Rao,
Centre for Technology Alternatives for Rural Areas
(CTARA), Indian Institute of Technology Bombay
(IITB)*

MULTICRITERIA SUSTAINABILITY
PERFORMANCE MEASUREMENT: ANP CUBAN
APPLICATION *Frank Medel-González, Universidad
Central "Marta Abreu" de Las Villas, Cuba; Valerio
Salomon, Sao Paulo State University, Brazil; Lourdes
García Ávila, Universidad Central "Marta Abreu" de
Las Villas, Cuba; Cecilia Toledo Hernandez, Federal
Fluminense University, Brazil*

STRATEGIC ASSESSMENTS AND SKYSCRAPERS:
AN APPLICATION OF THE ANP *Valentina Ferretti,
Politecnico of Torino, Italy*

USING MULTICRITERIA ANALYSIS TO SELECT
INDOOR HEATING ALTERNATIVES AT THE
SOUTH OF CHILE *Dante Caceres, Universidad de
Chile, Chile; Claudio Garuti, Fulcrum Ingenieria,
Chile; Luis Abel Quiñones, Universidad de Chile*

Session Organizer:

Claudio Garuti, Fulcrum Ingenieria, Chile

Session Chair:

Claudio Garuti, Fulcrum Ingenieria, Chile

058. Tuesday afternoon break

ISAHP

Break

3:00 to 3:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

059. AHP Theory and Methodology 5

04 AHP Theory & Methodology

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

EIGENVALUE METHOD AS A FULL MEASURING
TOOL *Igor Tomashevskii, Institute of Mathematics,
Information and Space Technologies, Northern (Arctic)
Federal University, Arkhangelsk, Russia*

EXPERIMENTAL EVALUATION OF THE
EFFECTIVENESS OF AN INTERACTIVE
INCONSISTENCY CORRECTION *Kyriacos
Antoniades, University of Portsmouth, UK; Alessio
Ishizaka, University of Portsmouth, U.K.*

GROUP DECISION AS APPROXIMATION OF
INDIVIDUAL INTERVAL WEIGHTS BY
INTERVAL AHP *Tomoe Entani, University of Hyogo,
Japan*

INVERSE PROBLEMS IN AHP *Masaaki Shinohara,
Nihon University, Japan*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Kyriacos Antoniades, University of Portsmouth, UK

060. Supply Chain Management

10 Supply Chain Management

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

APPLICATION OF ANALYTICAL NETWORK
PROCESS TO CUSTOMER ORDER SELECTION
PROBLEM: A CASE STUDY FOR A STRUCTURAL
STEEL COMPANY *Burcu Akyildiz, Istanbul Teknik
Universitesi, Turkey; Cigdem Kadaifci, Istanbul Teknik
Universitesi, Turkey; Ilker Topcu, Istanbul Teknik*

Universitesi, Turkey

BENEFITS ASSESSMENT OF TRAINING ON
SUPPLY CHAIN MANAGEMENT: THE CASE OF A
GLOBAL CHEMICAL CORPORATION *Claudemir
Leif Tramarico, Sao Paulo State University (UNESP),
Brazil; Fernando Augusto Silva Marins, UNESP - Sao
Paulo State University, Brazil; Ligia Maria Soto
Urbina, Technological Institute of Aeronautics, Brazil;
Valerio Salomon, Sao Paulo State University, Brazil*

MACROERGONOMICS EVALUATION OF A
LOGISTIC PROCUREMENT PROCESS IN A
PRODUCTION PLANT OF KITCHEN ITEMS
*Michaerlys Marrero-Oviedo, Universidad Central
"Marta Abreu" de Las Villas, Cuba; Alina Díaz-
Curbelo, Universidad Central "Marta Abreu" de Las
Villas, Cuba; Jorge Coello-Mena, Software
Development Constele. Inc, U.S.*

SUPPLY CHAIN RISK MANAGEMENT USING ANP
*Elena Rokou, National Technical University of Athens;
Konstantinos Kirytopoulos, University of South
Australia, Australia*

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.

Session Chairs:

Elena Rokou, National Technical University of Athens

Ilker Topcu, Istanbul Teknik Universitesi, Turkey

061. Information System

21 Information System

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Independence B

Participants:

COMBINATION OF AHP AND PROMETHEE FOR
MEASURING QUALITY OF OBJECT ORIENTED
SOFTWARE DESIGN *Petrus Mursanto, Universitas
Indonesia, Indonesia*

DETERMINATION OF A TASK'S VALIDITY IN THE
MARINE ENGINE ROOM OPERATING PROCESS

Piotr Kaminski, Gdynia Maritime University, Poland
RANKING CRITICAL SUCCESS FACTORS OF
HEALTHCARE MANAGEMENT INFORMATION
SYSTEMS USING AHP *Nizar Hussain M, Kerala*
University, India

Session Organizer:

Petrus Mursanto, Universitas Indonesia, Indonesia

Session Chair:

Petrus Mursanto, Universitas Indonesia, Indonesia

062. Human Resource Management

16 Human Resource Management

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Independence C

Participants:

AHP IN PERSONNEL MANAGEMENT: CAN THE
KEY COMPETENCIES CHANGE WITH
COMPANY'S STRATEGY? *Katerina Kashi, VSB -*
Technical University of Ostrava, Czech Republic; Jiri
Franek, VSB - Technical University of Ostrava, Czech
Republic

ANALYSIS OF THE FACTORS AFFECTING THE
DECISION MAKING PROCESS OF RECRUITMENT
AND SELECTION STRATEGIC POSITIONS *Alexis*
Olmedo, Andres Bello University, Chile; Felipe Rojas,
UNAB, Chile; Michael Alejandro Olivares, UNAB,
Chile; Paolo Herrera Manriquez, UNAB, Chile

DYNAMIC PROJECT PORTFOLIO MANAGEMENT
USING ANP *Petr Fiala, University of Economics,*
Czech Republic

THE IMPACT OF CLUSTER SETTING ON THE
PERCEIVED IMPORTANCE OF FORMAL VERSUS
INFORMAL REWARDS *Paul Mugurel Poleanschi,*
Bucharest University of Economic Studies, Rumania

Session Organizer:

Petr Fiala, University of Economics, Czech Republic

Session Chair:

063. Strategic Applications and Decision

Making

19 Strategic Applications

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

CASH & CARRY STORE LOCATION SELECTION
USING ANALYTIC NETWORK PROCESS: AN
APPLICATION IN TURKEY *Tuncay Gürbüç,*
Galatasaray University, Turkey; Hande Arik, MIGROS,
Turkey; Esra Yildiz Albayrak, Galatasaray University,
Turkey

MANAGEMENT STRATEGIES FOR TAIWAN
RESERVOIR CATCHMENT AREAS: A CASE
STUDY IN SHIH-MEN RESERVOIR CATCHMENT
AREA *Huang Hun-Feng, Tamkang University, Taiwan*

RUNWAY COMBINATION SELECTION OF
ISTANBUL ATATURK AIRPORT *Orhan Ertugrul*
Guclu, Anadolu University, Turkey; Cem Cetek,
Anadolu University, Turkey

SALES PREDICTION WITH MILTIAGENT TOWN
MODELS AND DECIDING STORE LOCATIONS
WITH AHP *Kazuhiro Kohara, Chiba Institute of*
Technology, Japan; Daiki Sekigawa, Chiba Institute of
Technology, Japan

Session Organizer:

Kazuhiro Kohara, Chiba Institute of Technology, Japan

Session Chair:

Kazuhiro Kohara, Chiba Institute of Technology, Japan

064. AHP/ANP Mixed Methods, Optimization and Applications 5

05 AHP/ANP Mixed Methods, Optimization and
Applications

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

PARAMETERS OF OPTIMUM HIERARCHY

STRUCTURE IN AHP *Stan S. Lipovetsky, GfK Custom Research North America, U.S.*

PROPOSING A DECISION MODEL FOR

PRIVATIZATION OF NEWSPRINT PAPER

INDUSTRY BY APPLYING ANP *Majid Azizi,*

University of Tehran, Iran; Mohammad Modarres, University of Sharif, Iran

RANKING THE CROSS-BORDER TECHNOLOGY

ACQUISITION MODES, COMBINING TOPSIS AND

ANP METHODES FOR MODEL DEVELOPMENT:

CASE STUDY OF CAR PART INDUSTRY IN IRAN

Somayeh Sahebi, Islamic Azad University, Iran; Arash Rdmehr, Author, Iran; Zeinab Sahebi, Author, Iran

SELECTION OF ELECTROCARDIOGRAPH FOR A

CARDIOLOGY DEPARTMENT USING ANP *Gulcin*

Bektur, Eskişehir Osmangazi University, Industrial Engineering Department, Turkey

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Stan S. Lipovetsky, GfK Custom Research North America, U.S.

065. Sustainability Application

07 Sustainability and Social Responsibility

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

AN INNOVATIVE MULTI-CRITERIA DECISION

METHOD FOR IMPACTS' ASSESSMENT OF

UNESCO BRAND *Paola Boati, Politecnico di Torino,*

Italy

COMPARISON OF HOUSEHOLD LEVEL DRINKING
WATER TREATMENT TECHNOLOGIES USING
ANALYTIC HIERARCHY PROCESS *Deepthi*

*Yaparla, Environmental and Water Resources
Engineering Civil Engineering Department Indian
Institute of Technology Madras, India; Anand B Rao,
Centre for Technology Alternatives for Rural Areas
(CTARA), Indian Institute of Technology Bombay
(IITB); Bakul Rao, Centre for Technology Alternatives
for Rural Areas (CTARA), Indian Institute of
Technology Bombay (IITB)*

DEVELOPING AN ENVIRONMENTAL
SUSTAINABILITY INDEX FOR A BUILDING
ASSESSMENT AND CERTIFICATION SYSTEM IN
CHILE *Jose Tomas Videla, Chile; Claudio Garuti,
Fulcrum Ingenieria, Chile*

FAILING THE WALL OF MARGINALIZATION AND
PROVIDING ELECTRICITY FOR ALL: DECISION
MAKING ON SMART SYSTEMS INTEGRATION
USING AHP *Fairouz Iberraken, University of Bejaia,
Algeria; Rabah Medjoudj, University of Bejaia,
Algeria; Djamil Aissani, University of Bejaia, Algeria*

Session Organizer:

Rabah Medjoudj, University of Bejaia, Algeria

Session Chair:

Rabah Medjoudj, University of Bejaia, Algeria

066. Gala Dinner - Odyssey Boat

ISAHP

Reception

5:00 to 9:00 pm

Odyssey Boat: Odyssey Boat

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

067. Plenary Session: A New Revolution in Conflict Resolution

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

H. J. Zoffer, University of Pittsburgh

Session Organizer:

Enrique Mu, Carlow University, U.S.

068. AHP Theory and Methodology 6

04 AHP Theory & Methodology

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

MANY HANDS MAKE WORK LIGHT OR NOT? A
NOVEL TOOL FOR GROUP DECISION MAKING
WITH ANP *Elena Rokou, National Technical
University of Athens*

MEASURING IN WEIGHTED ENVIRONMENTS
Claudio Garuti, Fulcrum Ingenieria, Chile

MINING METHOD SELECTION METODOLOGY BY
MULTIPLE CRITERIA DECISION ANALYSIS -
CASE STUDY IN COLOMBIAN COAL MINING
*Jorge Ivan Romero, Escuela Colombiana de Carreras
Industriales, Colombia; Felix Antonio Cortes Aldana,
Universidad Nacional de Colombia, Sede Bogota,
Colombia*

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chairs:

Claudio Garuti, Fulcrum Ingenieria, Chile

Elena Rokou, National Technical University of Athens

069. ANP in Supply Chain Management

10 Supply Chain Management

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

SELECTION OF A THIRD PARTY LOGISTICS SERVICE PROVIDER FOR AN AEROSPACE COMPANY: AN ANALYTICAL NETWORK PROCESS APPROACH *Birsen Karpak, Youngstown State University, U.S.; Ozden Bayazit, Central Washington University, U.S.*

ANALYTICAL NETWORK PROCESS (ANP): METHOD FOR HELPING MANAGERS LEARN, IMPROVE FIRM CAPABILITIES AND GAIN A COMPETITIVE ADVANTAGE *Ramesh Dangol, Youngstown State University, U.S.; Mona Bahl, Youngstown State University, U.S.; Birsen Karpak, Youngstown State University, U.S.*

AHP/ANP FOR SUSTAINABLE SUPPLY NETWORKS *Birsen Karpak, Youngstown State University, U.S.; Stephen Taraszewski, Youngstown State University, U.S.*

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.

Session Chair:

Mona Bahl, Youngstown State University, U.S.

070. Strategic Applications Study

19 Strategic Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

A REVIEW AND CRITIQUE OF HYBRID MADM METHODS APPLICATION IN REAL BUSINESS *Jiri Franek, VSB - Technical University of Ostrava, Czech Republic; Katerina Kashi, VSB - Technical University*

of Ostrava, Czech Republic

DEVELOPING A BUSINESS PERFORMANCE
MANAGEMENT MODEL *Ahmad Hasan Maharma,*
Project Manager, Palestinian Territory

MULTICRITERIA APPROACH FOR EVALUATION
OF SCENARIOS GENERATION MODELS APPLIED
TO THE MEDIUM-TERM HYDROTHERMAL
OPERATION PLANNING *Hugo Ribeiro Baldioti,*
PUC-Rio, Brazil; Bruno Agrelino Ribeiro, PUC-Rio,
Brazil; Reinaldo Castro Souza, PUC-Rio, Brazil

USING AHP TO REVEAL AN AUDIENCES
AUTHENTIC NEEDS AND DEVELOP A
STRATEGY TO ACHIEVE COMPETITIVE
ADVANTAGES *David Beecher Brauer, Durham*
University Business School, UK

Session Organizer:

David Beecher Brauer, Durham University Business
School, UK

Session Chair:

David Beecher Brauer, Durham University Business
School, UK

071. Analytic Hierarchy Process and Multicriteria Decision Making 1

25 Miscellaneous

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

AN APPLICATION OF INCOMPLETE PAIRWISE
COMPARISON MATRICES FOR RANKING TOP
TENNIS PLAYERS *Jozsef Temesi, Corvinus*
University of Budapest, Hungary; Sándor Bozóki,
Institute for Computer Science and Control, Hungarian
Academy of Sciences; László Csató, Corvinus
University of Budapest, Hungary

HUMAN VALUES ASSESSMENT IN HIGHER
EDUCATION INSTITUTION THROUGH AHP *Astrid*

Maria Oddershede, usach, Chile; Patricia Salome Jarufe, Universidad Diego Portales, Chile

IMPLEMENTATION OF ANALYTIC HIERARCHY PROCESS IN SOLVING TRAFFIC PROBLEMS

Danijela Baric, University of Zagreb Faculty of Transport and Traffic Sciences, Croatia

PRIORITIZATION OF PROBLEMS FACING COCOA FARMERS IN COUNTY CARONI TRINIDAD AND TOBAGO

Elroy Lester Wilson, University of the West Indies; Hazel Patterson-Andrews, University of the West Indies Trinidad and Tobago

Session Organizer:

Astrid Maria Oddershede, usach, Chile

Session Chair:

Astrid Maria Oddershede, usach, Chile

072. AHP/ANP Mixed Methods, Optimization and Applications 6

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

SINGLE MACHINE SCHEDULING WITH SEQUENCE-DEPENDENT SETUP TIMES BY USING AHP AND MULTI-CHOICE GOAL PROGRAMMING

Derya Deliktas, Dumlupınar University, Turkey; Orhan Torkul, Sakarya University, Turkey; Ozden Ustun, Dumlupınar University, Turkey; Safak Kiris, Dumlupınar University, Turkey

STRATEGY FOR AGRICULTURAL DEVELOPMENT IN ZANJAN CITY, IRAN: APPLICATION OF SWOT-AHP METHOD

Mostafa Nazari Nasab, science and research branch islamic azad university, Iran; Majid Azizi, University of Tehran, Iran

SYSTEMIC APPROACH FOR HISTORICAL MONUMENTS MAINTENANCE DECISION

SUPPORT *Mirosław Dytczak, AGH University of Science and Technology, Poland; Grzegorz Ginda, AGH University of Science and Technology, Poland*

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Derya Deliktas, Dumlupınar University, Turkey

073. Disaster Management

13 Disaster Management

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

A METHOD OF RISK ANALYSIS AND THREAT MANAGEMENT USING AHP: AN APPLICATION TO AIR DEFENSE SYSTEM *Gurinder Malik, DRDO, India; Sumanta Das, DRDO, India*

SITUATIONAL AWARENESS WINDOWS FOR DISASTER MANAGEMENT – A SYSTEMS APPROACH USING DSM AND AHP *Navneet Bhushan, Crafitti Consulting Limited, India*

STRATEGIC PLANNING IN CRISIS SITUATIONS *Gurinder Malik, DRDO, India; Arun Dayal, DRDO, India; Varun Kumar Singh, DRDO, India; Rajiv Gupta, DRDO, India*

THE IMPACT OF PERSONAL FACTORS ON GIS ADOPTION IN CRISIS MANAGEMENT ORGANIZATIONS *Azita Asadi, Universiti Putra Malaysia, Malaysia; Govindan Marthandan, Multimedia University; Majid Fathizahraei, Multimedia University, Malaysia; Murali Raman, Multimedia University*

Session Organizer:

Navneet Bhushan, Crafitti Consulting Limited, India

Session Chair:

Navneet Bhushan, Crafitti Consulting Limited, India

074. Wednesday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

075. AHP Theory and Methodology 7

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

SELECTION OF CHAIN-MATERIAL IN

AUTOMOBILE SECTOR USING MULTI

ATTRIBUTE DECISION MAKING APPROACH

Harwinder Singh, Guru Nanak Dev Engineering

College Ludhiana, India; Raman Kumar, Chandigarh University, India

USING ANALYTICAL HIERARCHY PROCESS (AHP)

Hussain Sinjar Alsamaray, Applied Science University, Australia

USING PRINCIPAL COMPONENTS ANALYSIS FOR
AGGREGATING JUDGMENTS IN THE ANALYTIC

HIERARCHY PROCESS *Natalie Scala, Towson*

University, U.S.; Jayant Rajgopal, University of

Pittsburgh, U.S.; Luis G Vargas, University of

Pittsburgh, U.S.; Kim LaScola Needy, University of Arkansas, U.S.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Natalie Scala, Towson University, U.S.

076. Strategic Applications

19 Strategic Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

ANALYSIS AND EVALUATION OF ALTERNATIVE SITES FOR A NEW HEAVY CRUDE UPGRADING PLANT IN COLOMBIA *Mario Castillo, Universidad de los Andes, Colombia; Astrid Johanna Bernal, Universidad de los Andes, Colombia; John Ríos, Universidad de los Andes, Colombia; César Bejarano, Ecopetrol S.A., Colombia; Óscar Martínez, Ecopetrol S.A., Colombia*

ANALYSIS OF AGRICULTURAL MECHANIZATION IN ZANJAN PROVINCE, IRAN: APPLICATION OF SWOT-AHP METHOD *Mostafa Nazari Nasab, science and research branch islamic azad university, Iran; Majid Azizi, University of Tehran, Iran*

THE APPLICATION RESEARCH ON WUHAN IRON AND STEEL CORPORATION SUSTAINABLE DEVELOPMENT DECISION-MAKING IN LOW-CARBON ECONOMY WITH ANP *Ling Zhang, Wuhan University of Science and Technology, China*

STRATEGIC MODEL OF TIN MINING INDUSTRY IN INDONESIA (CASE STUDY BANGKA BELITUNG PROVINCE) *Rudy Irawan, Bogor Agricultural University (IPB), Indonesia*

Session Organizer:

Mario Castillo, Universidad de los Andes, Colombia

Session Chair:

Mario Castillo, Universidad de los Andes, Colombia

077. Analytic Hierarchy Process and Multicriteria Decision Making 2

25 Miscellaneous

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

QUANTIFYING PERCEPTIONS OVER THE STUDENTS' MAIN REWARDS IN HIGHER EDUCATION: MOTIVATIONAL THEORIES VERSUS SPECIFIC CONSTRUCTS *Razvan Bucur, Bucharest University of Economic Studies, Romania; Adriana Agapie, Bucharest University of Economic Studies, Romania; Shahrazad Hadad, Bucharest University of Economic Studies, Romania*

SITUATIONAL AWARENESS EFFECTIVENESS USING AHP *Rahim Jassemi-Zargani, DRDC Ottawa, Canada*

USING THE ANALYTIC HIERARCHY PROCESS IN UNIVERSITY RANK AND TENURE COMMITTEE DECISIONS *Cynthia Mari Busin Nicola, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

WIKIPEDIA AND AHP/ANP *Louis F. Sander, U.S.*

INTERNAL CAPABILITY BASED ON AHP AND EXTERNAL LINKAGES IN THE INNOVATION OF IN ASEAN FIRMS *Masatsugu Tsuji, University of Hyogo, Japan*

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Louis F. Sander, Carlow University, U.S.

078. AHP/ANP Mixed Methods, Optimization and Applications 7

05 AHP/ANP Mixed Methods, Optimization and Applications
Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

TARGET SETTING FOR INDIRECT PROCESSES: A NEW HYBRID METHOD FOR THE CONTINUOUS IMPROVEMENT MANAGEMENT OF INDIRECT PROCESSES *Sebastian Ihrig, TU Munich, Germany; Alessio Ishizaka, University of Portsmouth, U.K.; Alwine Mohnen, TU Munich, Germany*

USING TRACKING COLUMNS TO IMPROVE OPTIMIZATION WITH A GENETIC ALGORITHM *Gavin Byrnes, Decision Lens, U.S.*

WEIGHTED EUCLIDEAN CENTERS AND INTERVAL RECIPROCAL MATRICES *Luis G Vargas, University of Pittsburgh, U.S.; Ami Arbel, School of Engineering at Tel Aviv University, Israel*

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Luis G Vargas, University of Pittsburgh, U.S.

079. Civil and Urban Applications

15 Civil and Urban Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

IMPLEMENTING AHP APPROACH TO SELECT A PROPER METHOD TO BUILD HIGH-RISE BUILDING (CASE STUDY: TEHRAN) *Amir Hesam Zamani Kia, Iran; Mehdi Mahdavi Adeli, Faculty Member, Iran*

PROVIDE A MODEL TO SELECT PROPER
DELIVERY SYSTEM FOR RAILWAY PROJECTS
IN IRAN *Kobra Gharouni Jafari, Student, Iran;*
Esmatullah Noorzai, Student, Iran; seyed reza
Makkiabadi, Student, Iran; Rouhollah Heshmat Nejad,
Contractor, Iran

SYSTEMIC BUILDING LCA *Mirosław Dytczak, AGH*
University of Science and Technology, Poland;
Grzegorz Ginda, AGH University of Science and
Technology, Poland

THE IDEA OF THE OLYMPIC WINTER GAMES IN
2022 IN KRAKOW *Wiktoria Adamus, Jagiellonian*
University Krakow, Poland

Session Organizer:

Grzegorz Ginda, AGH University of Science and
Technology, Poland

Session Chair:

Wiktoria Adamus, Jagiellonian University Krakow, Poland

080. Lunch and Closing Plenary

ISAHP

Lunch

12:30 to 1:30 pm

Grand Hyatt: Floor Independence Level - Independence
FGHI

Session Organizer:

Enrique Mu, Carlow University, U.S.

081. Accepted Papers that will not be presented

25 Miscellaneous

Panel

1:30 to 2:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

AN EMPIRICAL IDENTIFICATION OF VENDOR SELECTION PROCESS VIA DEPLOYMENT OF MULTIPLE ATTRIBUTE DECISION MAKING (MADM): COMPARISON AMONG SWEDISH AND IRANIAN COMPANIES *Mostafa Deldoost, Ferrara University, Italy; Antonella Petrillo, University of Naples "Parthenope", Italy; Fabio De Felice, University of Cassino and Southern Lazio, Italy*

DEVELOPMENT OF AN INNOVATIVE AHP-BASED DECISION SUPPORT SYSTEM IN THE FIELD OF IT SERVICE MANAGEMENT *Martin Jantscher, FH JOANNEUM, University of Applied Sciences, Austria; Christopher Schwarz, FH JOANNEUM, University of Applied Sciences, Austria; Erwin Zinser, FH JOANNEUM, University of Applied Sciences, Austria*

SIMULATION MODEL FOR DISASTERS AND EMERGENCIES MANAGEMENT FOR SAFETY AND SECURITY IN INDUSTRIAL PLANTS *Fabio De Felice, University of Cassino and Southern Lazio, Italy; Antonella Petrillo, University of Naples "Parthenope", Italy; Francesco Longo, University of Calabria, Italy; Laura Cirillo, University of Calabria, Italy*

Session Organizer:

Enrique Mu, Carlow University, U.S.

PROGRAM SCHEDULE
&
ABSTRACTS

001. ANP Sensitivity and Influence Analysis

ISAHP

Workshop

1:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Super Decisions has different kind of sensitivity calculation called "ANP Row Sensitivity" developed by Bill Adams for Decision Lens Inc. This workshop will cover both the usage and interpretation of these calculations as well as its theoretical basis.

Presenter:

William Adams, Decision Lens Incorporated, U.S.

Session Organizer:

Enrique Mu, Carlow University, U.S.

002. Sunday afternoon break

ISAHP

Break

3:00 to 3:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

003. Facilitating Group Decision Making

ISAHP

Workshop

3:30 to 5:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Daniel Saaty has more than 20 years of experience in facilitating group decision making sessions based on AHP with all sizes of groups. He will cover both theoretical questions facilitators may have and the psychological aspects of dealing with groups.

Presenter:

Daniel Saaty, Decision Lens
Session Organizer:
Enrique Mu, Carlow University, U.S.

004. Compatibility of AHP/ANP Vectors with Known Results

ISAHP

Workshop

5:00 to 5:45 pm

Grand Hyatt: Floor Independence Level - Independence DE

Presentation of a suggested new index of compatibility in weighted environments. How well do your derived priorities match some known results. Registration fee: No Charge.

Presenter:

Claudio Garuti, Fulcrum Ingeniería, Chile

Session Organizer:

Enrique Mu, Carlow University, U.S.

005. Welcoming reception

ISAHP

Reception

6:00 to 8:00 pm

Grand Hyatt: Floor Constitution Level - Constitution A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

**006. Plenary Session: Some Mathematics of
the AHP, ANP and NNP**

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

Thomas L. Saaty, University of Pittsburgh, U.S.

Session Organizer:

Enrique Mu, Carlow University, U.S.

007. AHP Methodology and Application

04 AHP Theory & Methodology

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

In this session, four scholars were invited to present their studies in AHP methodology and its application. Dr. Wang proposes an AHP methodology with gray theory to establish judgment matrix for the AHP, PhD. Peng constructs an AHP model with maximizing deviation method to evaluation regional innovation, Dr. Dong proposes a group AHP consensus reaching model for supplier selection in collaborative product development, Dr. Zhu proposes a weighted geometric aggregation AHP model to preserve rank in AHP.

Participants:

A GREY NUMBER APPROACH TO ESTABLISH JUDGMENT MATRIX IN AHP

Xiaojia Wang, School of Management, Hefei University of Technology, China; Jennifer Shang, University of Pittsburgh, U.S.

Multiple attribute decision making (MADM) is becoming an important part of modern decision science. It has been extensively applied to various areas such as society, economics, management, etc., and has been receiving more and more attention over the last decades. However, owing to the increasing complexity of decision, the uncertainty of decision information growing sharply and the multi-period multi-attribute decision making has become the focus of people's attention. Therefore, this study proposes a multiple attribute decision making model (MADM) which takes the AHP technique as main structure, integrating the concepts of grey number into it to cope with uncertain information. An emerging market stock selection example is employed to demonstrate the feasibility and practicability of the proposed model. Results show that the proposed model is efficient and robust, and is practical for real world applications.

EVALUATION OF REGIONAL INNOVATION IN CHINA USING AHP AND MAXIMIZING DEVIATION METHOD

Zhanglin Peng, School of Management, Hefei University of Technology, China; Shanlin Yang, School of Management, Hefei University of Technology, China; Xiaojia Wang, School of Management, Hefei University of Technology, China

This paper is researched to evaluate regional innovation capability in 31 districts (provinces, municipalities & Autonomous Regions) in China from 2006 to 2008 using the Analytical Hierarchy Process (AHP) and maximizing deviation method. There are both certain information and uncertain information in the processing of evaluating regional innovation capability. In order to get more precise results, we use the analytical hierarchy process to deal with certain information, and use maximizing deviation method to handle some uncertain information, then we get the attribute weight (just caused by the importance of the attributes or criteria) vector and variable weight (just caused by the discrepancy of the attribute values) vector in the evaluation model. In this paper, the data of science & technology achievements in 31 Chinese districts from 2006 to 2008 is collected. We compare them by ranking all districts through the evaluation results of regional innovation capability.

A GROUP AHP CONSENSUS REACHING MODEL FOR SUPPLIER SELECTION IN COLLABORATIVE PRODUCT DEVELOPMENT

Qingxing Dong, Central China Normal University, China; Keyu Zhu, Hefei University of Technology, China

Group consensus is an essential factor of a successful group decision. However, judgments are always diverse in the real world. Thus supporting the process of consensus reaching is of great significance. To improve the group consensus, the moderator of a

group can give some recommendations to the incompatible decision makers to revise extreme opinion. Also, in an autocratic group, where the decision makers are the experts or consultants providing their suggestion to the leader or client, the moderator can adjust the weight or importance of the incompatible decision maker to reduce the perturbation from the extreme opinion. In this paper, we propose a consensus reaching model for the autocratic group decision, where the members use the Analytic Hierarchy Process (AHP) to express their judgment. In this dynamic and interactive model, a moderator suggests the incompatible expert to revise his/her judgment. If the expert rejects this suggestion, his/her importance weight will be adjusted downward. This process supports the leader or client to make a successful decision with a dispersed group of expert by improving the consensus level in this group. Finally, a numerical example is given to illustrate the validity of the proposed consensus reaching model.

RESOLVING RANK REVERSAL IN CONSISTENT AND INDEPENDENT AHP MODEL

Keyu Zhu, Hefei University of Technology, China; Orrin Cooper, University of Memphis, U.S.; Shanlin Yang, School of Management, Hefei University of Technology, China

An open question that has existed for some time now is how to preserve rank in the AHP when a new alternative is added or when one is deleted. The essential conditions are that all judgments be consistent and all elements are independent; these have not been fully considered by the AHP critics and defenders. When a new alternative is added or when one is deleted, rank should be preserved when the conditions are satisfied. The weighted geometric mean aggregation rule is proposed to achieve the desired outcome. A proof demonstrates that the weighted geometric mean aggregation rule can preserve rank in the normalized priority vector.

Finally, the causes of rank reversal are analyzed: the principal eigenvector approach and the relative mode, and derive that they are not the real reasons of rank reversal.

Session Organizer:

Keyu Zhu, Hefei University of Technology, China

Session Chair:

Keyu Zhu, Hefei University of Technology, China

008. Manufacturing

11 Manufacturing

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

HOW TO CHOOSE THE BEST BLEND USING AHP: THE SIGNIFICANCE OF SENSORY EVALUATION *George A. Elmasides, SEKAP S.A., Greece*

This paper aims to give a structured solution to the complicated and knotty problem of selecting the best blend for the needs of any tobacco manufacturing company. The decision in cases like choosing the most appropriate blend –among a number of candidates– becomes an arduous task because the criteria that are taking into account involve measurable (objective) and also subjective or intangible factors. Analytic Hierarchy Process – AHP, is a widely accepted process for establishing priorities in multi-criteria decision problems, incorporating both objective and subjective considerations in the decision process. The implementation of AHP in the specific decision making indicated the suitable blend and also demonstrated the significance of sensory criterion. Finally, the use of the structure is recommended – with slight or extensive modifications– for companies that panel of experts is involved in Quality Control or R&D, such as Food Industries, Wine Manufacturing and Cosmetic Companies.

IMPROVING PERFORMANCE OF SME’S USING SUPPLY CHAIN FRAMEWORK AND MULTI- CRITERIA DECISION METHODOLOGY *Madani Abdu Alomar, University of Windsor, Canada; Zbigniew J. Pasek, University of Windsor, Canada*

This paper proposes a model that will assist enterprises, in particular small and medium-sized

manufacturing enterprises (SMEs), assess their supply chain performance by prioritizing supply chain strategic attributes and processes and selecting an adequate strategy under various market demand scenarios. The outlined model utilizes and integrates the SCOR framework standard performance attributes and processes and AHP approach to construct, link, and assess a four level hierarchal structure. The model also may help SMEs in deciding how much emphasis to place on supply chain operations and management.

INNOVATION CAPACITY AND POTENTIAL IN INDONESIAN MANUFACTURING SECTOR *Novi*

Maryaningsih, Bank Indonesia; Oki Hermansyah

Febrianto, Bank Indonesia

Manufacturing sector with comparative advantage, product diversification, and integration to global supply chain network will support sustainability of domestic economy. Manufacturing sector is the fourth largest in labor absorption as it constitutes 26.8% of total GDP (average 2005-2010).

Nevertheless, its growth deteriorates, from 9.2% yoy (1991-1996) to 4.0% yoy (2005-2010). The decrease indicates some problems in labor productivity and competitiveness of domestic firms in manufacturing sector, which are lack of productivity and technological progress in manufacturing sector respectively. Both aspects are mainly determined by presence of high-skilled labor and R&D activity.

Based on the background, this study is to reveal the innovation capacity and potential development in manufacturing sector based on Large and Medium Enterprise Statistic survey of Statistics Indonesia (BPS). To obtain weights of determinant factors of innovation capacity and potential, we used Analytic Network Process (ANP) method to gauge innovation level of each firm in manufacturing sector. This study found that most of Indonesian manufacturing firms have a low R&D activity. About 74% (16.851 firms)

categorized as low innovation, whilst 5% (1.152 firms) considered as high innovation. These facts themselves reflect the capability of firms to compete in the global market through exports. Of low level firms, merely 15% (2.516 of 16.851 firms) is involved in export activity. On the contrary, 49% (561 of 1.152 firms) of high innovation level is involved in export activity, mainly in food, chemical, furniture, and textile sectors. By spatial, highly innovative firms which doing exports mainly located in Java. It is possibly due to a high quality of infrastructure and human capital support which is relatively better in Java than any other parts in Indonesia.

MAX-PROD EIGENVECTORS AND CONSISTENCY OF THE PREFERENCE

MATRIX *Hana Tomášková, University of Hradec Králové, FIM, Czech Republic; Martin Gavalec, University of Hradec Kralove, Czech Republic*

Analytical Hierarchy Process can be described as a mathematical model of multi-criteria decision making that uses the decomposition of a complex unstructured situation into simpler parts - the hierarchical system. Using subjective pairwise comparisons the numerical values are assigned to individual components, showing their relative importance. In the paper the preference matrix is preferably processed in the max-prod algebra, which is close to the classical linear algebra. By max-prod algebra we understand a linear structure on a linearly ordered set of real numbers together with the binary operations maximum and multiplication (product), similarly as the addition and multiplication operations are used in the classical linear algebra. The preference matrix usually is not consistent, so the problem in this paper is formulated as finding the closest consistent approximation of the given preference matrix.

Session Organizer:

Martin Gavalec, University of Hradec Kralove, Czech
Republic

Session Chair:

Martin Gavalec, University of Hradec Kralove, Czech
Republic

009. Risk Analysis Study

14 Risk Analysis

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

**AN INTEGRATED APPROACH FOR
MANAGEMENT OF GLOBAL RISKS** *Pawan
Desai, None, India; Karthikeyan Iyer, Verchaska
Infotech Private Limited, India*

Until recently, businesses across the world have grown locally before venturing on a global scale. As a result, current risk management approaches are optimized to manage localized risks i.e. internal or in the immediate business environment. Risk managers are also attuned to these practices. Risk related decisions are taken by a small set of business leaders. However, in an increasingly networked world, businesses serve global customers using global infrastructure, resources and knowledge. Local events are having increasingly global impact. Decision makers are globally distributed. Without the ability to construct an effective big picture of risk, most risk managers try to manage risks locally and hope that super-system risks will manage themselves. Often, local risks are simplistically extrapolated or magnified with sub-optimal results. There are proven frameworks in prior art that address elements of the problem. Scenario Writing helps to explore how a business, its ecosystem and risks therein are expected to evolve globally. The Nine Windows approach helps organize risks using a scalable space-time representation. The Analytic Hierarchy Process allows experts to organize global risks in a hierarchy and build consensus on the relative impact of those risks at local and global scales. This paper describes a framework that combines Scenario Writing, Nine Windows and The Analytic Hierarchy Process to help businesses manage global risks. The paper also

presents a case to study to illustrate the benefits of this framework over conventional localized risk management approaches.

MCDM APPROACHES IN PROPERTY

INVESTMENTS: AN AHP MODEL FOR RISK

ASSESSMENT *Chiara D'Alpaos, DICEA - University of Padova, Italy; Rubina Canesi, DICEA, University of Padova, Italy*

When the future is uncertain and investments are durable and illiquid the decision to invest at a certain time contingent to new information to come as well as the correct assessment of risks are a key issues especially in times of global financial crisis. The existence of a well-functioning capital market allows investors with different time patterns of income and desired consumption to agree on whether real estate investment projects should be undertaken. In order to make the decision, investors need to measure risks and identify the relationship between risks borne and risk premiums demanded: developers have to determine how much risk they can tolerate, the return they need and its timing. Real estate development is de facto a dynamic multiphase process involving land development, followed by residential and/or commercial development, ending with the eventual marketing phase through the sale or leasing of the completed site. The three phases of the housing industry are interrelated, and each stage involves various risks, differently allocated between landowners, land developers, and homebuilders. The aim of this paper is to provide an operational framework to address risk and uncertainty by an integrated approach. More precisely, the paper proposes a procedure for a synthetic risks assessment that, based on the AHP model, will help investors to manage risk exposure and opportunities in property investments. Numerical examples on urban development projects are presented in order to test the effectiveness of the AHP model in supporting

decisions and adapting strategies to a permanently changing environment.

**SOCIAL MEDIA RISK MANAGEMENT
STRATEGY - APPLYING THE ANALYTIC
HIERARCHY PROCESS** *Kanwal Rai, Capgemini,
India*

Kanwal Rai (kanwal.raï@capgemini.com) Navneet Bhushan (navneet.bhushan@crafiti.com) Social Media is an ever emerging dynamic and complex ecosystem of people and communication process supported by diversified set of underlying digital technology platforms. The complexity and impact of this information system grows exponentially as it tends to become vibrant and volatile with multiplicity of choices for content, channels and active communities on a social network. It is being observed that such an emotional vibrancy in the digital network reaches a tipping point quite often, wherein an impact, positive or negative, spills beyond the social limits of the technology platforms, and paves its path into the physical world with far reaching repercussions, almost on instant basis, without any respect for the geographical measures of control and containment. There are no set predefined guidelines or obligations that can be imposed on it as levers to fully control the risks associated with the negative impacts, as they are shepherd by the diversified set of spontaneous perspectives and intents embedded within a sensitivity of a context. In short, an effective and targeted response to control or eliminate the risk or disaster originating from these social media platforms, can be designed and executed only after a thorough analysis of impacts, under consideration. Although a specific risk response is to be designed to address a specific negative impact, present under a given context, pre-acquired knowledge of meta-characteristics of various dimensions of social media system behavior like intent, content, channel, context and impact would help in selecting the right strategy

for a risk response. The key objective of this paper is to systematically structure and analyze various characteristics of social media and provide an AHP based framework to compute their significance for risk management team in designing the best possible risk response strategy.

Session Organizer:

Chiara D'Alpaos, DICEA - University of Padova, Italy

Session Chair:

Chiara D'Alpaos, DICEA - University of Padova, Italy

010. Medical and Health Applications

23 Medical and Health Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

APPLICATION OF ANALYTICAL HIERARCHY PROCESS (AHP) MODEL TO DETERMINE PATIENTS PERCEPTION TOWARDS SERVICE QUALITY OF PUBLIC HOSPITALS IN NIGERIA

*Emmanuel Olateju Oyatoye, University of Lagos,
Nigeria; Bilqis Bolanle Amole, Department of Business
Administration, University of Lagos, Nigeria; Sulaimon
Olanrewaju Adebisi, Business Administration
Department, Federal University of Agriculture, Nigeria*

Patients nowadays are more aware and more quality conscious than before as they stand to reason that a high level of quality can translate into patient satisfaction and this is important for a health care providers as they deal with life. This recognition by both the service provider and service receivers made government to establish units of service commission (SERVICOM) in each of the government agency including hospitals in Nigeria to monitor the level of quality of service delivery. However, to what extent does patients' perceptions about health services seem to have been largely recognized in the recent years by health care providers despite the (SERVICOM) unit? This led us to determine the perception of patients towards service quality delivery of public hospitals in Nigeria with the help of analytical hierarchy process (AHP) model to assess and prioritize the generic dimensions or factors for measuring service quality from the perspective of the patients. Questionnaire was formulated in an AHP format and distributed among the two hundred patients of the two public hospitals and responses obtained from them were analyzed accordingly. The findings indicate that the dimensions significantly affect the patients'

satisfaction. More specifically, among the five perceived service quality dimensions, tangibles dimension is the least satisfied one. Of particular interest is the attitude of medical Doctors and Nurses to patients' care and duty. However, service charges dimension was the most satisfying one as it cannot be compared to the high charges of private hospitals of comparable status. Thus, this study has implication for decisions on effective monitoring of the entire health system towards enhancing quality service delivery that will increase patient satisfaction which is the mission for establishing hospitals.

THE APPLICATION OF ANALYTIC NETWORK PROCESS IN HOSPITAL MANAGEMENT

Xiu Ning, Tsinghua University, China

Since the Analytic Network Process (ANP) was put forward, it has been widely applied in the many fields, such as conflict analysis, strategic planning. However, there are few applications of ANP relating to hospital management. This paper introduces ANP in the analysis of nosocomial infection and the evaluation of doctors' performance, which are two important aspects of hospital management. As a result, the main reasons of nosocomial infection can be determined and the performance of doctors can be systematically calculated, which will greatly benefit the hospital management.

USING ANALYTIC HIERARCHY PROCESS (AHP) FOR ASSESSMENT OF NATIONAL HEALTH INSURANCE SCHEME SERVICE DELIVERY IN NIGERIA

Sulaimon Olanrewaju Adebisi, Business Administration Department, Federal University of Agriculture, Nigeria; Olanrewaju Paul Olonade, Institute of Operations Research of Nigeria, Nigeria

National health insurance scheme (NHIS) was implemented in Nigeria like many other policies of government aimed at enhancing citizen welfare, but the healthcare services received by patients from

healthcare providers as well as the healthcare needs of the workers whom were compel to make the contribution (percent of their monthly income) as matter of law are different in various dimension. This make the situation to be multicriteria and complex, thus, the need for evaluating NHIS service delivery in Nigeria from the perspective of workers of various organizations that has contributed and enjoys the services as patient using analytic hierarchy process. In simplifying the problem, an hierarchical model was built for assessing healthcare service delivery of NHIS in Nigeria with the determinant of good/effective health care service delivery as the goal, while five criteria; protect of families from the financial hardship; rising cost of healthcare services; equitable distribution of healthcare costs, services delivery and healthcare services efficiency, also four levels of hospital were identified (FMC, general hospital, primary healthcare and private hospital) to serve as the alternatives. A pairwise comparison was carried out using the criteria and its sub, in relation to the goal and alternatives in order to enhance effective policy decisions that affect citizens' life positively. The results of the AHP survey reveal the priorities of the workers (patients) towards NHIS criteria so as to help at achieving effective healthcare service delivery in Nigeria as well areas that require overhauling in order for the insurance scheme to achieve its stated objectives. This study provides empirical based for assessment of NHIS implementation in Nigeria through it quantification of workers perception of the policy and the utilization of resources.

Session Organizer:

Xiu Ning, Tsinghua University, China

Session Chair:

Xiu Ning, Tsinghua University, China

011. Strategic Planning, Design and Implementation

05 AHP/ANP Mixed Methods, Optimization and Applications

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

In this session the papers focused on strategic planning, design and implementation using the AHP/ANP will be presented. The AHP/ANP is a powerful and flexible method for decision making, which help people set priorities and make the best decision when both qualitative and quantitative aspects of a decision need to be considered. This method can be applied in management, governing, education, design, allocation and distribution for strategic planning and making strategy decisions of high importance and responsibility. Using the AHP/ANP in strategic planning involves brainstorming the criteria and alternatives, connecting the criteria and alternatives according to ones best understanding, creating a structure in which to put the criteria and alternatives and their connections in a complete way, and prioritization of the influences on the outcomes to determine the best choice. Using the AHP/ANP in design requires a set of criteria and sub-criteria to create a structure that makes it possible to make a decision to select a best design to serve a certain function or functions subject to constraint. Implementation needs action strategies with their measures of effectiveness.

Participants:

A MULTI-CRITERIA JOB EVALUATION

METHOD FOR A STATE BANK *Ezgi Aktar*

Demirtas, Eskisehir Osmangazi University, Turkey;

Yeliz Buruk, Eskisehir Osmangazi University, Turkey;

Mujgan Sagir Ozdemir, ESOGU, Turkey

Wage management is an important task which affects the firm productivity in short term and the consistency of the firm's activities in long term. If an organization can't establish a fair wage policy among

the personnel, there will be a conflict in the organization. Establishment of a fair wage policy can be achieved by job evaluation. Job evaluation is a technique which is used to determine relative importance of all jobs in an organization. Jobs are evaluated with respect to ability, responsibility, effort, job conditions factors etc. So, job evaluation is a multi-criteria problem for organizations. In this study, a job evaluation methodology is developed by using Analytic Network Process (ANP) for a state bank. The relative importance of evaluation criteria are determined by an ANP model. The relative importance values are used to grade jobs with respect to one another by using Libaratore scale. This new methodology has a positive effect on competence and effective performance management system.

AHP BASED GROUP DECISION MAKING – CASE STUDY OF E-LEARNING IMPLEMENTATION IN PRE-TERTIARY EDUCATION *Nina Begicevic Redep, University of Zagreb, Croatia; Blazenka Divjak, University of Zagreb, Croatia*

In this paper we present overall methodology for strategic planning of e-learning implementation in education and put emphasis on the choice phase - group decision making with the AHP. Presented methodology combines e-readiness assessment, use of focus groups, the AHP and group decision making. It was implemented in Kosovo in the scope of EU-IT Pilot Project in the field of Education (EuropeAid/127855/D/SER/KOS). Strategic planning of e-learning implementation consists of four phases: Intelligence phase, Design phase, Choice phase and Implementation phase. During the Intelligence phase the central problem was identified and situation analysis performed. Central problem was to find sustainable approach for enhancing quality of education in Kosovo. The most important tools in this phase were questionnaire for e-readiness assessment, case study analysis, SWOT analysis, focus groups

and field research. Data that were gathered during e-readiness survey were very valuable for preparing the E-Readiness report for e-learning implementation in Kosovo. In the Design phase a lot of available documents were analyzed. Results from qualitative analysis and first focus group were systemized. After background research, analysis of proposed criteria/sub-criteria and alternatives essential for strategic planning and decision making on e-learning implementation was carried out. In the Choice Phase the criteria clarified in the Design phase served as an input into the AHP model. The AHP model is used for calculation of priorities needed for strategic planning. In this phase the second focus group meeting was held. The goal of the focus group was performance of group decision making with the AHP. Decision makers were teachers, students, municipality and the Ministry representatives. Obtained results served as inputs in the Action plan 2011-2015 for e-learning implementation and the Recommendations for E-learning Strategy in Kosovo. The fourth phase of the methodology involves integration of findings and building the Recommendations for E-learning Strategy and the Action Plan.

DESIGN AND PRIORITIZATION USING THE AHP

Thomas L. Saaty, University of Pittsburgh, U.S.;
Mujgan Sagir Ozdemir, ESOGU, Turkey;
Nina Begicevic Redep, University of Zagreb, Croatia

This paper is concerned with the development of a general and possibly comprehensive structure for design. Any design must meet a set of criteria and sub-criteria to create a structure that makes it possible to make a decision to select a best design to serve a certain function or functions subject to constraint. What we emphasize in our paper is the need to include all the factors in the decision that have significant bearing on the outcome so that the result is in principle optimal in the face of all the

compromises needed. Because design is a complex decision process, and as all multicriteria decisions require a structure to make it possible to apply judgments and derive priorities, we designed a generic structure to draw upon and specialize for particular designs. The need for prioritization forces us to connect these factors according to their interactions in order to compare them and prioritize them for resource allocation and for sequencing the actions required that lead to implementation. In the paper the general model of design problem is presented and two examples are given. We explain the use of a general model in the design phase on the complex example of planning and designing of a mousetrap. To validate how the general model works on a simple problem in the post-design phase we give an example of the laptop security mechanism problem. We believe that our approach to design presented in this paper is a fundamentally new approach that has not been considered in this kind of generality before.

AHP MODEL FOR QUALITY ASSESSMENT OF ARCHITECTURAL DESIGN *Tihomir Hunjak, University of Zagreb; Vjeran Strahonja, University of Zagreb, Croatia*

Public procurement process is strictly regulated in order to obtain best value for public money and protect the interests of all stakeholders. The paper shows how the evaluation of bids for the preliminary design project can be made, based on AHP method. It also describes the scenario of a complex procurement process in whose preliminary stage is used a heuristics elimination by aspects to reduce the set of all bids, and then the remaining bids are compared directly using the AHP model.

Session Organizer:

Nina Begicevic Redep, University of Zagreb, Croatia

Session Chair:

Tihomir Hunjak, University of Zagreb

012. Banking and Financial Applications

17 Banking and Financial Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

ANALYTIC HIERARCHY PROCESS AS A RANKING TOOL FOR DECISION MAKING UNITS *Josef Jablonsky, University of Economics, Czech Republic*

The paper aims in application of analytic hierarchy process (AHP) for efficiency analysis of the set of decision making units (DMUs). Conventional tool for analysis of efficiency of DMUs is data envelopment analysis (DEA). DEA models allow splitting the set of DMUs into two subsets – efficient and inefficient. The inefficient ones can be ranked according to their efficiency scores given by the DEA model but the efficient units cannot be ranked easily as their have identical maximal efficiency score. Many models have been proposed for ranking of efficient units in DEA models. The aim of the paper is to discuss the possibility of application of AHP models for ranking of efficient or entire set of DMUs. Numerical experiments are realized on the set of 20 commercial banks operating on the Czech financial market. The study is based on a real data set containing financial characteristics of the banks.

DETERMINATION OF ESTABLISHING FACTORING COMPANY'S LOCATIONS BY AHP ANALYSIS: IMPLEMENTATIONS OF 3 MAJOR CITIES IN TURKEY *Sadik Karaoglan, karaglan8912@gmail.com, Turkey; Mehmet Ilhan, University of Uşak, Turkey; Melek Ilhan, Uşak Üniversitesi İ.İ.B.F. No:6, Turkey*

All that exists in the world is in a process of changing and developing. Especially humans, they are the ones most affected by this changing process. The human

knowledge, wants, wishes, dreams, goals, needs and whatever he adheres to know has affected his environment. As well as technology developments, countries' situations, economics and finance, the bank and insurance systems, law systems and company's all are developed. Sometimes these developments can't be enough to answer or solve the problems of humans. As a result humans gave importance to developments of new methods. One of this is Factoring Companies. In the years 1980 it entered into Turkish market and it expanded after the years 2000. The main purpose of this work isn't the expanding business enterprise, the factoring companies cash method activity, examining the application or the risks taken for profits (every risk has its cost price) to transfer the days of paying debts, the factoring and insurance companies' comparison or the business' guaranty or the analyzing financing services' advantages. The main aim of this work is the factoring companies' plus the technology's development's establishment in Turkey's 3 biggest provinces to determinate the most affective factor AHP's analysis.

DEVELOPMENT OF A DECISION MODEL TO PRIORITIZING POTENTIAL FRAUD CASES FOR INTERNAL INVESTIGATIVE PURPOSES

James Carroll, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.

Corporate Fraud Investigation Units receive dozens of reports about possible fraud allegations annually. While all allegations must be addressed, clearly, it is not possible to investigate all cases upon receipt due to resource limitations, thus a method is necessary determine the cases to allocate resources and address immediately. For this reason, this study will develop an AHP ratings model for the prioritization of alleged fraud reports in a corporate setting, more specifically in a large metals and mining manufacturing company.

PERFORMANCE EVALUATION OF COMMERCIAL BANKS IN NEPAL USING AHP

*Ashish Bhandari, Upveda Technology Pvt. Ltd and
Institute of Engineering, Nepal; Amrit Man Nakarmi,
Tribhuvan University, Nepal*

This paper explores the determinants of performance exposed by the financial ratios and determines the financial performance of commercial banks in Nepal through Analytical Hierarchy Process based on their financial characteristics. The financial parameters were derived by segregating 5 major criteria which were Liquidity, Efficiency, Profitability, Capital Adequacy and Assets Quality. These criteria were further classified into 21 hierarchical sub-criteria. The performance evaluation was done for 13 commercial banks for financial data from year 2008/09 to 2011/12. The paper emphasizes financial decision problems to have strong multi criteria character and establishes priorities for performance parameters of commercial banks among financial indicators identified and ranks banks according to those indicators. This study has added one more literature to demonstrate the utility of AHP based bank evaluation to Nepalese banking community in particular, which not only evaluates the performance of banks but also gives insights to focus in the area of improvement to a particular bank in comparison to others.

Session Organizer:

*Josef Jablonsky, University of Economics, Czech
Republic*

Session Chair:

*Josef Jablonsky, University of Economics, Czech
Republic*

013. Monday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

014. AHP Theory and Methodology 1

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

A CHI-SQUARE BASED APPROACH TO CONSISTENCY EVALUATION OF MULTIPLICATIVE PREFERENCE RELATIONS

Michele Fedrizzi, University of Trento, Italy

In this paper we develop the idea introduced by Lipovetski and Conklin in 2002 of considering a pairwise comparison matrix (PCM) as a contingency table. Instead of focusing on outliers detection, we use the Chi-square value as an index to evaluate the deviation of a pairwise comparison matrix from consistency. We verify by means of numerical simulations that our new index satisfies a set of five properties recently introduced in order to characterize an inconsistency index. Therefore, we argue that our Chi-square based index can be considered as a suitable index for evaluating the inconsistency of a PCM.

**A FRAMEWORK OF A COMPREHENSIVE
UNCERTAINTY ANALYSIS OF THE AHP-
METHODOLOGY IN THE CONTEXT OF
ENVIRONMENTAL-DECISION-MAKING** *Werner
Toth, University of Natural Resources and Life Sciences
& Vienna University of Economics and Business,
Austria; Bernhard Wolfslehner, European Forest
Institute, and University of Natural Resources and Life
Sciences, Austria; Harald Vacik, Institute of
Silviculture, University of Natural Resources and Life
Sciences, Vienna*

The paper presents a framework to elaborate uncertainties in the Analytic Hierarchy Process methodology. This is done by a research design that allows the definition of environmental decision making and a systematically and explicitly formulated definition of uncertainty, which embraces a denotation, a categorization and a quantification of uncertainties. The quantification is conducted by a simulation experiment which uses random matrices as data basis to compute different uncertainty scenarios. Furthermore, a group decision scenario is simulated. Expected conclusions include a deeper understanding of different uncertainties, their combinations and their contribution to the incorporated uncertainty in the computed output priorities. Hence, recommendations regarding environmental decision making processes are formulated. However, limitations may arise due to the fact that randomly generated values may be different to human judgments and to time restrictions that limit the range of simulation experiments.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Werner Toth, University of Natural Resources and Life Sciences & Vienna University of Economics and Business, Austria

015. Risk Analysis Application

14 Risk Analysis

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

AHP FOR RECRUITMENT RISK MANAGEMENT IN R&D SECTOR *Rajinder Kaur Sokhi, Recruitment and Assessment Center, DRDO, India*

Recruitment and Assessment activities for Research and Development divisions are the challenge for most of the scientific organizations. Research and development for any organization is considered most important area to achieve excellence in the world of globalization and competitiveness. It has its unique characteristics with human resources playing vital role for enhancing the productivity of R&D sector. It is utmost important to recruit scientist with right blend of attributes which will enhance the productivity of the R&D organization. However, crisis way of recruitment of scientists may lead to disasters, especially in the sensitive areas of work. In one such pilot study, presented in this paper, structuring of aptitude of potential scientists was done based on review of literature available in scientific journals and identified four dimensions i.e. cognitive abilities, personality factors, social factor and subject knowledge. Data were collected from 20 medical doctors (MBBS). Analytic Hierarchy Process (AHP) was used to design formats to capture two matrices. Matrix I involved pair wise comparison of various attributes related to scientific dimensions. In matrix II the participants were requested to write down the marks out of 100 that they would give each factor based on their experience in the scientific field. Results were analyzed through AHP technique and arrived at the following weightages i.e. cognitive abilities 32%, Personality factor 10%, Social factor 10%, Subject knowledge 48%. In the similar way

weightages can be assigned to the identified attributes in unique situations where scientists have to work and it can prevent risks of committing human errors causing future disasters by helping scientists to excel in the scientific fields and enhance the productivity of the R&D organization.

RISK ASSESSMENT AND MANAGEMENT

DURING DEVELOPMENT OF GAS TURBINE ENGINE SUB-SYSTEMS

Parthasarathi Hans, Gas Turbine Research Establishment, Bangalore, India; S Ramachandra, Gas Turbine research Establishment, Bangalore, India; PN Srinivasamurthy, Gas Turbine research Establishment, Bangalore, India; Bashishtha kumar Jha, Gas Turbine research Establishment, India

Enhancement of complexity is associated with the evolution of any system, and risk escalates with complexity. Hence, any development process, including that of a gas turbine engine, is essentially a process of assessment and management of risk. Gas turbines, especially those used in aeronautical applications, are highly complex systems that involve several complex modules and sub-systems, including compressor, combustor, turbine, fuel system, engine gearbox, etc. This study focuses on engine gearbox, which is a very complex sub-system itself, involving a high level of developmental risk. The main functions of this gearbox are to transmit power from starter to engine main shaft during engine start-up and drive a host of accessories by extracting power from the engine during its operation. The gearbox supports and drives each accessory at a specific speed and direction of rotation. One of its important structural requirements is to be free from any destructive vibration throughout its operational range. It is also required to function in various altitude and attitude conditions, satisfying arduous endurance requirements. Further, like any other airborne system, the gearbox should also be designed to a strict weight budget. These conflicting requirements pose

considerable challenges to the designer and call for a careful decision-making process. To solve this complex problem, it was decomposed into smaller sub-problems using Analytic Hierarchy Process (AHP). Various design alternatives were considered; their capability of meeting various design criteria and the risk involved were studied before arriving at a decision. Furthermore, it is apparent that these risks need to be monitored and managed regularly during the course of design.

RISK ASSESSMENT IN DEVELOPMENT OF LEAN ARCHITECTURE FOR CONTROL SYSTEM OF AERO ENGINE *Bashishtha kumar Jha, Gas Turbine research Establishment, India; S Ramachandra, Gas Turbine research Establishment, Bangalore, India; PN Srinivasamurthy, Gas Turbine research Establishment, Bangalore, India; Parthasarathi Hans, Gas Turbine Research Establishment, Bangalore, India*

A modern gas turbine engine functions with a FADEC unit. This makes pilot free from the anxiety of monitoring engine performance and health. It is a result of reliable gas turbine along with complementing control system. Many a times shortcomings of the individual aerodynamic modules, matching of components, scaling of performance degradation over time, health management and performance management must be complimented by a smart control system. This philosophy increases complexity of the system as well as increased part count and weight. SE process has to be used for concept exploration and design path formulation to reap the benefit at the later part of lifecycle costs. Development of a complex system is recursive and conflicting during various lifecycle stages. Projects undertaken in the previous centuries used to be more than 10- 15 years duration and today similar projects are delivered with reduced time frame. The main thrust is on automating and optimizing the processes, with continual improvement of quality and reducing

waste. Management of change along with empowering the resources and manpower makes it indispensable use the lean principles to build these complex systems. Lean Architecture encompasses the above requirements. An existing control system has matured to TRL 6-7 considered in this study for upgrade for future application. A modern control system is being upgraded and lean architecture principle are followed to optimize the system along with reduction of weight by understanding the physical system design and data study from Integrated vehicle health monitoring (IVHM) system. The upgrade or redesigning approach can be inferred through various decision making process of systems engineering. This paper brings out the risk assessment concept of reducing the complexity through Analytic Hierarchy Process (AHP) approach where various alternatives, criteria and sub-criteria are evaluated and thereby assessing the risk in attempting to reduce the complexity and weight.

Session Organizer:

Rajinder Kaur Sokhi, Recruitment and Assessment Center,
DRDO, India

Session Chair:

Rajinder Kaur Sokhi, Recruitment and Assessment Center,
DRDO, India

016. Evaluation Methodology in Terms of Quality

12 Quality and Safety

Panel

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence BC

In this session of ISAHP 2014, three papers are presented about evaluation model in terms of quality. The first paper presents a power quality evaluation model for electric power customer. The second paper presents a nursing evaluation methodology using the AHP for undergraduate students. The third one is for evaluation used in call center using the ANP. Participants:

POWER QUALITY EVALUATION MODEL FOR ELECTRIC CUSTOMER BASED ON ANALYTIC HIERARCHY PROCESS *Buhm Lee, Chonnam National University, Korea; Kyoung Min Kim, Chonnam National University, Korea*

EVALUATION OF NURSING EDUCATION FOR STUDENTS BASED ON ANALYTIC HIERARCHY PROCESS *Sangsuk Kim, Chung-Ang University, Korea*

A STUDY ON THE PRIORITY CHANGE OVER AND INTERACTION OF SOFTWARE QUALITY FACTORS USING THE AHP/ANP *Min-Suk Yoon, Chonnam National University, Republic of Korea; Lingyu Hao, Chonnam National University, Korea*

Session Organizer:

Min-Suk Yoon, Chonnam National University, Republic of Korea

Session Chair:

Buhm Lee, Chonnam National University, Korea

017. Medical and Health Study

23 Medical and Health Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

OPTIMIZING HEALTH CARE DELIVERY

SERVICES IN NIGERIA: USING THE

ANALYTIC NETWORK PROCESS (ANP) *Stephen*

Gbenga Fashoto, Redeemer's University, Nigeria

Nigeria is a large, well-populated and developing country in the sub-Sahara Africa. Given its low pace of development, economic and social vices, and effective and inefficient public policies and programs, health sector development has become a very big challenge. The consequences of this are low life expectancy, diseases, debility and morbidity. Health reforms and policies have been lope sided against the majority and against finding solutions for the most common diseases. The thrust of this paper is thus to adapt a veritable tool for decision making towards influencing optimal policy for the health sector. The Analytic Network Process or Analytic Hierarchy Process is found highly invaluable in this regard. The research shows that primary health ailments are commonest amongst the citizenry, and hence should be given greater attention. Hospitals generally in Nigeria should be well equipped. Local Government owned health centers should be supported with adequate funding and health personnel supply, as they are nearest to the people. Policies should be put in place to reduce brain drain particularly of the medical personnel. More importantly, Federal and State Governments must support health programs and promote safe health culture through sensitization and improved health/hygiene education.

CHOOSING A BUYING OPTION FOR DIABETES MEDICAL DEVICES USING THE

SUPERDECISIONS SOFTWARE *Martha Merrill,
University of Pittsburgh, U.S.*

Diabetes is considered one of the world's most burdensome diseases. A medical device, which eliminates the effects of diabetes, would save numerous lives and significantly reduce costs to healthcare systems around the world. Inventors in bioengineering and medicine are developing technology to reduce the effects of diabetes. If these medical devices are found promising, then their inventors might approach large device companies to help manufacture and distribute. This model simulates the situation in which an inventor of a promising medical device in phase III of clinical trials approaches the board of directors of a device company (BioMed, BM). BM hopes to change their status from competitor to market leader. The Benefits, Opportunities, Costs, and Risks (BOCR) model as detailed by Saaty and Peniwati is used to determine whether acquisition, licensing, or passing on the offer is in the best interest of the company. Using additive and multiplicative models, acquisition and licensing are found as the best courses of action, respectively. After completion of the model, the author suggests that BM licenses the device with the option to buy when the product passes all clinical trials and obtains FDA approval. This model can be improved by a specific scenario and further development by experts in the field.

Session Organizer:

Martha Merrill, University of Pittsburgh, U.S.

Session Chair:

Martha Merrill, University of Pittsburgh, U.S.

018. Optimization & Real Life Applications 1

05 AHP/ANP Mixed Methods, Optimization and Applications

Panel

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Real life problems usually include multicriteria factors. These factors need to be analyzed by systematic and trustworthy methods. The parameters of multicriteria optimization problems also should be estimated carefully. Because their values directly affect the performances, the validities of the models and their outcome. This session invites presentations in this context. Mixed methods use both optimization procedures and multicriteria methods are welcome.

Participants:

THE RATIONALITY OF PUNISHMENT – MEASURING THE SEVERITY OF CRIMES: AN AHP-BASED ORDERS-OF-MAGNITUDE APPROACH *Thomas L. Saaty, University of Pittsburgh, U.S.; Mujgan Sagir Ozdemir, ESOGU, Turkey; Jennifer Shang, University of Pittsburgh, U.S.*

We propose an innovative AHP-based model to assess the severity of the harms a criminal committed to the society in a comprehensive and coherent way. Different from the traditional approach of structuring alternatives into one level, we organize the alternatives into multiple levels of that hierarchy. This arrangement and evaluation of alternatives differs from one criterion to another, which adds to the sophistication of the task when assessing numerous heterogeneous criminal activities. Structuring multifaceted decisions with the proposed model enables us to better deal with the complexity. The proposed approach can systematically tackle problems of widespread orders of magnitude of criteria and alternatives. When the sizes are actually very small or very large, the accuracy of rating alternatives one at a time is often very low. Through

the proposed method, we derive much better precision. For future works we plan to connect the outcome of this work to an optimization model which is going to decide the corresponding penalties of crimes according to their weights obtained by the AHP.

A TWO-PHASED MULTIOBJECTIVE MODEL FOR A SERVICE SYSTEM -AN APPLICATION FOR A TOURING COMPANY *Gulcin Bektur, Eskişehir Osmangazi University, Industrial Engineering Department, Turkey; Mujgan Sagir Ozdemir, ESOGU, Turkey*

Customer satisfaction is one of the most important factors for institutions considering with the competition among companies, especially for the service systems. This project proposes a methodology to assign customers of a tour company to its negotiated hotels. We take into account customer satisfaction by considering their preferences for hotels they want to stay. Two objectives are defined. First is the minimization of the deviation variables from the preference constraints. Second is assigning the same group of customers to the hotels which have the higher level quality as much as possible. The motivation of defining this multi objective case is due to this fact: Sometimes customers fail to decide their preferences related to hotels, by mostly preferring the low-price ones. On the other hand, tour companies have more experience; this study proposes a two-step methodology by re-assigning them to the hotels considering the hotel quality among their preferred ones, by using preemptive goal programming. Analytic Network Process is used to determine the hotel quality weights. We have not come across a similar study in this area, therefore the proposed methodology could be a motivation for future researches.

A TWO-PHASED SOLUTION METHODOLOGY FOR CAPACITATED MULTI VEHICLE ROUTING PROBLEM WITH TIME WINDOW AND CUSTOMER PRIORITIES A CASE FOR PHARMACY ROUTING *Mujgan Sagir Ozdemir, ESOGU, Turkey; Yeliz Buruk, Eskisehir Osmangazi University, Turkey; Ezgi Aktar Demirtas, Eskisehir Osmangazi University, Turkey*

Vehicle routing problems, attempt to define optimal delivery methods of goods to places, attract considerable attention because of their implications for delivery businesses. Their inevitable goal usually is the minimization of travelling distance or travelling cost. In this study, we propose a different objective function which aims to reach some prioritized delivery points as early as possible. To determine the pharmacies have the higher priority, we propose an Analytic Hierarchy Process model. Time window is already in use as a criterion for routing problems but our motivation comes from two different perspectives: First, providing specific delivery times may not conclude with applicable routes, deliver the goods as soon as possible could be preferable, and second the way to prioritize delivery points which have not be considered by now, need some systematic procedures. Proposed two-phased model is solved for a pharmacy chain, promising outcomes are achieved

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Mujgan Sagir Ozdemir, ESOGU, Turkey

019. AHP in the Classroom and the Community: Carlow University-Uganda Initiatives

24 Graduate Students (master, non-doctoral)

Panel

11:00 to 12:30 pm

*Grand Hyatt: Floor Independence Level - McPherson
Square*

Through this project, we intend to show how utilization of the AHP methodology in the experiential learning process of MBA students taking a decision-making class may also provide the benefit of allowing to address a specific decision faced by Carlow University, related to faculty proposed initiatives in Uganda. The questions are if the University should pursue these initiatives, to what extent they are congruent with Carlow's mission and interests and finally, - if a decision to pursue any Uganda initiative is made-, what would be the priorities that should be given to these initiatives. In addition, an undergraduate class in organizational studies was given a more focused task of developing a specific small business project for an Uganda family. At the end of the course, students were asked to evaluate and rank their business proposals; first, intuitively and the following week, using the Analytic Hierarchy Process-after having been explained the methodology and software. A final session to compare the differences, and pros/cons of each approach was made. This panel will present the findings of all these classroom experiences rooted into an experiential learning approach toward learning and also practicing engaged scholarship to address specific problems of the academic community (Carlow) and society (Uganda) at large. Finally, the Carlow-Uganda decision-making model developed here may constitute the basis for a more generic model to assess overseas opportunities for higher-education institutions.

Participants:

**CARLOW UNIVERSITY - UGANDA INITIATIVE I:
AN AHP BENEFIT/COST ANALYSIS** *Diana Nsemo, MBA - Carlow University, U.S.; Nora Suehr, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

The Carlow-Uganda Initiative was created to support Ugandan citizens in strengthening their communities through the collaboration on one of the four identified initiatives. The project proposes overseas cooperation between Carlow University and selected institutions in Uganda. The nature of the cooperation is the training of teachers and caregivers for vulnerable adults, children and adolescents which ultimately benefits the nation of Uganda, but also gives Carlow students the ability to participate and experience life outside of the United States. We utilized the Analytic Hierarchy Process software for our decision-making approach and used the hierarchical structure to determine which initiative carried the most weight in terms of criteria and sub criteria determined by the team.

**CARLOW-UGANDA INITIATIVE II: AN AHP
BOCR DECISION ANALYSIS** *Bethany Dorney, Carlow University, U.S.; Beth Kallenborn, Carlow University, U.S.; Douglas Edward Morgan, Carlow University, U.S.; Shannon Stefan Robertson, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

Through this project, we intend to demonstrate how utilization of the AHP methodology will allow the academic community of Carlow University to assist with societal issues in Uganda through collaboration, leadership, and community service. The mission for our selected project is to provide professional development to teachers and caregivers of vulnerable children and adolescents in Uganda. Through the assistance of Dr. Enrique Mu and the learning from class focused around AHP, we will attempt to demonstrate the best possible alternative for Carlow University and the Global Human Rights and

Wellness: Project Focus – Uganda utilizing Benefit/Cost/Opportunity/Risk (BOCR) analysis. AHP methodology of modeling hierarchies (goals, criteria, and alternatives), prioritization of criteria, and pairwise comparison of the alternatives in terms of their preference was done via a transdisciplinary pedagogical approach, with a primary focus on global health care through the Carlow University School of Nursing.

CARLOW-UGANDA INITIATIVE III: MULTIPLE BOCR TEAM PERSPECTIVE INTEGRATION

Kristen Faust, Carlow University, U.S.; Nidhi - Shukla, Carlow University, U.S.; Joanne M. Kavulick, Carlow University, U.S.; Sheila Rawlings, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.

A project has been recommended for collaboration between Carlow University specific institutions in Uganda. There are foreseeable benefits for Carlow students including professional development, cultural enrichment, social responsibility and other benefits related to experiences a student would see in Uganda. There are 4 alternatives students to choose from with compelling arguments. A

Benefit/Cost/Opportunity/Risk (BOCR) analysis has been performed. The information has been weighed using the AHP methodology and SuperDecisions software. The results will be presented at the ISAHP 2014 symposium.

CARLOW-UGANDA INITIATIVE IV: CASE STUDY OF USING AHP AT THE

UNDERGRADUATE LEVEL *Cynthia Mari Busin Nicola, Carlow University, U.S.; Enrique Mu, Carlow University, U.S.*

This case study explores the use of AHP in the quality of decision making at the undergraduate level. Students were charged to make small business recommendations for an entrepreneur in Uganda then rank those recommendations in preferred order

without any model of decision making. Second, students were taught the AHP process and asked to reconsider the rankings. Comparative results of decision making processes were shared and discussed as well as the value of teaching AHP at the undergraduate level.

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Nora Suehr, Carlow University, U.S.

020. Monday lunch

ISAHP

Lunch

12:30 to 2:30 pm

*Grand Hyatt: Floor Independence Level - Independence
FGHI*

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

021. AHP Theory and Methodology 2

04 AHP Theory & Methodology

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

AN INTEGRATED MODEL BASED ON AHP AND MAXIMIZING DEVIATION METHOD AND ITS APPLICATION

*Zhanglin Peng, School of
Management, Hefei University of Technology, China;
Shanlin Yang, School of Management, Hefei University
of Technology, China; Xiaojia Wang, School of
Management, Hefei University of Technology, China*

This study explores the potential of applying analytic hierarchy process (AHP) and maximizing deviation (MD) to determine the regional innovation capability of Chinese districts that need evaluation. Compared with some conventional single methods, the proposed combined model incorporates a much wider range of quantitative and qualitative criteria, and deals with a much more certain and uncertain information, and provides a more detailed and thorough research.

Firstly, we use the Analytic hierarchy process to deal with uncertain information, then get the first weight vector, which is determined by the importance or priorities of the attributes or criterions; secondly, we use maximizing deviation method to handle some certain information, then we get the second weight vector, which is determined by the discrepancy of the attribute values; finally, we integrate these two weight vector and apply them in evaluating and ranking the regional innovation capability n 31 districts (provinces, municipalities & Autonomous Regions) in China.

AHP MODIFICATION FOR DECISION MAKING UNDER UNCERTAINTY *Alexander Vladimirovich Bochkov, LLC NIlgazeconomika, Russia; Nikolay Nikolaevich Zhigirev, LLC NIlgazeconomika, Russian Federation*

The AHP-method proved its efficiency in different situations of decision making under conditions when experts can perform pairwise comparisons of compared objects under study. But, our real life consists of uncertainties. How can we compare the objects if information about them is not available or extremely uncertain? Pairwise comparisons are impossible. In this case, we propose to use the approach of minimizing the functional «errors» in the evaluation of comparable objects (F-ratio test). Through successive iterations initially given equal weight values compared objects are close to the true value (within the stated error). This method does not require the consistency of the pairwise comparisons matrix and, moreover, can be applied to AHP incomplete matrix. The iterations are repeated as long as the new changes do not result in improved objects estimates. The practical example of the method use is considered.

AHP PRIORITIES AND MARKOV-CHAPMAN-KOLMOGOROV STEADY-STATES PROBABILITIES *Stan S. Lipovetsky, GfK Custom Research North America, U.S.; W Michael Conklin, GfK Custom Research North America, U.S.*

An AHP matrix of the quotients of the pair comparison priorities can be transformed to a matrix of shares of the preferences. The transformed matrix can be used in Markov stochastic modeling via the Chapman-Kolmogorov system of equations for the discrete states. It yields a general solution and the steady-state probabilities. The priority vector can be interpreted as the eventual probabilities to belong to the discrete states corresponded to the compared items. The results of stochastic modeling correspond

to robust estimations of priority vectors.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Stan S. Lipovetsky, GfK Custom Research North America,
U.S.

022. Government & Politics 1

02 Government & Politics

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

APPLICATION OF A DECISION SUPPORT SYSTEM BASED ON THE ANALYTIC NETWORK PROCESS TO IMPROVE STATE PROGRAM OF MEDICINES SOCIAL ASSISTANCE

Daria Ivanovna Onischenko, Student, Russia; Vasilij Grigorjevich Sinuk, Russian Federation

Nowadays deficiency economic and social decisions increased the price that society has to pay. The increasing requirements for management quality in various spheres of human activity make it necessary do a special analytical work in decision-making. A manager shouldn't make a decision intuitively, and he should use the appropriate tools to find the best options and justify the choices made. This article deals with such social problem as choosing the best state program of medicines social assistance for benefit recipients using Super Decisions tools, supporting network analysis method. Structure of the problem solution has been developed. The phase of discrimination and comparative judgments, and the phase, associated with the synthesis have been described. Recommendations based on the results received have been made.

CATTLE BUSINESS DEVELOPMENT STRATEGY IN THE REGENT OF BULUKUMBA, SOUTH SULAWESI PROVINCE

Machmud Achmad, Bogor Agricultural University, Indonesia

From the results of this study, it is found that the internal and external strengths and weaknesses factors had identified in Bulukumba as well as threat and opportunity aspects. Among the strengths items are (1) an extensive area of land, (2) geographic

location, (3) suitable dry climate and (4) good irrigation system and the weaknesses are found as follows: (1) aspects of the capital (2) human resources, (3) cultivation techniques, (4). facility and infrastructure, (5) institutional and (6) linkages with other sectors. Here are the opportunity aspects that affect the success of farming in Bulukumba; (1) very prospective market due to the development of new regions in eastern Indonesia, (2) local autonomy, (3) high demand of beef in the province of South Sulawesi, (4) the presence of foreign financial aid, (5) beef self-sufficiency program in 2005, and (6) government policies for the development of KTI. Meanwhile, the threat aspects that hinder the success of the cattle business in Bulukumba are; (1) the unpredictable of exchange rate, (2) inconsistency of political conditions, and, (3) high load of imported beef. The results of this study from Process Hierarchy Analysis (AHP) indicate that the most decisive factors in the successful development of the cattle business was the cattle business linkages between one and the other sectors. The next determining factors is Capital factors, infrastructure and supporting facilities. The results of the analysis of hierarchy process (AHP) show the same weight of 0:08 between the interests of the environment, availability of land and cultivation aspects. It suggests that those factors are equally important in the development of cattle farming in Bulukumba. The most active parties involved in this business were cattle farmers and Animal Husbandry Officers with the weights of 0:23 and 0:20. Cattle farmers were directly involved in the business.

**GETTING LOCAL GOVERNMENT ONBOARD:
PRIORITIZING DECISIONS RATIONALLY** *Ellen
Szarleta, Indiana University NW, U.S.*

The value of AHP to local government decision making processes is clear to those practicing MCDM methods. Local government, however, views such

processes with skepticism and concern. The policy and political implications of the application rational decision making processes in local government must be understood before the method will take hold. Examining these implications also provides the foundation for a cultural change occurs supportive of AHP as a rational way of decision making. In this paper the costs and benefits of AHP are evaluated from the local government decision maker's perspective. The analysis then outlines an approach for expanding the toolbox beyond decision-making specialists. A case study of the application of AHP by local government is also provided. The paper will stimulate discussion of the application and dissemination of AHP in the local government sector.

ANALYTIC HIERARCHY PROCESS IN LOCAL GOVERNMENT DECISION MAKING: POLAND

Jacek Strojny, Rzeszow University of Technology, Poland; Anna Prusak, Cracow University of Economics, Poland

The main objective of this study was to apply the AHP method to identify the most important factors of local development in one of the districts of Southern Poland, Nowy Targ. The hierarchical model has been constructed based on the relevant literature and consultations with the workers of the District Office. The main criteria consisted of four areas of local development, including potential of the society, economic potential, environmental potential and institutional potential. 14 workers of the District Office participated in the survey. Individual results were aggregated using the AHP procedure (aggregation of individual priorities). The results indicate that the most important factors influencing local development at the district level are Entrepreneurship (10,4%), Tourist attractions (9,03%) and Demographic potential (8,78%). The research also revealed a range of problems related to group decision-making in public administration.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Ellen Szarleta, Indiana University NW, U.S.

023. Quality and Safety

12 Quality and Safety

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

ENAV TOP 5 IMPROVEMENT AREAS *Lorenzo*

Vacca, ENAV, Italy; Maurizio Mancini, ENAV, Italy

Top 5 IA is a methodology developed by ENAV, the Italian Air Navigation Service Provider. The objective is to identify, from a Safety point of view, the top 5 areas of improvement of Air Traffic Control Units. One of the Italian most complex (in terms of traffic and layout) Air Traffic Control Units, is the site that has been selected for this study. The method is based on the analysis of the answers that air traffic controllers gave to an ad-hoc questionnaire. Then, those answers have been evaluated by means of AHP (Analytic Hierarchy Process) methodology. The weights obtained have been mediated in order to determine a team-representative set of weights which have been combined with all the SME questionnaire answers. The results at last have been statistically analyzed to achieve the Top 5 Improvement Areas representative of the Air Traffic Control Unit. The activities identified by the model represent the starting point to schedule a set of enhancements and monitoring activities to continuously improve the Safety of the ATC Unit.

IDENTIFYING AND RANKING THE CRITICAL SUCCESS FACTORS OF CHALLENGES IN PROVIDING QUALITY EDUCATION BY THE MALAYSIAN PRIVATE HIGHER LEARNING INSTITUTIONS *Rafikul Islam, International Islamic University Malaysia; Azilah Anis, Universiti Teknologi Mara, Malaysia; Anisah Abdullah, International Islamic University, Malaysia*

The issue of quality education in higher learning

institutions is timely and crucial due to the government's aspiration to turn Malaysia into a center of educational excellence in the Asian region. Quality education acts as an indicator of the institution's ability to provide tertiary education to the society as well as an instrument for the nation's economic growth. Till date, numerous studies have been conducted in measuring the quality of education in higher learning institutions. However, the task in identifying the challenges faced by the institutions in providing quality education and the critical success factors to address those challenges are largely been ignored by previous researchers. Thus, by applying the mixed methods approaches, this study intends to identify and rank the challenges and critical success factors for each challenge. Data are collected from the Malaysian private higher learning institution's stakeholders for both stages namely; the qualitative and quantitative stage. Thematic analysis is utilised in identifying the challenges and critical success factors that gained through the semi structured interviews with the respondents. Subsequently, a survey is conducted to rank the identified challenges and critical success factors by employing the Analytic Hierarchy Process. At the end of the study, a framework to enhance the quality of education in Malaysian private HLIs is provided.

**INTEGRATING HSE QUALITY SYSTEMS USING
A HAZARDS PRIORITY REPORT BASED ON
THE AHP METHODOLOGY** *Diego D'Urso,
University of Catania, Italy; Antonio Giuseppe Latora,
University of Catania, Italy; Lucio Compagno,
Dipartimento di Ingegneria Industriale - Università di
Catania, Italy*

The protection of the health and safety of workers and the respect for the environment play a key role in the management of the industrial plants. The health, safety and environment management systems offer a methodological contribution that leads to a

continuous-loop process re-engineering and drive improvements based on different criteria. Thus, a multi-criteria evaluation of environmental and safety performances of industrial plants is required and allows a real integration of sustained efforts. In this scenario the hierarchical analysis (AHP) can allow an efficient synthesis of the environmental impacts and risks which are attributable to each production unit. Along this dimension of research, a hierarchical structure, related to the context of an oil refinery plant, has been codified. More in particular, the information content of the risk assessment and of the environmental analysis processes fed the hierarchical composition process of Saaty obtaining the assignment of a holistic judgment to each production unit that is responsible. This judgment determines the priority of allocation of maintenance resources and overcomes the limitations of risk matrices that are so focused on single hazard or environmental aspect to be short-sighted. The method also enables to engage the corporate management and institutional stakeholders involved in the assessment of the weights to be assigned to each criterion of risk and environmental assessment through the adoption of the group decision making.

Session Organizer:

Ozden Bayazit, Central Washington University, U.S.

Session Chair:

Rafikul Islam, International Islamic University Malaysia

024. Medical Decision Making and Tools

23 Medical and Health Applications

Paper Session

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

ANP AND DEMATEL FOR SIX SIGMA PROJECT SELECTION AND EVALUATION PROCESS IN A COLOMBIAN HOSPITAL *Miguel Angel Ortiz Barrios, Universidad de la Costa, Colombia; Heriberto Alexander Felizzola Jiménez, Universidad de la Salle, Colombia; Santiago Nieto-Isaza, Universidad de la Costa, Colombia*

This paper presents an integrated ANP and DEMATEL technique applied to identify and prioritize Six Sigma projects for healthcare companies. First, the Six Sigma evaluation structure is determined; then DEMATEL (Decision Making Trial and Evaluation Laboratory) is applied to calculate interrelations among healthcare criteria. Finally, the criteria weights are established by ANP (Analytic Network Process). An empirical case for a public hospital is presented, showing the effectiveness of the proposed technique.

INCORPORATING PRECLINICAL AND CLINICAL KNOWLEDGE AND EXPERIENCE TO EVALUATE DRUG DEVELOPMENT PROJECTS USING THE ANALYTIC HIERARCHY PROCESS *A. Lawrence Gould, Merck Research Laboratories, U.S.; Rajesh Krishna, Merck Research Laboratories, U.S.; Anis Khan, Medimmune, Inc., U.S.; Jeffrey Saltzman, AstraZeneca R&D, U.S.*

Resource limitations require choosing which candidates to progress at any stage of development to pursue, delay, or terminate. The choices must balance many dimensions such as efficacy, safety, pharmacology, market urgency, etc. The challenge is to integrate the knowledge and experience of the

product development team with the findings from completed experiments and trials to inform clear, objective, and consistent development decisions. We describe, and illustrate with application to an actual development project, an approach for quantitatively assessing alternative candidates at any stage of development. The method is based on mathematical combination of sets of pairwise comparisons, which are much simpler to carry out than multi-item ranking or weighting. The dimensions of the decisions, the rankings of the possible outcomes for each dimension, and the rules for combining the components to inform a decision are determined by the project team with management concurrence before obtaining the determinative data. All of the stakeholders participate in the decision process, to assure optimum relevance to clinically oriented project teams and science-oriented management committees. Laying out the rules before a candidate reaches the point of a decision at a key point of the development process maximizes the opportunity for making the actual decision objective and transparent, and facilitates exploration of the sensitivity of the recommended decision to various assumptions. The process can be applied at any stage of clinical development. Its statistical properties can be evaluated using standard statistical decision analysis methods.

LOCATION OF PREHOSPITAL CARE BASIS THROUGH COMBINED FUZZY AHP AND GIS METHOD *Lorena Pradenas, Universidad de Concepción, Chile; Marco Tiznado, Universidad de Concepción, Chile*

EMS (Emergency Medical Services) provides emergency medical care and prehospital service. Response times are critical and represent the basis of good care for injured or sick individuals. The present study aims to determine the optimal location of new EMS bases. The location of these facilities has been

addressed in the literature according to multiple perspectives, including qualitative considerations. A method that incorporates both the qualitative and quantitative methods by means of Geographic Information System (GIS) and a Fuzzy Analytic Hierarchy Process (FAHP) models is proposed. The current approach is flexible and tolerant to uncertainty, and it also considers the experience of the staff. A case study is performed in a city, obtaining a new location to meet the health care deficit

Session Organizer:

Claudio Garuti, Fulcrum Ingenieria, Chile

Session Chair:

Claudio Garuti, Fulcrum Ingenieria, Chile

025. Optimization & Real Life Applications 2

05 AHP/ANP Mixed Methods, Optimization and Applications

Panel

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Real life problems usually include multicriteria factors.

These factors need to be analyzed by systematic and trustworthy methods. The parameters of multi criteria optimization problems also should be estimated carefully. Because their value directly affect the performance and the validity of the model and its outcome. This session invites presentation in this context.

Participants:

AN AHP MODEL BASED SUPPLY CHAIN

NETWORK DESIGN *Gurkan Ozturk, Anadolu University, Turkey*

In this study we consider multi objective supply chain network design problem for a real life case. In order to evaluate each candidate distribution center an AHP model is developed. By this model different tangible and intangible criteria can be incorporated. Then a mathematical model which uses selected candidate solutions according to a threshold value is developed and solved

A TWO STEP MCDM METHODOLOGY TO MAKE EFFECTIVE SUPPLIER SELECTION AND AN

EXAMPLE *Mehmet Alegoz, Anadolu University, Turkey*

Choosing the best suppliers is one of the most important subjects for a company to take care about and one of the most challenging decisions to make. The proposed methodology aims to make this important decision effectively. The methodology consists of two steps. Simply, it is possible to say that the first step is to determine criteria weights and the second step is to choose one of the suppliers

according to criteria. Buckley's Fuzzy AHP algorithm is a good candidate for the cases where the collected information is not certain but it is fuzzy. It is easier than other fuzzy AHP algorithms and it generally gives more accurate results than classical AHP model gives since its boundaries are more flexible. For all these reasons, in the first step, the criteria weights are determined by using Buckley's Fuzzy AHP algorithm. After determining the criteria weights the first step is concluded. In the second step, Promethee algorithm is used to choose the best supplier. All the suppliers are evaluated for each criterion and finally one or a few of them is chosen. The methodology is also supported with an example so as to explain the application process clearly. This methodology provides the opportunity of objective and quantitative evaluation during all the process from the beginning (determining the criteria weights) to the end (choosing the best supplier). This important aspect makes this methodology differ from the other research in this subject. In addition to this two steps, a further analysis can also be done. There are a few studies in which the criteria weights are used as model parameters. In this way, it become possible to determine the optimum lot sizes and/or optimum amount of inventory by creating a general model or by using some existing inventory models.

**A REAL LIFE MULTI OBJECTIVE COURSE
TIMETABLING MODEL WITH ANP AND
CONIC SCALARIZATION** *Zehra Kamisli Ozturk,
Anadolu University, Turkey; Mujgan Sagir Ozdemir,
ESOGU, Turkey; Erdener Ozcetin, Anadolu University,
Turkey; Nergiz Kasimbeyli, Anadolu University,
Turkey; Mehmet Alegoz, Anadolu University, Turkey*

Course timetabling problem consists of assigning a number of courses to a certain number of rooms and timeslots with several constraints and objectives. Main objective of course timetabling problem consists of assigning the courses to the rooms and

timeslots with hard constraints like capacity of rooms and non-allowed overlapping courses. Furthermore, avoiding in the timetable of a student not to have more than two consecutive courses and not to have only one course in a day are the soft constraints of the model. Soft constraints are added to model as objectives with minimizing the number of violation of these constraints. With this adaptation, the mathematical model changes as a multi objective structure. Different weights of these objectives are defined with a developed ANP model. These weights are used in Conic Scalarization method to get scalarized problem. The scalarized problem is solved with an optimization tool and results are discussed. The ANP model developed here can also provide a general framework to investigate the course timetabling system in a systematic way.

MULTI CRITERIA DECISION MAKING FOR CUSTOMER SATISFACTION IN WAREHOUSE MANAGEMENT *Zehra Kamisli Ozturk, Anadolu University, Turkey; Refail Kasimbeyli, Anadolu University, Turkey*

In the rapid changing and developing market, the aim of the service systems is improving the customer satisfaction by offering the best service. Thus, to reach this aim, the consumer services that supply replacement part support of the production companies must attach importance to the warehouse management. In this study, four objectives are determined to improve warehouse management performance as maximization of satisfying ratio, maximization of circulation ratio, maximization of efficiency ratio and minimization of satisfying duration. Under these objectives a multiobjective linear mathematical model is developed. In the second part of the study, a warehouse management system for replacement parts is systematically investigated by an AHP model that considering both tangible and intangible criteria. There are lots of

criteria that effect the replacement part management in the warehouse. With the AHP model all the relative weights of the criteria are obtained and also some of these weights are used to prioritize the objectives of the warehouse inventory model. By using these weights of the determined objectives, the multiobjective function is transformed to a scalar function. Then the previously developed optimization model is solved with several constraints using these weights.

Session Organizer:

Zehra Kamisli Ozturk, Anadolu University, Turkey

Session Chair:

Zehra Kamisli Ozturk, Anadolu University, Turkey

026. YSU/Williamson College of Business

Master Students, AHP in Decision Making

24 Graduate Students (master, non-doctoral)

Panel

2:30 to 4:00 pm

Grand Hyatt: Floor Independence Level - McPherson Square

In this session Youngstown State University, Williamson College of Business master students will present Application of AHP into three managerial decision making situations involving multiple quantitative and qualitative criteria. First paper is about plant location. Copwire, a company from an emerging market, is seeking location to establish manufacturing site in the United States, serving New England market. The company is looking for locations within New York, Ohio, or Pennsylvania. This study identifies and compares relevant factors to support manufacturing site selection. Authors collected data from company executives, from sources such as the Bureau of Labor Statistics, the Energy Information Administration, state government websites, and Google Maps. Ohio was found to be the most favorable of the three states. In the second paper the authors utilized the Analytical Hierarchy Process to determine the most valuable Emerging Market (EM) among China, India, Turkey, and Russia. They found out that China is the most promising market yet Russia is the least. Third paper is again on Emerging markets. The emerging markets of Brazil, India and China were compared utilizing the Analytic Hierarchy Process (AHP) to determine which country was the most favorable to expand into for business. The robustness of the results was also tested using the sensitivity analysis. Results were sensitive to markets size importance and robust with the rest of criteria. China was the best emerging market among the three compared. Participants:

**BEST PLANT LOCATION FOR A
MANUFACTURING COMPANY: AN ANALYTIC
HIERARCHY PROCESS APPROACH** *Sayantoni
Dey, Youngstown State University, U.S.; Stephen
Bosela, Youngstown State University, U.S.; Jakub
Waksmundzki, Youngstown State University, U.S.*

Copwire, a company from an emerging market, is seeking location to establish manufacturing site in the United States, serving New England market. The company is looking for locations within New York, Ohio, or Pennsylvania. This study identifies and compares relevant factors to support manufacturing site selection. The identified criteria were classified as primary and secondary. Factors were analyzed using Expert Choice software, decision support system uses the Analytical Hierarchy Process (AHP) as a methodology. As most parameters in choosing a location are qualitative, quantitative or both, AHP model allows managers to successfully evaluate all considerations. This model structures the decision making process so that importance of criteria and sub-criteria as well as preference of each alternative over another are obtained as a result of expert pairwise comparisons. This paper emphasizes the reasons for assorting existing criteria, consisting of specific location analysis within each state, and performs/applies sensitivity analysis demonstrating the influence of selected parameter on the outcome via which tests the robustness of the alternative location selections.

**SELECTION OF THE MOST ATTRACTIVE
EMERGING MARKET FOR A BUSINESS TO
ENTER AMONG THE COUNTRIES TURKEY,
RUSSIA, INDIA, AND CHINA: AN ANALYTICAL
HIERARCHY APPROACH** *Matthew A Kuhns,
Youngstown State University, U.S.; David Lucas,
Youngstown State University, U.S.; Lyndi Schrecengost,
Student - Author, U.S.; Philip Nicholas Tizio,
Youngstown State University, U.S.*

In today's growing global economy, Emerging Market's (EM) in developing countries contain a lucrative opportunity to investors in a range of businesses. If considered appropriately, specific contributing dimensions composed of economic, political, and social factors can theorize growth or potential problems for a business in one of these EM's. Dimensions are composed of 16 measurable variables from each EM. The authors' objective in this study was to determine the best potential EM among the countries, Russia, China, India, and Turkey. To determine the most valuable EM, the authors utilized the Analytical Hierarchy Process, a multicriteria comparison approach. Results of testing ranked the EM's in the following order, China, India, Turkey, and Russia. It is the authors' opinion that the assigned weight of 44% to the importance of Market Size, specifically to China and India's advantage, is a flawed representation of EM's. Running a sensitivity analysis assigning Market Size a more congruent weight of 20 percent results in the new ranking of Turkey, China, Russia, and India, which is more fitting to the authors' analysis.

COMPARING THE EMERGING MARKETS OF BRAZIL, INDIA AND CHINA: WHO'S THE BEST? *Matthew Huston, Youngstown State University, U.S.; Jennifer Roberts, Youngstown State University, U.S.; Jason Ferguson, Youngstown State University, U.S.*

The emerging markets of Brazil, India and China were compared utilizing the Analytic Hierarchy Process (AHP) to determine which country was the most favorable to expand into for business. This method enabled us to compare both qualitative and quantitative multiple criteria simultaneously. The robustness of the results were also tested using the sensitivity analysis. Through examination of economic criteria we find that even though India is currently experiencing a substantial growth in

population, their emerging market ranking still remains behind both Brazil and China. Each of the three countries has areas where they stand above the other two countries showing why each of the three has strong emerging markets. But one country remained at the head of the pack regardless of the decision maker's setup, China. China is at the front of the pack when it comes to comparing emerging markets of the three by a substantial amount, over 20% greater than the next Brazil.

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.

Session Chair:

Ramesh Dangol, Youngstown State University, U.S.

027. Monday afternoon break

ISAHP

Break

4:00 to 4:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

028. Improving Supply Chain Activities by Advancing and Teaching AHP Applications

10 Supply Chain Management

Panel

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

This session includes three research proposals on analytic hierarchy process (AHP). The first study attempts to demonstrate an application framework of both AHP and DEA (data envelopment analysis) for evaluating suppliers, 3PL firms, and supply chain activities. Two approaches will enable supply chain managers to combine subjective data with AHP and objective data with DEA for supply chain management. The second study investigates improving scales for consistent AHP results. This study explores different scales with examples for finding one that provides AHP users with consistent evaluation scores. The third study discusses pedagogy for teaching DEA to supply chain students. AHP is a highly useful approach for supply chain management as evidenced with numerous AHP applications in the supply chain management area. Accordingly, teaching AHP to the students in supply chain management programs can be an imperative issue. In fact, many supply chain programs at universities include a course for supply chain modeling, which can adopt AHP. This study demonstrates the use of Microsoft Excel for computing AHP weights for simple problems.

Participants:

COMBINING SUBJECTIVE AND OBJECTIVE CRITERIA FOR EVALUATING SUPPLIERS USING AHP AND DEA *Seong-Jong Joo, Central Washington University-Des Moines, U.S.; Ozden Bayazit, Central Washington University, U.S.*

It is necessary to evaluate of supply chain partners such as suppliers and third-party logistics (3PL) providers for the selection and development of the partners. When we evaluate the partners for their performance, we have two choices for including data

such as subjective and objective criteria. If we assess their performance using two types of criteria in different models, we may have contradictory results with opposite directions. In addition, it is difficult to compare the results because they are estimated separately. We attempt to combine subjective criteria using analytic hierarchy process (AHP) and objective criteria using data envelopment analysis (DEA). We include weights from judgment matrices and objective data in relevant DEA models for evaluating the supply chain partners. We propose and demonstrate a framework with an example. At the time of this study, we found one study that utilized this approach using simple data from a previous study with limited variables. Accordingly, the major contributions of this study will be enriching literature in this area and providing practical insights to supply chain managers.

A NEW APPROACH TO THE USE OF A MEASUREMENT SCALE FOR ANALYTIC HIERARCHY PROCESS *Young Lee, Busan Development Institute, Korea*

This study identifies issues on analytic hierarchy process (AHP), which is popular for selecting a reasonable alternative in the studies of social sciences, by way of empirical analysis and suggests a new measurement scale that resolves these issues. The nine-point bipolar scale (a total of 17 point scale) that is used when converting a subjective preference into numerical values in AHP offers a flexible way to a respondent for choosing an answer. However, this study points out that consistency in the responses may be undermined due to the excessive number of points in the scale. A preceding study with an example identified the 17 point scale (the nine-point bipolar scale) as one of the causes that undermine the consistency by increasing the consistency ratio (CR) value and suggested that a nine-point scale (a bipolar scale of five points) might be used in order to resolve

this issue. However, since this study used only one example, it was difficult to generalize its result. Accordingly, this study conducts a survey on the same subjects twice: first, using a 17 point scale and, next, using a nine-point scale in the options given for responses. The distribution and range of responses along with CR values are compared to identify a scale that provides consistency in the responses and convenience to respondents. If the response results of the nine-point scale survey and the 17 point scale survey are similar, and the CR value by the nine-point scale survey is lower, then, there is no need to use the 17 point scale that makes it difficult to select a response.

**TEACHING ANALYTIC HIERARCHY PROCESS
TO SUPPLY CHAIN STUDENTS** *Seong-Jong Joo,*
Central Washington University-Des Moines, U.S.

Analytic hierarchy process (AHP) is a highly useful approach for evaluating suppliers for supplier selection and development, products and services for purchasing decisions, supply chain strategies and alternatives, and so on in supply chain management as evidenced by numerous AHP applications in this area. Accordingly, teaching AHP to the students in supply chain management programs can be an imperative issue. In fact, many supply chain programs at universities include a course for supply chain modeling, which can adopt AHP. This study demonstrates pedagogy using Microsoft Excel for computing AHP weights, which can be used for selecting suppliers and/or third-party logistics (3PL) providers and addressing other supply chain management related topics.

Session Organizer:

Seong-Jong Joo, Central Washington University-Des Moines, U.S.

Session Chair:

Seong-Jong Joo, Central Washington University-Des Moines, U.S.

029. Government & Politics 2

02 Government & Politics

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

EVALUATION OF BANDUNG CITY

GOVERNMENT STRATEGIC PROGRAMS IN ECONOMICAL EFFORTS TO STRENGTHEN AND INCREASE THE ABILITY OF PUBLIC PURCHASING POWER: A REVIEW OF PUBLIC POLICY ANALYSIS

*Bayu Kharisma, Department of
Economics University Padjadjaran Bandung, Indonesia*

This study aims to evaluate and prioritize the various forms of strategic programs at the city of Bandung in West Java, Indonesia in strengthening the economy and increasing purchasing power of the people based on public policy analysis. There are few steps or effort in evaluating various forms of local government strategic program in economics in order to increase the purchasing power of the city of Bandung, namely: 1) Observing the potential and the problems by SWOT analysis (strengths, weaknesses, opportunities, threats). 2) Evaluation and prioritization of programs of economic analysis using Analytical Hierarchy Process (AHP) and connect it to the macroeconomic indicators Bandung. In conducting the evaluation and priority, strategic programs are done also based on the study of literature and discussions with experts. The number of respondents in this study is 15 (fifteen) and sampling was done by purposive convenience sampling. Based on EFAS Matrix summary (External Strategic Factors Analysis) shows that the Bandung City Government is in a strong position to exploit the opportunities that exist to minimize the threats that will arise with regard to the external factors that affect the purchasing power of the city of Bandung. Furthermore, from the results of IFAS Matrix

summary (Internal Strategic Factor Analysis) shows that the Bandung City Government is in a relatively strong position to use and harness the forces that exist to minimize the shortcomings encountered in efforts to improve the people's purchasing power. The estimation results of AHP (analytical hierarchy process) to local agencies regarding the analysis of preference evaluation of Government programs of Bandung in economics in improving and strengthening the purchasing power suggests that external factors are the priority aspects.

SHOULD THE CITY OF PITTSBURGH AND ALLEGHENY COUNTY CONSOLIDATE THEIR INFORMATION TECHNOLOGY SERVICES?

Enrique Mu, Carlow University, U.S.; Howard A Stern, Carlow University, U.S.

Given the current difficult financial situation for the City of Pittsburgh; there has been extensive discussion about consolidating services to obtain savings due to economies of scale. However, although at first, the solution seems reasonable; there are also many valid opposing arguments. To analyze this situation in a more rational way, a Benefit/Cost /Opportunity/Risk (BOCR) analysis is being performed using the Analytic Network Process (ANP) methodology and SuperDecisions software for the analysis. At this moment the comparison judgments are being collected but the authors are confident that all the results will be available on time for the ISAHP2014 symposium presentation.

THE CORRELATION BETWEEN MAJOR CRITERIA OF AHP FOR GOVERNMENT R&D PROGRAM IN KOREA *Dong-Guen Kim, Korea Institute of S&T Evaluation and Planning (KISTEP)*

The preliminary feasibility study is carried for the newly proposed large-scaled government programs in Korea since 1998. PFS about research and development (R&D) programs also became

compulsory since 2008. In case of a PFS on R&D programs, there are three major criteria about technology, policy and economic effects. Each expert evaluates the program about three major criteria and the score of each criterion is aggregated into overall score. The newly proposed program is finally evaluated into two alternatives, feasible or infeasible. In this study, the correlation between three major criteria and overall score is analyzed. In addition, the feasible cases in which overall score are more than 0.5 and the unfeasible cases in which overall score are less than 0.5 are compared. The results show that the major criteria of preliminary feasibility study have correlation and the difference on feasible and infeasible programs is existed.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Dong-Guen Kim, Korea Institute of S&T Evaluation and Planning (KISTEP)

030. Corporate Social Responsibility

08 Corporate Social Responsibility

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

A COMBINED AHP-DELPHI APPROACH TO ASSESS THE SOCIAL RESPONSIBILITY DEGREE OF EQUITY MUTUAL FUNDS *Monica Garcia-Melon, Universitat Politècnica de Valencia, Spain; Tomás Gómez-Navarro, Universitat Politècnica de Valencia, Spain; Blanca Pérez-Gladish, University of Oviedo, Spain; Paz Mendez-Rodríguez, University of Oviedo, Spain*

The aim of this paper is to propose a ranking method for Spanish equity mutual funds based on multiple social responsibility criteria, which could allow individual and institutional investors to make investment decisions based on a set of agreed social responsible values. In order to reach this goal three key questions have been addressed: the identification of the main stakeholders; the definition of an agreed list of socially responsible investment criteria and, the determining of the agreed relative importance given to each criterion in the decision making process. In order to calculate this relative importance of the criteria a participative AHP procedure has been carried out.

MEASURING THE ATTRACTIVENESS OF SOCIALLY RESPONSIBLE ASSET INVESTMENTS *Antonella Petrillo, University of Naples "Parthenope", Italy; Fabio De Felice, University of Cassino and Southern Lazio, Italy*

Socially responsible investment is attracting more and more attention both in practice and in academia. A growing number of fund managers do invest while taking account of the societal effects of the companies they are investing in. In this study we

present a AHP model to make investment decisions in which both financial return and social return dimensions are considered. We propose a model that can be used to define a measure of the ethical performance of the mutual funds that follow a Socially Responsible Investing (SRI) approach. The final aim is to propose an index called “SRI index” that summarizes the “social, environmental and ethical performance” of each SRI-funds analyzed.

INDUSTRY RISK ASSESSMENT IN BRAZIL WITH THE AHP *Bernardo Brazao Rego Mello, BNDES, Brazil; Luiz Flavio Autran Monteiro Gomes, Ibmec, Rio de Janeiro, Brazil; Sergio Augusto Novis Filho, BNDES, Brazil*

With the increasing importance of the financial market over the past decades, credit risk has become paramount in investment evaluation, loan spreads, corporate solvency, growth prospects, etc. Credit risk evaluation models may be classified into two broad categories: quantitative and qualitative. Quantitative models consider financial statements and indexes, while qualitative models analyze the systemic variables that affect corporate business. These models typically follow a top-down approach and consist of analyzing the industries and going deep into the managerial structure. The aim of this paper is to present an industry risk model that can prioritize variables according to their importance and group them by their nature. The model is based on Analytic Hierarchy Process method and leads to an industry risk score and rating that can be useful to industry risk assessment. By applying it to three different industries in Brazil (pharmaceutical, information technology and airline), the obtained ratings show a strong coherent in terms of a credit risk perspective.

STRATEGIC PLANNING AND RESOURCE ALLOCATION FOR A SUSTAINABLE DEVELOPMENT IN A DEVELOPING COUNTRY

Claudio Garuti, Fulcrum Ingenieria, Chile

For society in the last years the idea of sustainable business has become a very important idea considering both sides view, the necessary inside developing of the business as well as the surrounding environment where is located. The different social organizations like communities, workers, families, and stakeholders, have understand the importance that business or entrepreneurships of certain level take care of their possible environmental, social and economical impacts, considering the two basic aspects for the “responsibility” concept, that is presenting the accountability of the business in front of their stakeholders and at the same time be able to respond to the different social organizations about his behavior, put together these two aspects it necessary carry into the Corporative Social Responsibility (CSR) concept, it means to look the business and its surrounding as a whole indivisible. This new approach takes the concept of sustainable development into the core of the business; this was the case of the Mining Company “Los Pelambres” in Chile (a developing Country). The Company has incorporated in his core business the concept of CSR using the triple view scheme (economic, social and environmental view) to design his strategy of resource allocation and projects assessment. To do this task considering the multiple actors that have to participates in the process, with different (even contra post) point of view, different data, units and type of information, it became necessary to apply the analytic Hierarchy Process (AHP) for the analysis and modeling process, incorporating from the very beginning of the business the visions of the stakeholders to measure the global impact of almost all the projects (the actions) of the Company.

Session Organizer:

Orrin Cooper, University of Memphis, U.S.

Session Chair: *Bernardo Brazao Rego Mello*, BNDES, Brazil

031. Renewable Energy Applications

25 Miscellaneous

Panel

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

This session covers four papers, three relating to application of Analytic Hierarchy Process (AHP) in renewable energy sector, mainly hydropower development related issues in Nepal. The fourth paper is about the diffusion of AHP in Nepal, a bibliographic survey covering academic and non-academic application of AHP over the period of ten years (2003-2013). Various mode of institutional and financing arrangement for hydropower project development is addressed in the first paper with the use of AHP in combination of impact analysis matrix (IAM). The second paper is on AHP application for prioritization of hydropower projects for development based on the scale or the size of the project. The third paper is about the sustainability assessment of rural renewable energy projects. The renewable projects considered for sustainability assessment in the third paper includes micro-hydropower, solar and bio-gas systems implemented in rural Nepal. The fourth paper is prepared to look at two aspects; firstly, to see how AHP diffusion is happening in Nepal secondly to prepare a bibliographic report of AHP application in Nepal for the period of ten years (2003-2013). The AHP diffusion survey is analyzed its application with respect to chronology and sector of application. It is observed that AHP application in Nepal is mainly for application in the area of water and energy related sectors and diffusion of AHP in Nepal is driven both ways, externally as well as internally. The authors of the session are all working professionals. Two of them are working PhD students in their respective fields. The third author is professional working in the hydropower sector with the electricity authority of government of Nepal. The fourth author and the session organizer is working professional with keen interest in AHP application and academic support, since last 15 years in Nepal.

Participants:

**MULTICRITERIA APPROACH FOR
EVALUATION OF MODE OF HYDROPOWER
DEVELOPMENT IN NEPAL** *Lila Nath Bhattarai,
Nepal Electricity Authority, Nepal*

This study evaluates different mode of institutional arrangement for hydropower development practiced in Nepal. The institutional arrangements practiced in Nepal so far are either public sector undertakings such as government of Nepal (GoN) and Nepal Electricity Authority (NEA) with multilateral/bilateral funding or GoN/NEA funding; national Independent Power Producers (IPPs) such as national private & national public company and international IPPs through foreign direct Investment. The resource criteria identified to examine the mode of the hydropower development are Technical, Cost and Schedule, Capacity Building, National Hydropower Industries, Environmental and Social, NEA's and National perspectives. Analytical Hierarchy Process (AHP) in combination with Impact Analysis Matrix (IAM) is utilized in the study. AHP was focused to get weights of different criteria and sub-criteria/attributes. The information thus generated through AHP and IAM helped to assess the impacts and tradeoffs that exist for various institutional modes of project development alternatives. The research study result shows that the hydropower development institutional model in Nepal requires more to focus on national perspective including linkages into local economy. It is followed by capacity building and involvement of national hydropower industries. The study recommends giving highest priority to national developer such as private, public and NEA self promoted projects and the projects funded through grant assistance almost in its entirety by the donor(s).

**PRIORITIZING HYDROPOWER DEVELOPMENT
USING ANALYTICAL HIERARCHY PROCESS –
A CASE STUDY OF NEPAL** *Rana Pratap Singh,
BOKU, Austria*

Relevancy of multi criteria decision analysis and effectiveness analytic hierarchy process (AHP) for hydropower prioritization is focus of this research. Increased social and environmental awareness in Nepal, not only out dated ad-hoc or economics based approach; rather call for multi criteria analysis tool in project selection. Prioritizing hydropower scale in Nepal using AHP is further established as easy and appropriate approach. This study organized in a framework of six criteria (factors) along with associated sub-factors and five alternatives (scale of hydropower plant). Subjective value judgment based on secondary sources gathered and used for further processing. Final prioritization generated using AHP based software called Expert Choice, found Medium hydropower as most appropriate scale of power generation and is closely followed by big hydropower on ranking.

**FRAMEWORK FOR SUSTAINABILITY
ASSESSMENT OF RENEWABLE ENERGY
PROJECTS IN NEPAL** *Ram Prasad Dhital, Institute
of Engineering, Nepal; Parakram Pyakurel, Alternative
Energy Promotion Center, Nepal; Tri Ratna
Bajracharya, Centre for Energy Studies, Institute of
Engineering, Tribhuvan University, Nepal; Rajendra
Shrestha, Mechanical Engineering Department,
Institute of Engineering Tribhuvan University, Nepal*

Long term sustainability of renewable energy projects in Nepal has been challenging issues due to projects are built in with a certain amount of investment subsidy from government. After installation of the energy system, it is the responsibility of the participating community or the users to operate, maintain and manage the system. The sustainability of renewable energy projects

considered largely depends on how much revenue it can generate from its users for operation, maintenance and management. Revenue from users' depends upon multiple factors categorized as technical, financial / economic, social, institutional and environmental. As such, sustainability of the projects needs to be evaluated based on the multiple criterions in a holistic manner. The paper is built on identifying the all possible factors relating to sustainability of renewable energy projects from the prospective of all concern people i.e. project implementers to end users, in addition to the all the concerned stakeholders, in the changed context of climate change and green economy. The paper reviews briefly the literature on utility of multi criteria methods for sustainability assessment of renewable energy projects. Assessment of relative standing of AHP is further conducted. An appropriate AHP based framework for sustainability assessment of the projects is recommended with due consideration to identified factors of sustainability concern from peoples' prospective with the wider representation.

DIFFUSION OF ANALYTIC HIERRCHY PROCESS IN NEPAL: OVERVIEW FOR THE PERIOD OF 2003 - 2013 *Shashi Bhattarai, Knowledge Holding International, Nepal*

The paper is overview of diffusion of analytic hierarchy process (AHP) in the form of application and research in Nepal and Nepalese issues during the period of ten years (2003-1013). AHP application in development decisions are reviewed in 2003, since then, it has been observed that the AHP has been diffused not only in development decisions, academia and industry within Nepal, but has been utilized to address the issues and problems of Nepal by Nepalese round the globe. The article of review of diffusion of AHP in the Nepalese contest is seen from academics, industry and individuals perspectives.

Real life applications, published papers and involvement of Nepalese within social media related to AHP has been discussed. The overview of diffusion survey reveals that Nepalese professionals are active in AHP related social media, research and application of AHP in diverse Nepalese context is increasing. Courses in business school are being offered; Nepal has been included among four countries in Asia in European Commission research project related to application of MCDM in general and AHP in particular, masters and higher level of thesis are being prepared, application in business and industry within the short period of ten years can be seen. The indication of faster diffusion of AHP in Nepal observed to be the appropriate tool of multi criteria analysis in Nepalese context. This AHP diffusion survey is observed to be eye opener for other developing countries of the region to look at the utility of AHP based multi criteria analysis in the context of respective countries. It is also observed that Energy and water related problem had mostly attracted for the application of AHP in Nepal.

Session Organizer:

Shashi Bhattarai, Knowledge Holding International,
Nepal

Session Chair:

Shashi Bhattarai, Knowledge Holding International,
Nepal

032. AHP/ANP Mixed Methods, Optimization and Applications 1

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

A DYNAMIC METHODOLOGY ON DETERMINING THE MOST APPROPRIATE DUE DATE ASSIGNMENT MODELS FOR JOB SHOP SCHEDULING *Serafettin Alpay, Eskisehir Osmangazi University, Turkey*

In a job shop production system, assigning exact due dates is an important task for scheduling performance. On the other hand, predicting due dates accurately is very difficult because of several decision factors should be considered. Many due date assignment models proposed in the literature but none of them is perfect and can produce the best due dates for all jobs arrived to the dynamic job shop environment. So using more than one due date assignment model for all job set may be reasonable. In this study a dynamic solution methodology for determining the most appropriate due date assignment models for the jobs arrived to the shop to optimize the aimed objective function by considering the related decision factors in a dynamic job shop environment is presented.

ALIGNMENT OF LEAGILE STRATEGIES WITH OFF-SITE MANUFACTURING: APPLICATION OF ANP IN AUSTRALIAN HOUSING SUPPLY *Sherif Mostafa, University of South Australia, Australia; Jantanee Dumrak, International Institute of Business and Information Technology, Australia*

The supply response of Australian housing has not been commensurate with the growing demand. Four

main factors affecting the Australian housing supply are house completion time, cost of finished house, customer preferences and level of skilled labor. Off-site manufacturing (OSM) could become a key innovation for the future of Australian house building as it provides capacity in meeting the growing housing demand, green construction and lesser requirements for labor force. OSM is a modern construction method in which house building components are produced in offsite factories and then transported to the construction site to be assembled. The supply responsiveness of OSM can be enhanced by employing lean and agile concepts. In this study, four leagile strategies are introduced to facilitate decision making based on different combinations of housing supply factors. This paper presents a matching of the four strategies with the four studied factors in the Australian house building using Analytical Network Process (ANP). The data employed for the ANP model derived from the actual specifications of 258 houses built in five Australian States by five major house builders in Australia. The results from the ANP model show the suitability in applying each strategy under different degrees influenced by the factors tested.

AN AHP MODEL TO DESIGN MOBILE

APPLICATIONS *Emre Cimen, Anadolu University, Turkey; Gurkan Ozturk, Anadolu University, Turkey*

There are millions of applications in the mobile app markets. Everyday, lots of apps are supplied to these markets. While some of them get high market shares, the others do not. It is really important to know, how an app can be successful in the markets, before submitting the app to the store. In this study we developed an AHP model to depict design rules for messaging mobile applications. In this way, a mobile app developer can weigh the factors (i.e., graphics, social network support, etc.) according to their relative importance.

AN INTEGRATED DEMATEL-ANP APPROACH IN RENEWABLE ENERGY RESOURCES

SELECTION *Gülçin Büyüközkan, Galatasaray University, Turkey; Sezin Güleriyüz, Galatasaray University, Turkey*

Renewable energy resources (RER) are one of the most growing energy sources in the world and various researches point out that these resources will have vital importance in the future. On the other hand, the limited reserves and negative environmental impacts of fossil fuels make investors to consider RER for sustainable development. In this study, multi-criteria decision making (MCDM) approach based on Decision Making Trial and Evaluation Laboratory Model (DEMATEL) integrated with Analytic Network Process (ANP) is considered for selecting the most appropriate RER in Turkey from investor-focused perspective. The originality this work is, its ability to combine technical, economical, political and social attributes with a developed model and ability to apply this model with integrated techniques in Turkey.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chairs:

Emre Cimen, Anadolu University, Turkey

Sezin Güleriyüz, Galatasaray University, Turkey

033. Graduate Presentations

24 Graduate Students (master, non-doctoral)

Panel

4:30 to 6:00 pm

Grand Hyatt: Floor Independence Level - McPherson Square

These presentations correspond to graduate (Master-level, non-doctoral) students who constitute the next generation of AHP/ANP scholars and practitioners.

Participants:

AHP BASED DECISION MODEL FOR APPRAISING RESIDENTIAL REAL ESTATES IN AN ABSTRACTED ZONE *Secil Kavas, Istanbul Technical University, Turkey; Ilker Topcu, Istanbul Teknik Universitesi, Turkey*

Certain land and buildings that have been made by people all over this land are considered as "real estate". After using real estates as a trading good, "the value of the property" concept has been born. "Value of the property" term can be explained as the benefit to be obtained by the owner of the property at the time in the market. Since the transaction aim of the property is not only for commercial but also for residential, the value of the real estates is unstable in the market. It varies according to features and the specialties of the real estate, willingness to buy/sell and so on. As viewed from this side, valuation of the property is a complex problem with many parameters and constraints. The objective of this paper is to present a decision model that estimates the value of a residential property according to its structural and neighborhood features. To achieve this, firstly, the evaluation criteria which are commonly used in the literature to determine the characteristics of the residential property have been identified. Then, judgments of the experts from the residential market are collected. The literature outcomes and expert views have been aggregated and customized according to focused problem. As a result, "criteria

pool” that will be used in appraising a given residential property is identified. After structuring the decision model, the next stage is prioritizing the criteria. For this purpose, pairwise comparison judgments of the experts are assessed. The performance values of zones as well as residential properties are received based on expert judgments and objective evaluations. Finally, global rating scores, which can be expressed as estimated values of residential properties, are calculated.

AN EMPIRICAL EVALUATION OF M-PAYMENT BUSINESS MODELS USING ANALYTIC HIERARCHY PROCESS AND SENSITIVITY ANALYSIS

Abid Ali, International Islamic University Islamabad, Pakistan

Mobile payment is the core concept in today’s m-commerce. There are different mobile payments business models but we cannot see the dominant model in the existing market. This work surveyed different factors from literature which support the sustainability of these models and were used for empirical evaluation. The literature does not report any empirical investigation about the relative importance of selection parameters and performance of each model based on this relativity. This study analyzed quantitatively current m-payment business models using AHP which is a quantitative method for decision making in case of multiple criteria and conflicting objectives, and on the basis of this analysis, the reported models and factors was prioritized according to their relative performance values. Similarly Sensitivity Analysis was done in order to find out different views about final prioritized list under varying conditions.

COGNITIVE MAPS AND AHP FOR SUPPLIER SELECTION IN A PRIVATE HIGHER

EDUCATION INSTITUTION *Ana Lucia Pegetti, University of São Paulo, Brazil; Jesse D'Assuncao Rebello de Souza Junior, University of São Pulo, Brazil*

Supplier selection is a key decision in the procurement and purchasing processes. Both the choice of criteria and the evaluation of possible alternatives are critical steps in this decision-making. One of the great challenges of private higher education institutions (PHEI) in Brazil in recent decades has been the attempt to institutionalize administrative practices applied in the business market with the primary goal of optimizing their business processes and achieve reduced risks and operational costs, thereby increasing their productivity and the quality of services. These initiatives aim to maintain self-sustaining and competitive institutions in an aggressive market which is constantly expanding. Therefore, a critical and professionalized look at their business processes has been one of the solutions in order for them to achieve their organizational goals. In this context, this paper proposes to formalize the decision-making process in the selection of suppliers through their systematization using cognitive maps to structure and identify the criteria that effectively present value during the partner selection of the decision-maker's procurement and purchasing department. The paper also proposes the subsequent prioritization of these criteria for evaluation and selection of potential suppliers through the use of the AHP multi-criteria method.

SELECTING THE FIELD HOSPITAL PLACE FOR DISASTERS: A CASE STUDY IN ISTANBUL

Nazanin Vafaei, İstanbul Teknik Üniversitesi, Turkey

Increasing population growth and lack of enough medicine care within disaster such as volcanic eruption, typhoon, tropical cyclone, tornado an

earthquake, a landslide or war is the most important problem for the disaster managers and metropolitans. Importance of disaster preparedness, the effects of disasters in previous years, Importance of Medical services in case of emergency persuade us to select a proper place for emergency field hospitals. In the emergency cases we can use Multi-Criteria Decision Making (MCDM) and Geographical Information System (GIS) together for having better evaluating. So, we use Multi-Criteria Decision Making process that combines Geographical Information System (GIS) analysis with the Analytical Hierarchy Process (AHP), and use this process to determine the optimum site for field hospital in the Istanbul urban area. We use some criteria such as Distance from Arterial Routes, Travel Time area to access existing hospitals; Environmental pollution, Population Density, Time of Operate, and Capacity of Beds.

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Ilker Topcu, Istanbul Teknik Universitesi, Turkey

034. Program Organizing Committee

Reception

ISAHP

Reception by invitation only

6:00 to 8:00 pm

Grand Hyatt: Constitution DE

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

TUESDAY, JULY, 1

035. Plenary Session: AHP and Analytics

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

Daniel Saaty, Decision Lens

Session Organizer:

Enrique Mu, Carlow University, U.S.

036. Conflict Resolution

01 Conflict Resolution

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

CONTINUAL ENGAGEMENT APPROACH THROUGH GIS-MCDA: CONFLICT RESOLUTION OF LOGGERHEAD SEA TURTLE BYCATCH IN MEXICO *Luis Antonio Bojórquez- Tapia, LANCIS UNAM, Mexico*

The Eastern Pacific population of the loggerhead sea turtle (*Caretta caretta*) epitomizes the challenges of designing conservation strategies for highly migratory, endangered species. The loggerhead performs one of the longest trans-oceanic migrations (~12,000 km) of any marine vertebrate. Incidental fishing bycatch has been documented as a major threat to sea turtles around the world. Loggerheads are incidentally captured on the high seas by fishing fleets registered in Hawaii, and on the nurture habitat by small scale fishing fleet in the Gulf of Ulloa, Mexico. Because regulations for small scale fisheries in the Gulf of Ulloa are lacking, the U.S. government has notified possible trade sanctions to Mexico. To address this conflict, a "continual engagement" model was implemented to integrate the knowledge from policy makers, fishing communities, and researchers. This model focused on the creation of hybrid scientific-local knowledge highly relevant to community and policy makers needs, while balancing the power asymmetries among stakeholders. Continual engagement involved the creation of a boundary object (a planning artifact) capable of linking the stakeholders without interruption throughout a policymaking process. This boundary object was based upon the combination of GIS-MCDA and risk assessment approaches. The AHP was fundamental for synthesizing the different

sources of knowledge into a geospatial model. In particular, the AHP enabled to assess the salience, legitimacy, and credibility of the information produced for all involved. Results enabled the development of specific policies based upon an assessment of the risk of the loggerhead population to different levels of fishing bycatch, and the needs of the fishing communities in the region.

THE MIDDLE EAST CONFLICT – AN EXAMPLE OF A RETRIBUTIVE CONFLICT *Luis G Vargas, University of Pittsburgh, U.S.*

A retributive conflict is a conflict in which the parties decide on courses of action not just because of the benefits they accrue but also because of the costs they exert on the other party. The AHP has been used to study this conflict and to provide potential solutions that could lead to a peace agreement. We show how the AHP is used to assess the concessions/tradeoffs of the parties and how an agreement in principles has resulted pointing to a possible solution of the conflict.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Luis G Vargas, University of Pittsburgh, U.S.

037. Industrial Engineering Applications 1

09 Industrial Engineering

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

IDENTIFYING THE CRITERIA AND THEIR PRIORITIES FOR LOCATING BANK

BRANCHES IN TURKEY *Ayfer Başar, Istanbul Technical University, Turkey; Ozgur Kabak, Istanbul Technical University, Turkey; Ilker Topcu, Istanbul Teknik Universitesi, Turkey*

Although technology has improved and distribution channels such as credit cards, mobile-internet banking, operation centers, automated teller machines, point of sales etc. have become alternative opportunities for reaching bank services, the branch offices are still important for the banks to gain new customers and keep in touch with them. Therefore the problem of selection best location for branches is a fundamental topic for banks to reach their goals. Finding the best location for bank branches depends on a number of distinct measures which differ according to the banks' strategies and vision, customer profile in the potential location and features of the place where the branches will be located. This paper presents a methodology to find the criteria and their priorities for location planning of Turkish bank branches in Istanbul. For this aim, firstly, a number of criteria are selected by the help of a detailed literature review and expert judgments. Subsequently priorities of these criteria for four different types of bank branches are identified based on expert judgments using pairwise comparisons. The priorities will be used in a new mathematical model developed to decide the best branch locations of a Turkish national bank in Istanbul.

**THE NONLINEAR NATURE OF PREFERENCES,
ITS IMPACT ON THE SENSITIVITY AND
EFFECTIVENESS OF MULTIPLE CRITERIA
ALTERNATIVES** *Rafael Sarkisyan, Moscow State
University of Railway Engineering, Russian
Federation; Aleksandra Masalida, Moscow State
University of Railway Engineering, Russia; Elena
Kobetc, Moscow State University of Railway
Engineering, Russia*

The mechanisms of creating and processing expert and/or statistical information, which underlie the AHP/ANP, do not enable to take into account the nonlinear nature of preferences and their dependence upon intensiveness of measurable features and qualities of optimized systems. In the traditional methods of multiple criteria (multiobjective) optimization based on the concept of preferences and utilities, the nonlinear nature of preferences as well as the loss of sensitivity and effectiveness of alternatives caused by it can be taken into account, if to use concave increasing property of a corresponding evaluation function (preference function). If to assume also that the concave increasing preference function is differentiable, then it can be decomposed into components which reflect the relative sensitivity of the causal relation and the effectiveness of criteria values. In effect, these measures characterize the relative weight (importance, return) of individual criteria and play the same role in alternatives ranking as the priority vector coordinates do in the AHP/ANP schemes, but now they depend on the state vector (i.e. on criteria intensiveness). The maximization of the relative sensitivity and effectiveness functions on the preference function level surface generates a trajectory of solutions that provide a "consistent" value of the criteria interaction function. Also the possibility of using the proposed analytic correlations in the AHP/ANP traditional procedures is being discussed. As applications a multiple criteria problem of corporate resources management and diagnostic

messages processing in transport systems are being considered.

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chairs:

Elena Kobets, Moscow State University of Railway Engineering, Russia

Ilker Topcu, Istanbul Teknik Universitesi, Turkey

038. Performance and Simulation Application

20 Performance and Simulation

Paper Session

9:30 to 10:30 am

Grand Hyatt: Independence B

Participants:

A DECISION SUPPORT TOOL TO SUPPORT INNOVATIVE AND STRATEGIC PROCESSES

Antonella Petrillo, University of Naples "Parthenope", Italy; Fabio De Felice, University of Cassino and Southern Lazio, Italy; Leandro Pecchia, University of Warwick, UK

In recent years a growing number of companies modified their innovation process. Especially after the recent financial downturn, companies are looking for much more efficient and creative business processes. The aim of the presented paper is to present a decision support tool or in other words a software system for the application of the AHP method to support innovative and strategic process. Few studies propose analytic quantitative methods to elicit user/stakeholders needs, and among those a method that seems to be particularly effective to elicit user need was the Analytic Hierarchy Process (AHP).

EVALUATING ACADEMIC PERFORMANCE OF DEPARTMENTS IN ENGINEERING FACULTY OF A UNIVERSITY USING FUZZY DELPHI AND TOPSIS

Oguz Toragay, Gazi University, Turkey; Murat Arikan, Gazi University Industrial Engineering Department, Turkey

The development and competition in educational facilities, is gradually increasing the importance of the quality of service. In order to accommodate this fast process, the educational organizations attempt to increase the quality of their service and to measure their performance. In general, the organization's performance should not depend only on one criterion, but it should be evaluated based on multi criteria. In

this study, the academic performance of the departments within the Engineering Faculty of Gazi University have been compared by using one of the multi attribute decision making methods, called TOPSIS. In contrast to the most of the previous studies, in this study the necessary criteria for TOPSIS method and their weights were obtained not relatively, but based on the views of the specialists. For this purpose, in order to prevent the loss of information in the areas of the group decision making, linguistic variables have been utilized and criterion weights have been obtained by using a fuzzy Delphi method.

SMARTER STREETS EASIER ACCESS VIA

PERCEPTION *irene doosuur Mngutyo, Benue State University, Makurdi, Benue State, Nigeria.; Ajene A Ajene, Benue State University*

Streets are public spaces. They are everywhere and the most fundamental integrators of the city. They are used for all kinds of purposes depending on how people perceive the streets. Perception is a difficult construct to define. It is influenced by culture, age, gender and socioeconomic status. This study uses the Analytic Hierarchy process (AHP) to determine more accurately dominant perceptions on street use. It also determines how these perceptions are distributed along influencing factors. A GIS map of Makurdi town was generated. All the streets on the map were highlighted and grouped according to four road categories of connectors, distributors primary and secondary arterials these form the population under study. Ten streets each from the four categories were randomly selected to give a sample size of 40 streets. On the streets systematic sampling of every 5th residence of ten households for every street was done where resident's perception was measured using questionnaires. Anticipated findings include major activities carried out on streets. Perceptions that influence use of streets AHP was applied to analyze

data findings. This data is crucial for evaluation of street use in Makurdi.

Session Organizer:

Antonella Petrillo, University of Naples "Parthenope",
Italy

Session Chair:

Antonella Petrillo, University of Naples "Parthenope",
Italy

039. Group Decision Making

25 Miscellaneous

Panel

9:30 to 10:30 am

Grand Hyatt: Independence C

The process of management is based on constant decision making, where the decisions are becoming increasingly complex and multifaceted. In the modern world most decisions are made by groups of people, often from various disciplines. The ability to use multicriteria methods (e.g. AHP/ANP) of supporting decisions is one of the key challenges that modern managers face. That's why the methods supporting decision making are an inherent element of the knowledge of management science. During the current track and organized sessions we will try to considerably expand the knowledge in this area with using AHP/ANP.

Participants:

AGGREGATING PAIR-WISE COMPARISONS GIVEN IN SCALES OF DIFFERENT DETAIL

DEGREE *Vitaliy V. Tsyganok, Institute for Information Recording of National Academy of Sciences of Ukraine; Oleh V. Andriichuk, Institute for Information Recording of National Academy of Sciences of Ukraine*

In this paper we suggest an original approach to conducting individual pair comparisons during group decision-making (including AHP/ANP-based decisions). Under this approach every expert is given an opportunity to use the scale, in which degree of detail (number of points) most adequately reflects this expert's competence in the issue under consideration. Before aggregation all separate expert estimates (judgments) are brought to a unified scale, and scales, in which these judgments were built, are assigned respective weights. A respective instrument for pair comparison conduction has been developed, and an experiment has been organized. The experiment statistically proves that as a result of suggested technology usage, there is an increase in degree of correspondence between estimates, input

by an expert, and his (her) own notions on examination objects.

**CONSISTENCY IMPROVEMENT IN
COMBINATORY SPANNING TREE
ENUMERATION METHOD** *Sergii Kadenko,
Institute for Information Recording of the National
Academy of Sciences of Ukraine*

The paper addresses the problem of consistency improvement in group decision-making. The research is done in the context of studies performed by the Laboratory for Decision Support Systems of IIR of NASU (<http://dss-lab.org.ua/>). Particularly, the paper focuses on the problem of improving the consistency of pair comparison matrices (PCM) in AHP-based group decision support method called “enumeration of all spanning trees” or “combinatory algorithm”. Quite often expert judgments do not satisfy consistency requirements. PCM provided by an individual expert can be inconsistent within itself, while matrices built by several experts in the context of the same decision-making procedure can be mutually inconsistent. Combinatory methods of expert judgment aggregation are designed to utilize the redundancy of expert data most thoroughly. But such aspects as satisfactory PCM consistency level and ways of consistency improvement still need to be studied more carefully. The task, tackled in the current paper, is to study the opportunities for development of a converging consistency improvement procedure, allowing to achieve satisfactory levels of initially inconsistent expert judgments in combinatorial aggregation methods.

**GROUP DECISION MAKING WITH THE AHP/ANP
– AN OVERVIEW OF APPROACHES TO
AGGREGATION OF JUDGMENTS AND
PRIORITIES** *Anna Florek-Paszkowska (Greda),
Cracow University of Economics, Poland; Anna
Prusak, Cracow University of Economics, Poland;*

Piotr Stefanow, Andrzej Frycz Modrzewski, Cracow University College, Poland

The objective of the present paper is to review knowledge in the area of analytic hierarchy and network processes (AHP/ANP), with respect to group decision-making and aggregating results from many respondents. This knowledge refers to one of the most important aspects of methodology of the AHP/ANP. It reviews two main approaches to aggregating the AHP/ANP results: qualitative (behavioral) and quantitative (mathematical). Qualitative approach includes consensus and voting or compromising, while quantitative approach consists calculating geometric mean of individuals' judgments (aggregating individual judgments – AIJ), and combining results from individual models or parts of a model (aggregating individual priorities – AIP). The authors review these approaches and recommend the matrix of selection of the most appropriate aggregation procedure of the AHP/ANP judgments and priorities dependent on the character of a group.

Session Organizer:

Anna Florek-Paszowska (Greda), Cracow University of Economics, Poland

Session Chair:

Anna Florek-Paszowska (Greda), Cracow University of Economics, Poland

040. Marketing Applications 1

18 Marketing Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

**A LINEAR PROGRAMMING APPROACH
DETERMINING EMINENT DRIVERS OF
CUSTOMER BASED BRAND EQUITY IN
SPORTSWEAR INDUSTRY** *Richa Singh, Birla
Institute of Management Technology, India; Veenu
Sharma, Birla Institute of Management Technology,
India; Gokulanda Patel, Birla Institute of Management
Technology, India*

Along with its substantial part in business practices, brand equity is considered one of the significant concepts in academic world too. Creating and managing brand equity has been accentuated as an essential task for most of the firms. With Indian sportswear segment tramping its way in an upward movement, presence of number of national and multinational brands are seen contending for customer's attention and market share. This paper looks into the most eminent drivers of brand equity, from a customer-based point of view, in the Indian sportswear market. We present an approach based on linear programming (LP) generated within the framework of the analytical hierarchy process (AHP). Sportswear industry offers products that provide more intangible value to its users than tangible characteristics, the proposed approach is chosen. Since it allows for pair wise comparison between non-directly measurable criteria, providing ranks to the intangible drivers of the brand equity. Data was collected by interviewing consumers as the customers are considered to be the experts when it comes to their purchase decision. The analysis also furnishes a global ranking for four sportswear brands: Nike, Reebok, Adidas and Puma.

A STUDY OF THE ACCEPTANCE OF WEARABLE TECHNOLOGY FOR CONSUMERS-AN ANP PERSPECTIVE

Chiau-Ching Chen, Department of Management Sciences, Tamkang University, Taiwan; Hsu-Shih Shih, Dept. of Management Sciences, Tamkang University, Taiwan

Wearable technology is one of popular emerging trends in 2014 Consumers Electronic Shows, which can be applied in many devices or gadgets and added some functions to create innovative and diverse services or goods for making people's life quality better. However, SPOT, a prototype of smart watch, was introduced by Microsoft in 2004, but it has not been popular because of lacking appealing and replaceable contents. Now, the wearable technology is noticed again. Will it be successfully attract consumers to accept it or not? Traditionally, many studies of predicting a new technology being accepted usually utilized Unified Theory of Adoption and Use of Technology (UTAUT) model which was proposed by Venkatesh, Morris, Davis and Davis in 2003 and viewed as a better robust model than the others with similar purposes. Besides, the original contents of UTAUT, Analytical Network Process (ANP) can further examine the detailed priorities of factors inside the dimensions or clusters. These detailed results are benefit of the firm which tries to understand the acceptance of wearable technology in the market in the future. Therefore, in this paper we exploit some key influential factors of the using intention and actual using behavior of customers on wearable technology in Taiwan by applying ANP under the structure of UTAUT.

DETERMINATION OF PROMOTIONAL STRATEGY FOR ORGANIZATIONS IN THE NIGERIAN INSURANCE INDUSTRY USING THE AHP MODEL *Bolajoko Nkeminim Dixon-Ogbechi, University of Lagos, Nigeria; Sikuade Oladimeji Jagun, Sol Simon Investments Ltd, Nigeria; Salome Oghenechuko Ighomereho, Redeemer's University, Nigeria; Rahim Ajao Ganiyu, University of Lagos, Nigeria; Elizabeth Marie Haran, Salem State University, U.S.*

Several studies have revealed that insurance companies are experiencing low patronage and they have recommended the use of promotional strategy to create awareness and to boost customer patronage. However, research revealed that there are seven basic promotional tools that most companies in the service industry can use in their promotional mix. Thus, this paper applied the Analytic Hierarchy Process model (AHP) to assist managers in the Nigerian insurance companies evolve a promotional strategy by determining the best mix of the promotional elements to use, given certain criteria. To achieve this goal, the survey approach was used. The multistage sampling technique was used to select a sample of sixteen (16) insurance companies out of a population of 49 insurance companies in Lagos metropolis and questionnaires were administered to managers of these companies.

DETERMINATION THE SIGNIFICANCE LEVEL OF FACTORS THAT ARE AFFECTING YOUNG CONSUMERS' PURCHASING PREFERENCES BY AHP *Mufit Aydin, Usak University, Turkey; Mustafa Hotamışlı, Afyon University, Turkey; Yasir Altıntop, Ahmetli Vocational HS, Turkey*

The purpose of the study is to determine the significance level of factors that are affecting young consumers' purchasing preferences by AHP. In this point of view, primarily criteria that are effective in the purchasing preferences of young consumers' are

defined as brand, price, quality, color and design, advertising, availability, promotions and discounts, conformity to fashion and after-sales services. These criteria will be applied separately to each essential product group such as food & beverage, clothing & accessories and technological products. Obtained results will be revealed in the full paper.

Session Organizer:

Bolajoko Nkemdinim Dixon-Ogbechi, University of Lagos, Nigeria

Session Chair:

Bolajoko Nkemdinim Dixon-Ogbechi, University of Lagos, Nigeria

041. AHP/ANP Mixed Methods, Optimization and Applications 2

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

ANALYTIC NETWORK PROCESS FOR DECIDING DISASTER RECOVERY PROGRAM IN

YOGYAKARTA INDONESIA *Ignatius Luddy Indra Purnama, Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta Indonesia; Ririn Diar Astanti, Department of Industrial Engineering, Universitas Atma Jaya, Indonesia; Hery Hery, Departemen Perindustrian, Perdagangan dan Koperasi Kabupaten Sleman Provinsi DIY, Indonesia; Mujgan Sagir Ozdemir, ESOGU, Turkey*

Mount Merapi volcano eruption in Yogyakarta Indonesia on November 2010 resulted many survivors who most of them worked as a farmer that lived surround the mountain lost their jobs. In addition, as the volcano destroyed their home they have to live in the temporary shelter provided by the government while they were waiting for their house to be rebuilt. Disaster recovery program was then conducted by the government where one of the purposes of that program is to empower the survivors, especially the women by giving them skills to enable them doing small scale economies activities in the future to generate the income. The local government then faced the problem in determining the appropriate skills that have to be given to the survivors. The data in the past show us that not all skills were appropriate to them and supported them in generating small scale economies activities. The model based on Analytic Network Process will be developed in this paper for disaster recovery program by deciding the type of the skills that have to be

given to the survivors, especially the woman.

ANP ROW SENSITIVITY AND THE RESULTING INFLUENCE ANALYSIS *William Adams, Decision Lens Incorporated, U.S.*

Sensitivity analysis in the AHP settings gives useful and interesting information, especially when doing that analysis on the upper levels in the model. In the ANP setting (with feedback, and/or nodes having multiple destination clusters) the equivalent sensitivity on a particular judgment set yields either no sensitivity at all, or at the best, very minimal sensitivity. The other option of adjusting the global priorities in the ANP setting bypasses the ANP structure (i.e. the limit matrix calculation). This paper presents a method of ANP sensitivity calculations (ANP Row Sensitivity). That calculation reproduces the AHP calculation in that setting, gives useful sensitivity results, and preserves as much of the ANP structure as possible. With that defined, various influence analysis calculations are presented.

APPLICATION OF MCDM METHODS FOR A GROUP OF NONHOLONOMIC MOBILE ROBOTS TO DETERMINE THE BEST ROUTE AND THE MOST SUITABLE ROBOT *Mujgan Sagir Ozdemir, ESOGU, Turkey; Alpaslan Yufka, Anadolu University, Turkey*

In this study, a fire-fighting scenario in an office environment wherein three different nonholonomic differential-drive mobile robots are used is considered as a case study. The 2D configuration space of the office environment is divided into grid cells by using the method of “Occupancy Grid Map” such that each grid cell is associated with each interrelated node. Each robot constructs a reachability tree by using these nodes and Breadth-First Search (BFS) algorithm. The back-tracking algorithm is used to obtain the finite solution set of paths from the motion planning. The set of alternatives is

constructed by randomly selecting routes from the finite solution set of paths. Each robot determines its own best route by applying Multi-Criteria Decision Making (MCDM) methods such that “Elimination et Choix Traduisant la Realite (ELECTRE I)” and “Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)”. Criteria for the path selection is weighted by applying the method of “Analytic Hierarchy Process (AHP)”. Then, each robot except the leader robot sends its best path-info to the leader so that the leader robot determines the most suitable robot that conforms to the fire-fighting task by using AHP. To analyze the effect of criteria’s weights on the alternatives and perform sensitivity-graphs, Expert Choice 11 software is used. The robot determined by the leader executes the task by tracking its own best path.

APPLYING AHP AND RATING MODEL FOR PRIORITIZING IRAN PROVINCES AND ESTABLISHMENT OF SOLAR WOOD DRYING

Majid Azizi, University of Tehran, Iran; Nemat Mohebbi, University of Tehran, Iran

Solar energy is one of the free and clean sources of energy supply without any destructive influence on the environment. Solar energy has been used in different forms for a long time. Concentrators of solar radiation can be used to produce unlimited, clean and free energy and save fossil fuels considerably. One of important applications of solar energy is to manufacture solar wood drying units. Iran has been located in an appropriate situation in the world with respect to receiving solar energy. For identifying and determining the best location for establishing solar wood drying; first experts of kiln wood drying were interviewed for preliminary investigation. As the second step, hierarchy of criteria was designed and weighing values of them were calculated by AHP. In the third step, model was used rating for prioritizing capable provinces. Results showed that Qom

province, with average temperature, has the highest priority as a criterion and alternative.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Ignatius Luddy Indra Purnama, Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta Indonesia

042. Environmental Application

06 Environmental Application

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

ANALYTIC HIERARCHY PROCESS TO ASSESS TECHNOLOGICAL SYSTEM IN WATER TREATMENT PLANTS *Claudio Macuada, USACH, Chile; Astrid Maria Oddershede, usach, Chile*

This paper proposes a multi-criteria approach to assess current technology systems in water treatment (WT) plants and water waste treatment (WWT) plants to find out the main implications on the quality of service. Presently, the plant production process and efficiency improvement of WWT plants has become a challenge for WWT plants. The need of cost-efficient and reliable treatment processes has significantly increased so as to meet the level of environmental regulations and national goals. A case study has been carry out in a main WWT company in Chile with the purpose to identify priority plants that must improve its technological standard. We have considered five technological systems that are indispensable in the process. With empirical data, expert opinions and combining scoring method with the Analytic Hierarchy Process (AHP) it was possible to obtain a plant ranking for the problem in study.

APPLYING THE ANALYTIC HIERARCHY PROCESS TO OIL SANDS ENVIRONMENTAL COMPLIANCE RISK MANAGEMENT *Izak Johannes Roux III, P. Eng, Walden University, Canada*

Oil companies in Alberta, Canada, have spent more than \$15 billion in 2013 on new oil-sands projects. There is demonstrable deficiency in the uniformity and understanding of environmental legislation requirements, which can lead to environmental

damage. The purpose of this quantitative study is to develop a prioritized list of environmental regulatory compliance risk factors and mitigation strategies for oil-sands projects using the Analytic Hierarchy Process (AHP). The multicriteria decision-making process using expert input is the basis for the study's theoretical foundation. The quantitative descriptive design consists of 3 phases: (a) the identification of the potential environmental compliance risk factors and mitigation strategies using the Alberta Energy Regulator (ERCB) database; (b) the formation and administration of a pilot study followed by a specialized survey on a sample of 15 industry-specific subject matter experts (SMEs) to provide their individual pairwise priorities among the identified risk factors and mitigations strategies; and (c) the application of the AHP, using SuperDecisions, on the collected sample to rank each of the risk factors and mitigation strategies. Enabling the Alberta oil companies' leaders to gain additional legislative and public trust through demonstrating improvements to their environmental risk management practices can make social-economic change possible. Knowing not only the environmental risk factors but also understanding the ranking of these factors will help oil companies completing sustainable oil sands projects in compliance with local regulator's requirements.

DECISION-MAKING POLICIES FOR THE SALGADO RIVER BASIN, CEARÁ – BRAZIL

Francisco de Assis Vilar Sobreira Júnior, Universidade Regional do Cariri, Brazil; Rodolfo José Sabiá, Universidade Regional do Cariri, Brazil; Anna Flávia de Oliveira Lima, Universidade Regional do Cariri, Brazil; Valerio Salomon, Sao Paulo State University, Brazil; Fernando Augusto Silva Marins, UNESP - Sao Paulo State University, Brazil

The parliament water of “Salgado” river, an event that guided the actions and recommendations for the

future of the waters of the “Salgado” River, south of the Brazilian state of Ceará, was obtained through a democratic process, with 100 public, private and the third sector institutions. We have intended to define a model of development compatible with the aspirations of society as regards to the priority use and the water quality standard we want to achieve, and what the necessary actions and strategies for multi-criteria analysis of the instrument national water policy, the Framework water. The main goal of the analysis is to decide what is the appropriate policy to meet the purposes of the Parliament of the Waters of the “Salgado” River. So we have used the Analytic Hierarchy Process method (AHP): the criteria was analyzed economic, socio-economic, social, environmental and environmental; alternatives were defined essentially preservationist policies, sustainable policies and essentially economic policies. Preliminary results indicate that the application of AHP method was effective in decision made.

ENVIRONMENTAL DECISION MAKING – A HYBRID APPROACH *Saroj Koul, OP Jindal Global University, India; Rakesh Verma, National Institute of Industrial Engineering (NITIE), India*

Environmental decision-making is a process of weighting alternatives and selecting the most appropriate alternative, by integrating results of risk assessment with social, economic, political and engineering data to reach a rigorous decision. Decision-making tools help in the selection of prudent, technically feasible, and scientifically justifiable actions to protect the environment and human health in a cost-effective way. The main challenge in environmental decision-making is that alternatives are multiple and diverse in nature, and often have conflicting criteria. Multiple criteria decision-making (MCDM) methods are employed where alternatives are predefined and the decision-

maker(s) ranks available alternatives based on the evaluation of multiple criteria. The ability of MCDM to address the numerous quantitative and qualitative criteria that affect environmental decision-making process makes it appropriate for the said topic. Analytic Hierarchy Process (AHP) is one of the most commonly used utility-based methods for environmental decision-making (Sadiq, 2001). The AHP uses objective mathematics to process the subjective and personal preferences of an individual or a group in decision-making (Saaty, 2001). Complex proportional assessment (COPRAS) method (Zavadskas, Kaklauskas, 1996) was applied to the solution of various problems in construction (Kaklauskas et al., 2007) and assessment of road design solutions. COPRAS method has been used to define the utility and market value of real estate and for measuring sustainable city. COPRAS, along with TOPSIS, were used in the evaluation of social and economic development of Lithuanian regions. This paper presents a hybrid approach of a combination of AHP and COPRAS to select the best alternatives under multiple environmental criteria and is demonstrated with a detailed illustrative example.

Session Organizer:

Monica Garcia-Melon, Universitat Politecnica de Valencia, Spain

Session Chair:

Monica Garcia-Melon, Universitat Politecnica de Valencia, Spain

043. Tuesday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

044. AHP Theory and Methodology 3

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

AN ANALYSIS OF THE PROCESS IN DERIVING FURTHER BENEFITS OF AN AHP MODEL

Chakradhar Iyyunni, L&T Institute of Project Management, India; Viraj Trivedi, Faculty of Technology, CEPT University, India; Vittal S Anantatmula, Western Carolina University, U.S.

This paper deals with evaluation of benefits from the AHP methodology that can improve the quality of the decision making process. In this research effort, evaluation (give second opinions) of another's assessment of goal is carried out, wherein, the criteria assessment is different while keeping the alternatives assessment with respect to each criteria constant, to test if the priority vector of the alternatives is same or different.

ASSESSMENT OF ENERGY EXPENDITURE OF WORKERS BY USING 'AHP': A CASE STUDY OF PROCESS INDUSTRY

Harwinder Singh, Guru Nanak Dev Engineering College Ludhiana, India; Amandeep Singh, Department of Industrial & Production Engineering, National Institute of Technology, India; Paramjit Singh Bilga, Guru Nanak Dev Engineering College, India; Lakhwinder Singh,

*Department of Industrial & Production Engineering,
National Institute of Technology, India*

The objective of research study is to develop an efficient multi-criteria approach for evaluation of various influencing factors that have a major impact on energy expenditure of workers engaged in manual lifting and carrying tasks. The present case study under taken sixty male workers having age between 30-60 years and performing manual lifting and carrying of 50kg fertilizer filled sac up to a distance of eight steps. Total Daily Energy Expenditure (TDEE) was found to be maximum among youngest age group i.e. in group I (30-40yrs) followed by group II (40-50yrs) and group III (50-60yrs). This study utilized a holistic method study to solve the problems in evaluating the various influencing factor that have a major impact on energy expenditure. The factors with the highest weights are determined by using analytical hierarchy process (AHP) which resulted physical workload as the most influencing factor (0.454139) followed by physical work capacity (0.252781), type of activity (0.129274), organizational factors (0.125318) and personal factors (0.038488) respectively. The results implicates that there is a need to redesign the work content of the occupation in order to reduce excessive energy expenditure of the workers.

CONSISTENCY IN THE CONTEXT OF AHP: HALF

FRIEND, HALF FOE *Adriana Agapie, Bucharest
University of Economic Studies, Romania*

A general measure of the comparative judgments' goodness in building up decision matrices within the AHP is consistency, measured through the random index. Indeed, for a consistent, positive, reciprocal matrix, every element is the ratio of the correspondent components in the eigenvector associated with the highest correspondent eigenvalue, thus allowing a perfect match for the interpretation of each element in a decision matrix as being a

comparison-expressed as a ratio- of the criteria's weights in the associated priority vector. Starting from Saaty's famous examples in which the decision matrices with small random indices were showing an almost perfect fit between the estimated priority vector and the real ones, this algebraically general construction was almost unanimously recognized as an ideal for every decision matrix. A quest for improving consistency in every decision matrix, either through the achievement of consensus or through other methods, led to the development of two main directions, linguistic and bold consistency. This paper is raising two questions. First is about how relevant are Saaty's famous examples. It is thus illustrated that in term of the relationship between the consistency ratio and the standard deviation of the associated priority vector, achieving consensus in these consecrated examples were highly improbable events. Second, following the spirit of Saaty's famous examples, some experiments in which the true priority vectors are known are replicated on a larger scale, in order to see whether improving on the consistency is indeed conducing to a closer match between the priority vector and the true one. Results achieved so far revealed the fact that only in approximate one half of the decisions matrices, the effort of improving consistency (either linguistic or bold) led to a priority vector closer to the true one.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Harwinder Singh, Guru Nanak Dev Engineering College
Ludhiana, India

045. Industrial Engineering Applications 2

09 Industrial Engineering

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

**A NEW OFFERING FAHP AND FTPSIS
APPROACH, PRODUCTIVITY INDEXES
IRANIAN CENTRAL IRON ORE COMPANY**
*Rasoul Motakiaee, Master in Management Science,
Iran*

In decision making science, an important aspect is to select one strategy from available ones and to prioritize. multi criteria decision making methods, especially fuzzy MCDM have made their way in to this field for several years. among them, analytical hierarchy process(AHP)method and technique for order preference by similarity to ideal solution (TOPSIS)have been employed more than other technique and methods have. Function productivity is among many different factors. In the climate of decision making to increase productivity. Therefore, raised question is that on which factor and how much we should put emphasis. This study tries to answer this question using MCDM models. For this reason, after primary data was collected with identification questionnaire and effective factors were categorized by using statistical analysis done with SPSS software, a primary refinement was carried out on factors and criteria. Next these factors are ranked by analytical hierarchy process (AHP), fuzzy technique for order preference by similarity to ideal solution (FUZZY TOPSIS), and Fuzzy AHP methods. Which are among the most important multi criteria techniques. Given that the results from above methods in some cases, are not in agreement with each other, combined POSET technique was used reach consensus on ranking criteria. Finally disagreement between the results was examined by using

freedman's statistical test and spearman's correlation coefficient. With regard to the results of this study, a combined ranking method, taking ranking means, was employed to make decisions on prioritizing productivity objectives of Iranian Central Iron Ore company. Since it was impossible to choose optimal ranking method from fuzzy and non fuzzy methods. Eventually, important criteria in making policy on human force productivity were identified from management factors. Human force and customers, with management factors being the most important ones separated by management information system index.

AN AHP, ANP DECISION SUPPORT APPROACH FOR THE PRIORITISATION AND SELECTION OF "RESTORATION" AND "IMPROVEMENT" PROJECTS WITHIN AN INDUSTRIAL ENVIRONMENT *Jean M. B. Khalil, Dr., Egypt*

In industry, rather commonly, and especially in developing countries and indeed when financial crises persist, it becomes hard to convince the decision takers of an organization to invest in "restoration" or "improvement" projects within: their infrastructure, their equipment or their methods of function. But the fact is, ceasing to perform "restoration" or "improvement" projects are like a patient who stops taking his/her medication, a direct way of slow suicide. Even if the managers are convinced with this fact, they face the traditional difficulty of selection or deferral of projects; as well as the difficulty of deciding on the amounts and the proportions of expenditures on these projects. To the best of the author's knowledge, this problem has never been discussed in literature before. This paper proposes a solution approach through the implementation of the AHP and the ANP to help the decision taker, compose an objective decision on: the selection and the expenditure amounts of "restoration" and "improvements" projects within

their domain. The Hierarchy or the network is built based on the relevant criteria as deduced from actuality in industry. The judgments are input by experts from the industry. The user conducts the judgments for alternatives once a year, and therefore gets a measurable output of the organization's interest in realizing the projects subject of the discussion. This output is therefore translated into selection and trend of expenditures. One major characteristic of the proposed approach is that it takes in consideration the surrounding conditions through the user judgments and therefore evolves with the organization. The implementation of this approach is expected to preserve vast investments from deterioration or collapse, guarantees the continuous improvements to take place and as importantly prevents subjective conflicts over requirements of expenditures.

CREATING VALUE WITH BUSINESS ANALYTICS

EDUCATION *Ozay Ozaydin, Dogus University, Turkey; Fusun Ulengin, Sabanci University, Turkey*

The third millennium is expected to be a challenge with its highly dynamic circumstances that is driven by the combination of population growth, resource depletion and rising expectations of given standards. This will force the firms to restructure and to become leaner in order to compete successfully in the marketplace, both domestically and globally (Manyika et al., 2011). Finding ways to provide competitive advantages will continue to be a great concern for many countries. In recent years, business analytics has become increasingly important in the world of business, particularly as organizations have access to more and more data (Evans, 2014). Business analytics has been recently adopted across a variety of organizations as an important business function that adds value. Researches conducted show that high-performing businesses use five-time more analytics in their strategic decisions when compared

to low-performing businesses (Davenport and Harris, 2007).

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chair:

Ozay Ozaydin, Dogus University, Turkey

046. Performance and Simulation Study

20 Performance and Simulation

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Independence B

Participants:

CONSISTENCY OF EXPERT-BASED

PREFERENCE MATRICES *Martin Gavalec, University of Hradec Kralove, Czech Republic; Karel Mls, University of Hradec Kralove, Czech Republic*

In AHP approach to multi-criteria decision problem, the relative importance of alternatives is computed from preference matrices, which come from experience and can possibly be inconsistent. An algorithm for computing a consistent approximation of a given preference matrix by digraph method is described in this paper. We start with an analysis of the inconsistency of a given preference matrix. The first type of inconsistency is caused by so-called inconsistency cycles. The inconsistency of this type is removed by computing the strongly connected components in the associated digraph and a small modification. If the modified matrix is cyclic consistent, i.e. it contains no inconsistent cycles, or if some of the entries of the matrix are missing, then a consistent approximation is computed.

OPTIMAL CONSISTENT APPROXIMATION OF A

PREFERENCE MATRIX *Richard Cimler, University of Hradec Kralove, Czech Republic; Martin Gavalec, University of Hradec Kralove, Czech Republic; Karel Mls, University of Hradec Kralove, Czech Republic*

Modern smartphones are powerful devices with computing performance comparable to personal computers and laptops. Various sensors are embedded into these devices. These sensors are capable of monitoring a lot of different physical quantities which makes smartphones, together with smartphone computation performance, useful devices

capable of monitoring and processing information about health status of person. Watch Dog application is designed for android mobile phones in order to gather information about the monitored person. All the information from the sensors has to be processed and the system evaluates the actual state of the monitored person according to the measured values. The experts helping to adjust the system are doctors – specialists on different medical sectors. There can be different opinions on the importance of the measured value combination. Each disease can have different set of symptoms, moreover every specialist has his specific view on the importance of the measured data. Thus the evaluation matrices from the experts could be inconsistent and contradicting. This situation has to be solved by suitable decision making approach. The search for consensus in group decision making is typical in many real world situations. Several methods and tools, based on AHP were suggested to build consensus. In medical applications, the need for more cautious approach to uniting of individual expert opinions is vital. To get the best evaluation of the model and to find the best alternative in the health monitoring application, not only consensus between experts, compromise or aggregation of individual judgments or priorities is sufficient. In our paper we propose to analyze inconsistency in individual expert evaluations and then to apply extremal algebra approach to construct the common evaluation of the decisional model.

COMPARISON ACCURACY – IMPLICATIONS FOR DERIVING PRIORITIES AND CONSISTENCY

William Charles Wedley, Simon Fraser University, Canada

Some paired comparisons are more accurate than others. Which ones? If we knew, then we could use the more accurate comparisons to derive the priority vector and maybe discard the less accurate ones.

Using experiments where the true comparison values

are known, this study investigates which comparisons are more accurate and whether a priority vector should be based upon partial information. In general, comparisons to the least dominant alternative are found to be more accurate. It is recommended that the first $n-1$ comparisons be made in reference to the least dominant alternative. Thereafter, changes in priorities and degree of predicted consistency can be used to determine whether the comparison process can be stopped. An ancillary finding is that consistency alone is not a reliable indicator of accuracy. In order to achieve accuracy, the DM must be both knowledgeable about the task being evaluated and conscientious in making evaluations.

Session Organizer:

William Charles Wedley, Simon Fraser University,
Canada

Session Chair:

William Charles Wedley, Simon Fraser University,
Canada

047. Theory and Application of the Analytic Hierarchy Process

25 Miscellaneous

Panel

11:00 to 12:30 pm

Grand Hyatt: Independence C

This session discusses the most fundamental features of the Analytic Hierarchy Process, i.e., pairwise comparison and its aggregation process, and the most practical application, e.g., diagnosis for human preference. In the AHP procedure, pairwise comparison and its aggregation process play key roles in quantifying human perception. The eigenvector method and the use of linear scale, as well as the 11-normalization of the outputs are considered as the standard for the process. While, not a few criticisms exist, which propose other non-linear scales, or different approaches to aggregation. Paper proposals 2 and 3 deal with these issues. On the other hand, the AHP has come into wide use to various fields, in conjunction with the development of software, e.g., *expertchoice*[®], because of its powerful and flexible decision making process, and its versatility and compatibility. Among the enormous amount of applications, quantification of human perception and its application to diagnosis procedure for user preference in supply chain management is one of the most prosperous fields. Paper proposal 1 introduces a case.

Participants:

A HYBRID DIAGNOSIS PROCEDURE FOR OPTIMIZING THE SPECIFICATION OF BTO PRODUCTS *Yuji Sato, Graduate School of Management, Chukyo University, Japan*

The objectives of this paper are to propose a diagnosis process of user's preference for a build-to-order (BTO) product. Manufacturing companies need to investment strategically for their development due to increasing focus on corporate social responsibilities, compliance and sustainability.

However, determining the specification of a BTO

product is a complicated task, because of subjective factors entering into the evaluation of necessary and sufficient specification of the system. Consequently, the choice of appropriate specification often lacks transparency and traceability in the process. This paper addressed this issue by combining cost-benefit analysis and the AHP. Wastewater treatment system for a chemical company is considered as one of BTO products, and a case study in the company was carried out to demonstrate the applicability of the procedure. The results of this paper show some evidence that the diagnosis process proposed in this paper succeeded in quantifying user's preference for potential systems.

RELATIONSHIP BETWEEN THE ANALYTIC HIERARCHY PROCESS AND WEIGHTED SUMMATION *Yoichi Iida, Tokyo University of Science, Japan*

Weighted summation, which is also called weighted average method, is a famous and simple multi-criteria evaluation method. This method is essentially applied for items with absolute evaluation values like marks or dollars. On the other hand, there are various cases where we want to evaluate items without such values. The AHP is helpful in these cases. The purpose of this paper is to clarify the relationship between the AHP and weighted summation by introducing weighted summation ratio method. The AHP is similar to weighted summation, but these two methods are different from each other. Indeed, we need some precautions when evaluating items by absolute numbers with respect to criteria. This was already pointed out by T.L. Saaty, the founder of the AHP/ANP. In this paper, first I extend weighted summation to weighted summation ratio method in order to apply it to items without absolute evaluation values. I also show the validity of it with fundamental mathematics. Weighted summation ratio method is a framework and needs certain methods to guess

relative evaluation values of items with respect to criteria and adjust them. Therefore, after that, I propose the method with paired comparisons in the AHP/ANP to the former and logarithmic least square method to the latter. I show a numerical example to explain this method. The relationship between the AHP and weighted summation is shown in the process. By the way, we might be able to use a supermatrix in the ANP as weighted summation ratio method. However, these two methods are different from each other since it doesn't take impacts or influences between clusters or items in cluster into consideration like weighted summation. I don't deal with the relationship between the ANP and weighted summation ratio method.

**AN ALGEBRAIC REPRESENTATION FOR
COMPARISON METHODS OF AHP** *Takafumi
Mizuno, Meijo University, Japan*

In this paper, we propose a simple algebraic representation for comparison methods of AHP. The representation is associative relation between the importance of elements and consists of basic arithmetic operations. First, we define a ratio, which is estimated by decision makers with comparing the importance of elements, as a partial differentiation of importance. And we construct systems of differential equations. Algebraic representations of the importance are derived as formal solutions of the equations. We analyze the pairwise comparison methods with the representations in section 3. A validity of using eigenvectors in the method is illustrated by a particular solution of the equations. In section 4, we describe the ternary comparison method, which is a variety of visual analog scaling, with modifying the definition of partial differentiations. We also represent the importance as a system of differential equations and derive algebraic representations of them by solving the system. We, probably, first introduce clearly into

AHP's field and analyze the method. Finally, we discuss the applications of the representations.

**APPLICATION OF ANALYTIC HIERARCHY
PROCESS FOR STRATEGIC PLANNING AND
IMPLEMENTATION AT NEPALESE
UNIVERSITIES AND COLLEGES** *Prabal Sapkota,
Kathmandu University, Dhulikhel, Kavre, Nepal*

Due to the increasing competition in higher education, time has come for the Nepalese educational institutions to identify their core competencies. Even though strategic planning is practiced by some of the institutions, management is often lost during the implementation of the strategic plan. Several goals, objectives and strategic paths have been found to be identified during the strategic planning. Due to unavailability of enough resources, all the goals and objectives cannot be achieved together. This research has been done to assist the management in prioritizing the most important goal, objective and strategic path for the educational institute to achieve its vision. The work has been conducted in two different types of educational institutions with different vision and different sets of problem they were facing. The research could provide guidelines for universities and colleges of developing countries with constraints in resources and time to achieve the desired vision.

Session Organizer:

Yuji Sato, Graduate School of Management, Chukyo University, Japan

Session Chair:

Yuji Sato, Graduate School of Management, Chukyo University, Japan

048. Marketing Applications 2

18 Marketing Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

**DETERMINING CONSUMER'S CHOICE AMONG
VARIOUS INSURANCE POLICIES: AN
ANALYTICAL HIERARCHICAL PROCESS
APPROACH** *Emmanuel Olateju Oyatoye, University
of Lagos, Nigeria; Rukayat Yetunde Folorunso, UBA,
PLC, Nigeria*

In recent time, how to spend less money on the most secured insurance policy from the services of various insurance companies motivates modern people to buy a policy. However, making the right choice of policy is always the problem. An insurance policy with which individual can easily achieve their goals of insurance and make financial plans does matter under the shadow of accidents, retirement and disasters at any time. This study determines the best choice amongst various insurance policies for consumers' need using analytical hierarchy process (AHP) method in carrying out contrastive analysis with decision criteria and objective alternatives. Many challenges of this kind associated with making a right choice from multiple choices can be remodeled as multi-criteria decision making (MCDM) in order to evaluate the decision weights which serve as the standard for selecting the right policy. The data employed by this study was obtained from expert from two major insurance firms whom are professional in the field of insurance and from customers that are conversant with various kinds of insurance policies. The AHP provides a scientific approach to the quantification of the relative importance of various decision-influencing criteria. The use of AHP also helped in the simplification of the complex problem as well as enable the insured' to

understand their demands so that effective decisions are made.

DETERMINING CONVENTION PLANNERS' PERCEPTIONS OF CONVENTION HOTEL SELECTION CRITERIA BY ANALYTIC HIERARCHY PROCESS *Meryem Akoglan Kozak, Anadolu University, Turkey; Cagil Hale Ozel, Anadolu University, Turkey; Emre Ozan Aksoz, Anadolu University, Turkey*

Being successful in convention tourism requires conducting continuous research about the convention planners' preferences for convention hotels. Owners of such events forward their requests to convention planners and leave the full organization of convention to convention planners. For that reason, convention hotels compete fiercely with each other to attract the attention of convention planners. The aim of this study is to determine the importance rank order of convention hotel selection criteria for national and international convention planners operating in Turkey. To accomplish that aim, convention planners from 41 different provinces in Turkey were interviewed face to face via survey questionnaires. Data gathered from convention planners were analyzed with Analytic Hierarchy Process. Findings demonstrated the most and the least important criteria of convention hotel selection.

ENHANCING THE SALES PROCESS USING ANALYTIC NETWORK PROCESS *Fariborz Y. Partovi, Drexel University Philadelphia, U.S.; Cynthia A. Conway, Drexel University, U.S.*

In 2010, a leading wealth management firm set a milestone to be recognized as the provider of choice for comprehensive, multigenerational wealth management services in the US by 2015. In 2010, the firm was ranked 15th. Using the Strategic Service Vision (SSV) and Analytic Network Process (ANP) methodologies, they leveraged their strategic thinking

to improve their sales process, and determine which project initiatives provided the highest ability to increase sales.

EVALUATING SUBSCRIBERS PREFERENCE FOR SERVICE ATTRIBUTES OF MOBILE TELECOMMUNICATION IN NIGERIA USING ANALYTIC HIERARCHY PROCESS (AHP)

Sulaimon Olanrewaju Adebisi, Business Administration Department, Federal University of Agriculture, Nigeria; Emmanuel Olateju Oyatoye, University of Lagos, Nigeria; Bilqis Bolanle Amole, Department of Business Administration, University of Lagos, Nigeria

Policy and strategies in the growing Nigeria telecommunication industry can only have significant impact if it is substantially driven by research on what subscribers preferred and why they do? Thus the need for operations research model (AHP) to evaluate customer preference of their mobile telecommunication attributes so as to direct policy and strategies at what is/are important to subscribers whom were the essence of business activities. The paper built hierarchical model for choice/determinant of subscribers preference for mobile telecommunication attributes in Nigeria as the goal, using seven main attributes (Quality of calls, tariff, coverage, data plan, promotion, message delivery and complaint management) as the criteria for evaluation, while the four main players in the GSM market (MTN, Airtel, Glo and Etisalat) are the alternatives. An AHP based questionnaires was administered and distributed among student of tertiary institutions in Lagos. Out of the four hundred questionnaires distributed, only three hundred and eighty six were duly filled, returned and found suitable for the analysis. The data were analyzed, considering the set of evaluation criteria (service attributes), and a set of alternative (network providers) scenarios among which the best decision is to be made. We generated a weight for each evaluation criterion and scenario

according to the information provided by the decision makers (stakeholders). AHP was used to combine the objective and scenario evaluations to determine the ranking for scenarios. The result reveals that an average student preferred network providers with cheap (affordable) follow by quality of connections and reliable data plan for internet service. The priority was done for the criteria to direct strategic decisions in the telecommunication industry towards meeting subscribers' needs as coverage was not given priority as they assumed all providers have similar coverage. Thus, this will assist at improving the quality of decision making of stakeholders.

Session Organizer:

Fariborz Y. Partovi, Drexel University Philadelphia, U.S.

Session Chair:

Fariborz Y. Partovi, Drexel University Philadelphia, U.S.

049. AHP/ANP Mixed Methods, Optimization and Applications 3

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

CHOOSING THE SUITABLE METHODE OF KNOW-HOW TRANSFER FROM UNIVERSITIES TO INDUSTRY BASED ON AHP TECHNIQUE

Amin Jahangiri Nia, Author, Iran; Somayeh Sahebi, Islamic Azad University, Iran; Zeinab Sahebi, Author, Iran

In the new modern global deplane, creating knowledge and optimum use of that counts as a critical factor between economics and social systems. Universities and research centers are most effective organizations in knowledge based economic. Present research main purpose is to finding technical knowledge transferring methods from university to industry and selecting suitable method focusing on country infrastructures, conditions and utilities. After reviewing background of used method in MIT, Harvard, Oxford, Stanford and Tehran universities as literature review, a conceptual model for transferring of technical knowledge from university to industry is presented that its main parts includes technical knowledge transferring methods, selection methods standards and factors effective on transfer process. With a survey took from professionals creating firm by researcher for making product of technical knowledge method was identified as best method. Also, by reviewing factors effective on transferring technical knowledge process from university to industry, "industry suitable awareness of produced technical knowledge in universities", "Education", "financing technical knowledge owners to convert technical knowledge to product", "university need to

transfer technical knowledge to industry" and "industry interest to using technical knowledge created in the country" identified as the most important factors and methods by expert choice software.

DEVELOPMENT OF DEMATEL AND ANP METHOD FOR THE PLANNING PROCESS OF AMPHIBIOUS OPERATION *Raha Ahmadi, Sekolah Tinggi Teknologi Angkatan Laut, Indonesia; Yudy Arie Bintoro, STTAL, Indonesia*

Amphibious Operations Planning Process follows 14-step process of decision-making according to military doctrine Books of TNI (Indonesian Armed Forces) Joint Operations. 7th (seventh) step of the decision-making process in Amphibious Operations planning is implementing Course of Action (CoA) comparison. Course of Action is an individual plan or Commander who will complete or in connection with the completion of a mission. Comparison of CoA is very important because the best CoA would be a reference for the preparation of the Plan of Operations which would be turned into Command Operations. Thus the staff could use some of the techniques/methods of decision making that can produce the best recommendation of CoA, so the Commander can make the best decision anyway. Decision making of the best CoA will consider many criteria in it. Therefore in this study used methods Decision Making Trial and Evaluation Laboratory (DEMATEL) and Analytic Network Process (ANP) which can be used in solving problems with many criteria or Multiple Criteria Decision Making (MCDM). DEMATEL method is used to obtain the consideration of decision making by knowing the relationship interrelations among criteria or aspects. While the ANP method is used to determine the value of alternative priority weights based on models derived from the DEMATEL method. The results of this study are the form of criteria and sub-criteria

which affect the CoA comparison, the relationship between the criteria/sub-criteria and main subcriteria priority weight values obtained from the results of data processing. The main sub-criterias based on the largest weight value of each criteria are Mobility (Criteria for Operating), Logistics Support System (Criteria for Logistics), Victims Approximating (Criteria for Personnel) and Enemy Detection (Criteria for Electronic Communications).

ERP SOFTWARE SELECTION MODEL USING ANALYTIC NETWORK PROCESS *Andre Surya Lesmana, Universitas Atma Jaya Yogyakarta, Indonesia; Ririn Diar Astanti, Department of Industrial Engineering, Universitas Atma Jaya, Indonesia; The Jin Ai, Department of Industrial Engineering, Universitas Atma Jaya Yogyakarta, Indonesia*

During the implementation of Enterprise Resource Planning (ERP) in any company, one of the most important issues is the selection of ERP software that can satisfy the needs and objectives of the company. This issue is crucial since it may affect the duration of ERP implementation and the costs incurred for the ERP implementation. This research tries to construct a model of the selection of ERP software that are beneficial to the company in order to carry out the selection of the right ERP software vendors according to the needs and objectives of the company. The proposed ERP software selection model is constructed based on three different perspectives, that are business, technology, and organizational perspectives. Each perspective consists of various criteria needed to be considered in the selection of ERP software. The proposed model is built over four clusters, which are Business Perspective (Cost, Quality, Vendor Status, Customization), Technological Perspective (Functionality, Duration of Implementation, User Friendliness, Software Update), Organizational Perspective (Training, Employee Needs, Company

Culture, Human Resistance), and Vendor Alternative (Vendor A, Vendor B, Vendor C). Since this problem of ERP software selection is involving many criteria and there exist dependency among criteria, the ERP software selection model is constructed based on the Analytic Network Process methodology. The Super Decision software used in this research for solving the model using an illustrative example from an automotive finance company in Indonesia.

EVALUATION OF THE EXCHANGE PROGRAMS BY USING ANALYTIC HIERARCHY PROCESS

Bahar Celik, Dumlupınar University, Turkey; Ozden Ustun, Dumlupınar University, Turkey; Derya Deliktas, Dumlupınar University, Turkey

The number of university students participating in exchange programs has risen increasingly over the last decade. Student mobility, or studying at universities other than the institution at which the student originally matriculated, has been an important element in a fully rounded academic education for a long time. Therefore, the student mobility for studies and placements is important for Higher Education Institutes and university students in both national and international platform. In this study, we evaluated three exchange programs as Erasmus program, Mevlana program and Farabi program using an analytic hierarchy process (AHP) under benefits, opportunities, costs, and risks concepts. Fourteen criteria were set up, and the priorities of each criterion were appraised using the AHP method. The sample of the study consisted of 17 outgoing students from Dumlupınar University who benefited from the exchange program. Students' expectations have to be determined by considering benefit, opportunity, cost and risk (BOCR) of the exchange programs because the exchange program process has a critical importance to achieve mutual cooperations effectively among universities in both national and international platform. The evaluation process is a

practical multiple-criteria decision making (MCDM)
process including group decision-making with
tangible and intangible criteria.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

The Jin Ai, Department of Industrial Engineering,
Universitas Atma Jaya Yogyakarta, Indonesia

050. Environmental Management in Protection Area

06 Environmental Application

Paper Session

11:00 to 12:30 pm

*Grand Hyatt: Floor Independence Level - McPherson
Square*

Participants:

AN ANP APPROACH FOR THE STAKEHOLDER ANALYSIS IN PARTICIPATORY ENVIRONMENTAL MANAGEMENT. THE CASE OF SPANISH WETLAND LA ALBUFERA *Pablo Aragonés-Beltrán, Universitat Politècnica de València, Spain; Monica Garcia-Melon, Universitat Politecnica de Valencia, Spain*

The aim of this paper is to analyze the influence of the stakeholders in a participatory decision making process. For that, the relationships and influences among stakeholders involved in a specific environmental problem, namely rice straw management in the Natural Park of La Albufera, Valencia (Spain), have been studied using an Analytic Network Process approach. The main question we set is how to measure the influence among stakeholders. This a complex question in a real life problem, due to the difficulty for a stakeholder to answer the direct question: Who do you think exerts more influence on you when you have to solve a problem? In this work, we present a case study assuming that the information exchange is the way to measure the influence among the individuals in the network. We will use these data to solve an easy ANP model. This model is a first approach to prove the utility of ANP to measure the influences among stakeholders in a Social Network.

COMBINING AHP GROUP ANALYSIS AND GIS IN VULNERABILITY ASSESSMENT OF

PROTECTED AREA IN VIETNAM *Huong Quynh Nghiem, University of Greifswald, Germany*

In land use resources, forests play an important role in mitigating climate change by reduce carbon uptake through afforestation as well as sustainable forest management. Vietnam is viewed as a “country in transition” with a “biodiversity hot spot” because many strange mammals have been discovered by scientists. In the process of rapid social-economic development, Vietnam is facing many problem such as the conflict between the need of reduce poverty and the need of protect biodiversity. This research assess vulnerability of Bach Ma National Park (BMNP) - a protected area in central Vietnam - using spatial multi-criteria decision analysis and application of Geographic Information System (GIS). Expert interviews from different background are identified in order to establish AHP - group decision making framework. Different AHP results from individual judgments are then aggregated into a group decision to support the final decision making for vulnerability assessment. Data are processed and analyzed with help of ArcGIS to determine the spatial distribution of vulnerable areas in the National Park.

MODELLING DECISION MAKING IN THE

MANAGEMENT OF NATIONAL PARKS *Monica Garcia-Melon, Universitat Politècnica de Valencia, Spain; Tomás Gómez-Navarro, Universitat Politècnica de Valencia, Spain; Maria Blanca Fernández-Viñé, Universidad Metropolitana de Caracas, Venezuela; Diego Díaz-Martín, Universidad Metropolitana de Caracas, Venezuela*

Despite the importance of National Parks, the management of many of these areas face serious difficulties determined by a variety of shortcomings, one of the most important being the incomplete monitoring system and the lack of collaboration of all

involved stakeholders. A procedure for determining the influential factors in NP management is proposed. The procedure was applied to the Waraira Repano national park (WRNP) in Venezuela. Key aspects found for the effective management of WRNP showed to be Driving forces like “Human population growth” or “Patterns of use of natural resources”; Pressures like “Forest fires” and “Illegal human settlements”; States like “Biodiversity composition and abundance” and “Ecosystem and landscape integrity”; Impacts like “Natural resources depletion” or “Altered connectivity”; and Responses like “Stakeholders’ participation” or “Environmental surveillance”. Finally, key indicators have been proposed to monitor the evolution of these influential factors. Regarding the lack of effective cooperation among stakeholders, the Analytical Network Process (ANP) is used for modeling the decision problem and helping stakeholders to participate assessing the sustainability of the solution alternatives. In the presented methodology, a panel of experts in natural areas management, and specifically in the WRNP, was arranged to determine the decision model i.e. the network of criteria and alternatives structured into clusters. Five clusters were set according to the DPSIR structure, where the Responses were the alternatives. The findings confirm that stakeholders hold different interests, approaches to sustainability and sensitivities. Thus, an improved participation is obtained and a consensus, or at least general agreements, is more likely. Also a better commitment to the overall objective is achieved as the decision model facilitates improving the alternatives design in order to lessen the possible burdens for specific stakeholders or the environment.

**INFLUENCE OF PERCEPTION ON THE USE OF
NEIGHBOURHOOD PARKS IN MAKURDI** *irene
doosuur Mngutyo, Benue State University, Makurdi,
Benue State, Nigeria.*

Parks are areas created to engender formal recreation. Neighbourhood parks in Makurdi have been abandoned and are at various stages of deterioration. Yet there is a proliferation of areas where people are seen relaxing in the evenings. This implies a disconnect between planning intentions and user satisfaction. Preliminary research showed negative perception as the reason for non utilization of parks in Makurdi. In order to design parks that are locally understood there is a need to assess the dominant factors influencing the use of parks and their ranking in terms of priority, thus this study uses the Analytic Heirachy Process (AHP) which is a theory of measurement through pairwise comparisons .Perception is a multidimensional construct ,it is influenced by many factors but this study highlights age and gender. Multistaged sampling was applied to cluster the 11 wards of Makurdi at the first level in terms of high, medium and low density from this cluster2 neighborhoods were randomly selected totaling six neighborhoods. Stage two level were determined using street/road categories hence primary, secondary and distributor streets were clustered. In this cluster three streets were randomly selected from each category to arrive at nine streets. Areas where people congregate to relax were counted on these nine streets and an average score of 4 areas per street was determined. The 11 wards that make up Makurdi have an average of 20 streets per ward. Four multiplied by 20 by 11 gives a rough estimate of 880 relaxation spots as population. A sample size of 50% was determined for convenience. Hence 440 copies of questionnaire were issued to residents of Makurdi. Anticipated findings include what dominant factors influence use of park space, ranking in order of importance of the perceptions.This data is useful in

determining local perspectives for recreation. Also results are a data base for evaluation of recreation planning in Makurdi.

Session Organizer:

Pablo Aragonés-Beltrán, Universitat Politècnica de València, Spain

Session Chair:

Pablo Aragonés-Beltrán, Universitat Politècnica de València, Spain

051. Tuesday lunch

ISAHP

Lunch

12:30 to 2:00 pm

*Grand Hyatt: Floor Independence Level - Independence
FGHI*

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

052. AHP Theory and Methodology 4

04 AHP Theory & Methodology

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

CONSTRUCTING HIGHLY CONSISTENT PAIRWISE COMPARISON MATRICES IN ANALYTIC HIERARCHY PROCESS (AHP)

Sahika Koyun, Yildiz Technical University, Turkey;

*Vildan Cetinsaya Ozkir, Yildiz Technical University,
Turkey*

AHP provides a decision making framework by quantifying the decision elements in order to evaluate alternative solutions with respect to a specified objective in multiple criteria decision making problems. AHP uses pairwise comparison (PC) data for generating weight vectors of decision elements for final results, which is limited to the consistency of PC matrices. Final results (resulting weight vector) can only be considered as a reliable reflection of the evaluator's opinion, if and only if relevant data is sufficiently consistent. By determining the causes of inconsistency, we develop a new method for constructing highly consistent PC matrices. This study investigates underlying reasons of inconsistency, and explores new tools/methods to derive consistent matrices.

DEPENDENT AND INDEPENDENT CLUSTER COMPARISONS IN THE SUPERMATRIX

Orrin

Cooper, University of Memphis, U.S.; Guoqing Liu,

University of Pittsburgh, U.S.

When designing an ANP model it is important for decision makers to acknowledge and properly address whether the elements in the models are dependent or independent of each other. If it is determined that the criteria and alternatives are dependent then criteria cluster weights should be

obtained individually for each column in the Supermatrix. If criteria weights are applied broadly across large clusters or rows of the Supermatrix a compromising or restricting effect on the relative influences of the alternatives termed the “pigeonholing effect” can occur. Pigeonholing compromises the ratio preservation in the final priority vector and can lead to unintended results in the Limit matrix. A final priority vector with ratios that represent alternatives which are dependent on the criteria are best obtained by performing cluster comparisons individually for each column.

**DYNAMIC AVERAGING PROCESS FOR
INCOMPLETE INFORMATION CASE** *Masaaki
Shinohara, Nihon University, Japan*

Dynamic Averaging Process is studied for the incomplete information case where some elements in a pairwise comparison matrix are missing. As the averaging operation of a DAP, the generalized mean with the p -th power, or the p -th power mean, is considered. Note that those with $p=1$, $p=-1$, $p \rightarrow 0$, and $p \rightarrow +\infty$ are the arithmetic mean, the harmonic mean, the geometric mean and the maximum operation, respectively. First, we show and prove that the convergent weight vector of a geometric DAP, or the DAP with geometric mean averaging (the power mean with $p \rightarrow 0$), is equal to the LLS(Logarithmic Least Square) solution under the reciprocity condition ($a_{ij} \times a_{ji} = 1$) and the self-identity condition ($a_{ii} = 1$). Second, the Harker method is modified in two ways so that it can cope with the p -th power mean and it can take into account the effect of the eigenvector λ , or the stationary state increasing rate. Third, we show and prove that the convergent weight vector of a p -th power DAP, or a DAP with the p -th power averaging (power mean with $p \neq 0$), is equal to the convergent weight vector of the modified Harker method under the stationarity condition ($x(t) = \lambda x(t-1)$), or the existence of the stationary rate

λ). Finally, since a DAP can be regarded as the power method for calculating an eigenvector for the generalized algebraic system, the possibility of using the geometric DAP, or the LLS, is discussed to estimate the weight vector for an incomplete information comparison matrix.

EFFECTIVENESS OF AHP IN THERMAL COMFORT ASSESSMENT THROUGH PASSIVE DESIGN ALLOCATION IN TROPICAL SCHOOL OFFICES *Chan Siew Chong, INTI International University, Malaysia*

Since global environmental issues are widely discussed nowadays, a number of studies are being carried out to resolve the challenges of reducing energy usage in buildings, especially related to energy use to sustain the indoor thermal comfort level. In order to tackle the fundamental problems effectively, a comprehensive investigation tool is crucial to identify the comparative related factors and provide solutions according to their priority. Among the methodologies used, Analytical Hierarchy Process (AHP) is commonly used to study the problems with multiple influencing factors which consist of different degree of implications. In this study, this model is used to investigate the effectiveness and consistency of respondents' feedback onto the utility of passive design features in office buildings in order to sustain the indoor thermal comfort levels besides depending on artificial cooling equipment. A number of 413 academic staff from 20 units of primary schools within urban and rural areas in Seremban District were involved in the study. All the schools were equipped with passive design elements, but different types of mechanical ventilation systems were installed in particular schools. Questionnaires with Likert scales were distributed to assist the respondents rank their subjective opinions with objective numerical values. The outputs of rankings generated through AHP by

different batches of the respondents were studied, and its consistency were further analysed with t-distribution tests to justify the consistency of the findings. The results showed that there is a quite significant difference among the evaluated batches, and thus, additional studies are much needed to link with unidentified environmental and physical factors, and further integration between evaluation systems.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Orrin Cooper, University of Memphis, U.S.

053. Industrial Engineering Applications 3

09 Industrial Engineering

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

AN INTEGRATED RANKING PROCEDURE FOR REPLACEMENT DECISIONS OF CRITICAL MEDICAL EQUIPMENTS

Tugba Efendigil, Yildiz Technical University, Turkey

Hospitals and healthcare centers should take decisions on processes for acquisition, use, maintenance and replacement of medical equipments during their life cycle. Besides, managing large number of medical equipments is a complex and critic operational issue regarding an effective maintenance management which reduces operational costs at a significant ratio. The aim of this paper is to propose an integrated ranking procedure for replacement decisions in a health care setting including both quantitative and qualitative criteria. Both Analytical Hierarchy Process (AHP) and Grey Relational Analysis (GRA) techniques are integrated to make a prioritization of the criteria. A numerical illustration is applied to the proposed model.

APPLICATION OF THE METHOD AHP FOR REDUCTION OF THE FINE IN TELECOMMUNICATION COMPANIES

Rodrigo Araújo Pereira, Pontificia Universidade Católica de Campinas, Brazil

The support systems the decision taking comes gaining bigger acceptance in the organizations and being applied in financial, operational, commercial areas, amongst many others. The objective of this work was to apply the method Multicritério AHP to identify the relative importance of the main problems that afflict the consumer of the services given for the companies of mobile telephony. The multiplicity of

these questions has generated not only hundreds of claims next to the agency of defense of consumer PROCON and the national agency of telecommunications ANATEL, as well as many actions at law of weighed fines. The result of the work allowed to identify the due relative importance of each one of the problems responsible for the dissatisfaction of the users what it becomes then possible to manage of strategic form and to develop specific operational plans for the solution of the same ones in the scope of the company.

EVALUATION OF MANAGEMENT CONTROL SYSTEMS IN TACTICAL- OPERATIONAL LEVELS: AHP APPLICATION *Alina Díaz-Curbelo, Universidad Central "Marta Abreu" de Las Villas, Cuba; Michaerlys Marrero-Oviedo, Universidad Central "Marta Abreu" de Las Villas, Cuba; Jhully Paulin Martínez Giraldo, Researcher, Colombia*

Management control is a useful tool to guide processes management towards business goals and as an instrument to evaluate it, but many management control systems (MCS) are left in the measurement of the company global objectives being unable to measure whether local performances contribute or not to the achievement of global objectives. The aim of the research is to evaluate the MCS at the tactical-operational levels through a new procedure and the design of the Management Control Level of the Process indicator (MCLP) that integrates the four key management processes: planning, organizing, management and control, and the use of the AHP method. This indicator allows to know the extent to which management of the area or process is aligned with business goals and contributes to the strategy fulfillment. The breakdown of the calculated indicator to identify potential for improvement and priority order for implementation according to the weight given.

Session Organizer:

Fusun Ulengin, Sabanci University, Turkey

Session Chair:

Alina Díaz-Curbelo, Universidad Central "Marta Abreu"
de Las Villas, Cuba

054. Fuzzy AHP

03 Fuzzy AHP Approach

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Independence C

Participants:

DETERMINATION OF THE IMPORTANCE OF THE PROBLEMS IN ENTREPRENEURSHIP BY FUZZY AHP - APPLICATION WITH FUZZY TOPSIS

*ONUR Kurtçu, Sakarya University, Turkey;
Esra Tekez, Sakarya University, Turkey*

Fuzzy AHP and fuzzy TOPSIS methods are decision-making way at the end of integrating the current methods with fuzzy structure. In this study, the problems of entrepreneurs are discussed and the popular factors in these processes aimed to determine in a systematic way. At this point, it is asked to compare the problem's criteria with each other by using linguistic scale in fuzzy AHP method. At the end of the judgment, the weights of the criterion are determined and ranked as to importance point. After determining top problem factors, the sector analysis of the entrepreneurs is completed with fuzzy TOPSIS method. The proposed model enables new entrepreneurs to better understand the difficulties of the related processes and help to design road map to proceed in efficient way

FUZZY AHP MODEL FOR THE DETERMINATION OF THE LOCATION OF THE NAVAL BASE (STUDY OF THE MARITIME SECURITY AND DEFENSE SYSTEM IN

INDONESIA) Raha Ahmadi, Sekolah Tinggi Teknologi Angkatan Laut, Indonesia

The Location determination is a strategic issue both in business and public. There are many factors leading to management decisions in expanding or relocating their business facilities. With the improvement in technology especially

communication and information technology, have made the time and space constrain insignificant for managers in doing their businesses. A few existing theory and method in determining location have tend to refer to the profit oriented issues, where more of its decision variables are able to measured precisely. The most common method used was procedure ranks method, center of gravitation analysis method and the linear programming method. Recent development have shown that many location determination issues have been resolve by using Analytical Hierarchy Process (AHP) method. A few disadvantage of the traditional AHP method that was requirement of every factors or indicators in the same level to be independent have been anticipated by using Fuzzy sets theory approach. The military base location determination issue is a complex issue which involve immeasurable variables. This decision variables was ideology, politics, economy, social-cultural, defense and security. Fuzzy AHP Method was the development from the traditional AHP method that was superior to use in resolving problems of multi-variable decision makings which involve immeasurable variables, such as military base location determination issues.

**OBJECT-ORIENTED PROGRAMMING
LANGUAGE SELECTION USING FUZZY AHP
METHOD** *Seyed Hajir Lesani, Atilim University,
Turkey; babak Daneshvar rouyendegh (B. Erdebilli),
Atilim University, Turkey*

A programming language is a notation for writing programs, which are specifications of computation of algorithm. The common view is programming languages make it easier to write programs for computers, now while that is true, what is often overlooked by language designers is that the other purpose, and maintain its primary purpose, is to make it easier for people to read and understand programs. A programming language decision inherently is a

multi-criterion problem. In this context, we used Fuzzy Analytic Hierarchy Process (FAHP) for selecting the best object-oriented programming language. FAHP is a useful approach for evaluating complex multiple criteria alternatives involving subjective and uncertain judgment.

PRIORITIZATION OF SUPPLIER SELECTION CRITERIA IN BATIK INDUSTRY: A FUZZY-AHP APPROACH *Aries Susanty, Department of Industrial Engineering, Diponegoro University, Indonesia*

Supplier selection is one of the most important problems in the supply chain of batik industry and its have strong effect on performance of SMEs. Proper selection of suppliers is very important for the profitability of SMEs and the direct and indirect consequences of poor decision making will impact the ability of SMEs to gain competitive advantage. This study reveals the application of Fuzzy AHP in some of SMEs in the batik industry to determine the relative importance of the criteria in supplier selection and to assign the weight to that criteria. These in turn help to identify the preferences of owner of SMEs at Laweyan Center (Solo), Kauman Center (Pekalongan), and Wijirejo Center (Yogyakarta) selecting their suppliers in the context of purchasing fabric and wax. The result of this study shows us that percentage of defect rate and offering price are the top rank and second rank in supplier selection in batik industry. SMEs in Laweyan Center has different patterns in assessing the degree of importance (rank) of the various criteria for supplier selection compared to the other region

Session Organizer:

Jennifer Shang, University of Pittsburgh, U.S.

Session Chair: *Seyed Hajir Lesani*, Atilim University

055. Strategic Applications and Innovation

19 Strategic Applications

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

INTRODUCING A STRATEGY FOR SELECTION OF PLOWING SYSTEMS USING HYBRID SWOT-AHP METHOD *Kamran Afsahi, Zanjan University, Iran*

In order to advise system, the research results cannot be adequate. So for identifying the effective factors in system selecting, the experience of experts should be used. The present study examines the strengths, weaknesses, opportunities and threats (SWOT) of system at plowing in all of the used methods (conventional tillage, Local and abroad Conservative tillage and No-tillage) in planting the wheat in Ijroud city in Zanjan by ranking via the analytic hierarchy process (AHP). According to the expert's ideas, the existing threats like the small size of the farm, the lack of research and qualitative study on new methods and the lack of research and qualitative study on new methods and the lake of governments protection (47 percent) in selecting the methods relative to weaknesses (18 percent), strengths (percent) and opportunities (17 percent) are effective. By considering the effects of SWOT factors, the farmers select the local conservative tillage (27.2 percent). The threats cause that only 19 percent of farmers, by knowing the advantage of conservative tillage and No-tillage, like to select the conventional tillage. In this condition, by utilizing the new laws the threats should be changed to opportunities and strengths, so some items like:- making coordinate the lands,- doing the qualitative tests about new machines,- identifying the government's policy about importing and exporting the crops and the price of the guarantee purchase should be clear before farming.

**M&A AND PARTNERING AS EXTERNAL
CORPORATE GROWTH STRATEGIES – AN
AHP/ANP-BASED DECISION TOOL** *Axel*

*Rossdeutscher, External Ph.D. candidate / WL BANK,
Germany*

In order to sustain their competitiveness companies pursue different growth strategies. As crucial factors like time and know-how limit the companies' abilities to exercise internal growth strategies, Mergers & Acquisitions (M&A) and Partnering strategies emerge as alternative organization modes of external corporate growth. To enable decision makers within companies to choose the appropriate growth strategy, the essential influence factors are composed into a consistent factor framework. With the help of pairwise comparisons the importance of each influence factor can be precisely determined by the actors involved in such decisions. The derivation of this AHP/ANP-based decision tool and the subsequent illustration of an in-depth case study in the retail industry provide advancement to academic knowledge and managerial practice.

**USING ALIGNMENT WITH CORPORATE
STRATEGY FOR THE SELECTION OF A
PROJECT PORTFOLIO BASED ON ANP** *Monica*
*Garcia-Melon, Universitat Politecnica de Valencia,
Spain; Rocío Poveda-Bautista, Universitat Politècnica
de València, Spain*

In this paper a new approach to prioritize project portfolio in an efficient and reliable way is presented. The research methodology is based on a combination of a synthesis of the literature across the diverse fields of project management, project alignment, multicriteria decision methods and a parallel analysis of an industrial case study. The paper introduces a rigorous methodology with acceptable complexity which seeks to assist managers of the National Electricity Corporation of Venezuela (Corpoelec) in

their yearly resources' assignment on their projects portfolio. The aim being to determine the degree of alignment of each project to corporate strategy based on the judgments of a group of experts on the expected contribution of the projects to the business strategic objectives. The model presented can be used both as a descriptive and a prescriptive model. The approach presented uses project prioritization based on the multi-criteria decision-making technique called Analytic Network Process. Thus the corporate strategic objectives will be used as prioritization criteria to obtain the Relative Alignment Index (RAI).

**USING ANP TO DESIGN A LIVING SYSTEM LIKE
BALANCED OPERATING MODEL FOR
INTANGIBLE SERVICES** *Angela Minzoni,
laboratoire génie industriel/ECP, France; Éléonore
Mounoud, Ecole Centrale Paris; Majid Fathizahraei,
Multimedia University, Malaysia*

ANP and AHP based approach for weighting criteria within decision making contexts has no need to be presented once more. Academic literature in disciplines like economics, engineering, political sciences, statistics or mathematics witness of the broadness of topics, situations and cultures where the method's value has been proven. From supply planning or road mapping to monitoring, from crisis management or banking crime to rural water supply, decision makers –both in governments or firms- have implemented this method in the five continents. Less has been done in the use of the method beyond decision making, as for example in the field of innovation or organisational design where it can be expected that ANP-AHP facilitates a suitable dynamics to inter wave the complex links of experts representations of the system under study. We advance the hypothesis that the rough data level friendliness of ANP-AHP method, combining tangible and intangible information is at the centre of

the cross - disciplinary creativity needed for disruptive innovation.

Session Organizer:

Rocío Poveda-Bautista, Universitat Politècnica de València, Spain

Session Chair:

Rocío Poveda-Bautista, Universitat Politècnica de València, Spain

056. AHP/ANP Mixed Methods, Optimization and Applications 4

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

INTEGRATING THE ANALYTIC HIERARCHY PROCESS METHODOLOGY INTO THE PROCEDURES OF DECISION MAKING IN GOVERNMENTAL AGENCIES *Asma M Bahurmoz, King Abdulaziz University, Saudi Arabia*

The Gulf Cooperation Council Countries are challenged by unprecedented labor problems. These countries suffer from unemployment problems in spite of the fact that they offer jobs for millions of immigrants. Non indigenous fill 95% of the private sector jobs in these countries. Saudi Arabia as the largest country in terms of area and population suffers the most from this unemployment problem. In cooperation with the ministry of Labor , executive MBA(EMBA) students from KAU focused on a number of these problems, defined them, explored solutions and prioritized these solutions from the point of view of officials in the ministry, employers and job seekers. The Analytic Hierarchy Process was chosen as the methodology to help the decision makers in the ministry decide on which strategy to take to address these problems. The objective is to promote the use of AHP in the process of governmental decision making by introducing it via the activity of Service Learning.

NUTRITIONAL DIAGNOSIS USING AHP WITH THE GARUTI INDEX COMPARED WITH DRIS
METHODOLOGY: A CASE STUDY *Victor Gabriel Valenzuela, Universidad Técnica Federico Santa María, Chile*

The objective of this study is to create a new Analytical Hierarchy Process (AHP) model incorporating the Garuti Index (Garuti 2012) to measure nutrients levels more effectively than the current Diagnosis and Recommendation Integrated System (DRIS) model. To create the model it was necessary to develop the hierarchy of the AHP including macronutrients, micronutrients, and the nutrients in general. The next steps was to measure the weight of all the components and create scales of diagnosis to calculate the Garuti Index and compare the results with the DRIS model. The data set were taken from a DRIS study performed by García S.(2000) on potato leaves from the States of Coahuila and Nuevo Leon in Mexico.

LEADING INNOVATIVE TEAMS USING ANP *Sam Sharp, Numerix Pty. Ltd., Australia; Mark Long, Numerix Pty. Ltd., Australia*

‘Agile’ project management has provided the main paradigm for managing software projects over the past decade, recognising the inherent uncertainty and volatility in many areas of the work. It is natural to attempt the extension of these methodologies to general knowledge-work projects, i.e. those typically requiring specialist skills and expertise. One of the most appealing characteristics of the approach is the empowerment of teams, which are frequently vested with intellectual autonomy and decision-making responsibility. In this paper we show how modern teams working in these areas can take carriage of the innovation process. We argue that the worth of an innovative idea can only be evaluated rationally if its connection to the ultimate objective is explicit and can be properly compared with that of its

competitors. Connections are best represented in a network diagram, commonly favoured in ideation environments. Nodes here depict not only the solution alternatives and objectives, but drivers, sub-drivers, criteria and other intermediate problem or decision entities through which solutions are expected to exercise their effect on the objective. We propose that once idea generation has been exhausted, the network diagram, useful for discussion and testing connections, be converted to an influence matrix which is much more amenable to analysis and evaluation. From here teams can use AHP/ANP prioritizing techniques to evaluate the relative strength or importance of the influences of outgoing arcs on their immediate neighbors. Conventional ANP methodology can be applied, prioritizing cluster-to-cluster effects to provide a weighted supermatrix and then a limit matrix. By providing teams with a natural transition to ANP via the influence matrix, they can make rational and transparent decisions instead of subjecting alternatives to a vote or some sort of ranking system as is the common practice.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Asma M Bahurmoz, King Abdulaziz University, Saudi Arabia

057. Environmental and Strategic Assessment

06 Environmental Application

Paper Session

2:00 to 3:00 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

COMPARATIVE ASSESSMENT OF DISPOSABLE PLATES FROM THE USER AND POLICY PERSPECTIVE

Soumya Jain, Indian Institute of Technology Bombay (IIT-B), India; Anand B Rao, Centre for Technology Alternatives for Rural Areas (CTARA), Indian Institute of Technology Bombay (IITB)

Disposable plates are used for serving food because of their easy handling and disposal. Traditionally, disposable plates made of leaves were used in India. Different types of plant leaves have been used for plate making in different states. The present market of disposable plates, however, largely comprises of paper and expanded polystyrene (foam) plates. The three types of leaf plates studied are Areca (Areca catechu), Siali (Bauhinia vahlii) and Sal (Shorea robusta). More than half of the production cost of leaf plates is attributed to procurement of raw material and labour wages. This indicates that leaf plate making is a labour intensive business creating employment in rural areas. Areca plates (Rs 7/ plate) have the highest market price while paper plates (Rs 0.5/ plate) have the lowest. It was found that the energy consumption of making Sal and Siali plates is comparable to that of making the paper plates; while the energy consumption of making Areca leaf plates is the highest. Nowadays, Sal and Siali plates have an embedded polythene sheet. Thus, looking at the currently available designs in the market, non-coated paper plates and Areca leaf plates were found to be the only completely biodegradable disposable plates. The present paper attempts to compare three major types of leaf plates with paper plates on the basis of a

variety of attributes such as economic, performance and environmental from the user perspective and the policy perspective using Analytic Hierarchy Process (AHP). The attribute data was collected through key informant interviews and secondary sources. The user perspective gives the user a decision making template to select from the biodegradable disposable plates available in the market. Similarly, the policy perspective can help the policy maker in decision making or formulating policies which promote sustainable development.

MULTICRITERIA SUSTAINABILITY

PERFORMANCE MEASUREMENT: ANP

CUBAN APPLICATION *Frank Medel-González, Universidad Central "Marta Abreu" de Las Villas, Cuba; Valerio Salomon, Sao Paulo State University, Brazil; Lourdes García Ávila, Universidad Central "Marta Abreu" de Las Villas, Cuba; Cecilia Toledo Hernandez, Federal Fluminense University, Brazil*

Sustainability have become a big challenge for humankind, organizations of all sectors are being more pressured to address environmental and social responsibility performance in addition to the traditional financial performance. Corporate sustainability is a multidimensional concept, is the translation of Sustainable Development concept at a business level. Sustainability in organizations must be managed and assessed by decision makers, for that reason a multicriteria sustainability performance measurement is necessary. The aim of this paper is combine different important tools that helps to make operative corporate sustainability and sustainability performance measurement in organizations. The combination of Sustainability Balanced Scorecard, multicriteria decisions models like: Analytic Network Process, and Alignment Matrix for Sustainability Strategy, can help managers in sustainability performance measurement and assessment. The result of this paper focus in a Corporate Sustainability

Measurement Network design as a first approach for further sustainability performance measurement systems development emphasizing in multicriteria analysis.

STRATEGIC ASSESSMENTS AND

SKYSCRAPERS: AN APPLICATION OF THE

ANP Valentina Ferretti, Politecnico of Torino, Italy

Territorial transformation processes can be seen as complex decision problems, due to the presence of multiple conflicting objectives, many different stakeholders to be involved, high levels of uncertainty associated with the decision outcomes, long term consequences, the presence of intangible elements and the spatial distribution of the different impacts. The present research aims at providing urban planners, as well as other stakeholders and decision makers, with a scientifically sound and practical approach to supporting the strategic planning and evaluation phase in urban areas. Since the last decades Strategic Environmental Assessment (SEA) has been recognized as a very important and rapidly growing area of research and application in the domain of sustainable development. This paper thus proposes and tests the development of a complex ANP analysis, based on the definition of Benefits, Costs, Opportunities and Risks for a complex territorial transformation involving the construction of a new skyscraper in the city of Torino (Italy). The idea below these projects is that the construction of the new tall buildings represents the possibility of creating important architectural landmarks, both at the urban and at the territorial level. As a result, key planning priorities and weaknesses are identified to support the subsequent decision-making phase.

USING MULTICRITERIA ANALYSIS TO SELECT INDOOR HEATING ALTERNATIVES AT THE SOUTH OF CHILE

Dante Caceres, Universidad de Chile, Chile; Claudio Garuti, Fulcrum Ingenieria, Chile; Luis Abel Quiñones, Universidad de Chile

Background: according to World Health Organization half of the world's population uses fossil fuels and other forms of biomass as a source of energy, such as fuelwood, cultivation residues and manure for cooking or heating purposes. These fuels generate high levels of indoor pollutants, which can be extremely deleterious to the health of the exposure persons. This problem is relevant if we consider that people spend about 70-90% indoors spaces, and particularly important to susceptible groups like children, elderly and persons with heart and respiratory diseases and population living geographic zones with long winter time. Objective: to select the most appropriate energy low emission heating systems pollutant heating systems using the Analytic Hierarchy Process (AHP) decision-making method by considering the balance between social benefits, economic cost, and health and environmental risk. Results: This analysis provided a prioritized ranking of the alternatives in each hierarchy studied, defining electricity (oil-electric system) as the most appropriate alternative, which could be explained mainly by the high degree of "safety" that these systems deliver; being weighted with close to 50% total importance of "social benefits" delivered by the alternatives, even though the low environmental risk was also a good criteria and the cost was negative for this heating system. The "gas" and "electricity" options were very similar concerning quality and quantity of social benefits delivered. Conclusion: This methodology can support the process of decision-making considering qualitative and quantitative algorithms in an integrated manner, thus specifying the validity of the decisions in environmental management.

Session Organizer:

Claudio Garuti, Fulcrum Ingenieria, Chile

Session Chair:

Claudio Garuti, Fulcrum Ingenieria, Chile

058. Tuesday afternoon break

ISAHP

Break

3:00 to 3:30 pm

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

059. AHP Theory and Methodology 5

04 AHP Theory & Methodology

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

EIGENVALUE METHOD AS A FULL MEASURING

TOOL Igor Tomashevskii, *Institute of Mathematics, Information and Space Technologies, Northern (Arctic) Federal University, Arkhangelsk, Russia*

The eigenvalue method (EM) is a well-known approach to deriving information from pairwise comparison matrices in Analytic Hierarchy Process. However this method isn't logically complete since its actual numerical error is unknown and its robustness is doubted by the problems of EM, such as "right-left asymmetry", "rank reversal", and violation of "order of preference" and "order of intensity of preference". We show that EM, as a calculation procedure, is equivalent to some «matrix» measuring process. This process is analyzed from the viewpoint of measurement theory. Formulas for the actual EM error are obtained and it is shown that the problems of EM are eliminated when we take into account the numerical values of the EM error. The full measuring tool is composed of the pairwise comparison procedure, EM as a data processor, and the obtained formulas as an error indicator. This tool is suitable to measure and ranking any comparable elements with positive numerical values. The mean relative error of the tool is equal to the square root of the double Saaty's Consistency Index. In the case of decision making processes, the numerical value of errors entirely depends on a measuring scale inaccuracy and inconsistency of expert judgements.

**EXPERIMENTAL EVALUATION OF THE
EFFECTIVENESS OF AN INTERACTIVE
INCONSISTENCY CORRECTION**

Kyriacos Antoniadou, University of Portsmouth, UK; Alessio Ishizaka, University of Portsmouth, U.K.

In a previous experimental study, it was observed that an automatic correction of inconsistency worsens the preference representation of the decision maker. In this paper, a new experimental study investigates if decision makers' preferences are better represented using an interactive inconsistency correction technique. The experimental results show that an interactive approach does not better represent decision makers' preferences for both the subjective and objective measures. Therefore, the interactive effort to reduce inconsistencies is not justified.

**GROUP DECISION AS APPROXIMATION OF
INDIVIDUAL INTERVAL WEIGHTS BY
INTERVAL AHP**

Tomoe Entani, University of Hyogo, Japan

The individual decision in this study is denoted as interval weights of alternatives. Based on the idea that the inconsistency among comparisons stems from the uncertainty of the weights in a decision maker's mind in giving them, the uncertain weight is assumed as interval in Interval AHP. Then, the group interval weight is obtained as an approximation of the individual interval weights based on the satisfaction and dissatisfaction of each decision maker. The condition of the group decision is to have some common to all decision makers' for a consensus. S/he is satisfied more with the group decision, as it reflects his/her decision more. The satisfaction is defined as the range of the group decision supported by him/her. While, s/he is dissatisfied with the group decision, when it is different from his/hers so that the dissatisfaction is defined as the range of the group decision which is not supported by him/her. In the proposed model, the satisfaction and dissatisfaction is

maximized and minimized, respectively, under the group decision condition. As a result the deviations of the upper and lower bounds of the group and individual interval weights are minimized.

INVERSE PROBLEMS IN AHP *Masaaki Shinohara,
Nihon University, Japan*

Two classes of inverse problems in the process of the AHP are studied. The first class, which we call “inverse hierarchy problem”, is the inverse of the forward problem of obtaining the global priority weight vector for the alternative set from the local priority weight data set, such as the weight vectors for criteria and for alternatives viewed from each criterion. The second class, which we call “inverse eigenvector problem”, is the inverse of the forward problem of obtaining the eigenvector from the pairwise comparison matrix. For the inverse hierarchy problem, two types of the problems are mathematically formulated as constrained least p -th norm problems and are applied to some real examples. The inverse hierarchy problem of type 1 is to estimate, from the given objective global priority weight vector for the alternative set, the local priority weight vector for the criteria. The inverse hierarchy problem of type 2 is to estimate, from the given objective global priority weight vector for the alternative set, some of the local priority weight vectors for the alternatives viewed from each criterion. For the inverse eigenvector problem, we show that, given a priority weight vector x and an eigenvalue λ (or Consistency Index $CI = (\lambda - N) / (N - 1)$), the problem of finding A which satisfies $Ax = \lambda x$ can be equivalently transformed into the problem of finding E which satisfies $E1 = \lambda 1$, where $e_{ij} = a_{ij}(x_j/x_i)$, $x > 0$, and 1 is the all-1 column vector. For $N=3$, the reciprocity assumed and λ given, the error matrix E is determined uniquely in the sense that a quadratic equation has a unique pair of solutions. On the basis of this result for $N=3$, the inverse eigenvector

problem “ $E1=\lambda 1$ ” is analyzed for the cases of $N=3m$, $3m+1$, and $3m+2$, respectively, and the error matrix E is shown to be expressed explicitly with $N(N-3)/2$ free independent parameters.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Kyriacos Antoniadis, University of Portsmouth, UK

060. Supply Chain Management

10 Supply Chain Management

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

Participants:

APPLICATION OF ANALYTICAL NETWORK PROCESS TO CUSTOMER ORDER SELECTION PROBLEM: A CASE STUDY FOR A

STRUCTURAL STEEL COMPANY *Burcu Akyildiz,
Istanbul Teknik Universitesi, Turkey; Cigdem Kadaifci,
Istanbul Teknik Universitesi, Turkey; Ilker Topcu,
Istanbul Teknik Universitesi, Turkey*

Customer order selection is a very critical and crucial issue for the manufacturing companies as far as their limited capacities are concerned. When the current awarded projects start to cover large portions of the company's design and manufacturing capacities, the company confronts with the decision problem of choosing which customer order next to allocate the remaining scarce capacities properly. The most important objective in this decision problem is usually maximizing the profit, because the firms in manufacturing sector are profit based companies. In order to make this decision, the important evaluation criteria are determined for a selected company as follows: the potential profit rate per unit of time, the compatibility of potential order with the available capacity, the level of potential future order with higher profit, customer credit of future business opportunity, and the negotiability level of production schedule for the order. An Analytical Network Process (ANP)-based decision model is developed by using these criteria to choose the most profitable projects under the limited capacities of the company.

BENEFITS ASSESSMENT OF TRAINING ON SUPPLY CHAIN MANAGEMENT: THE CASE OF A GLOBAL CHEMICAL CORPORATION

Claudemir Leif Tramarico, Sao Paulo State University (UNESP), Brazil; Fernando Augusto Silva Marins, UNESP - Sao Paulo State University, Brazil; Ligia Maria Soto Urbina, Technological Institute of Aeronautics, Brazil; Valerio Salomon, Sao Paulo State University, Brazil

Modern organizations rely upon their core competencies to support their competitive advantages. In that context, organizational functions should contribute for strengthening company's core competencies. Nowadays, supply chain management has to be developed in order to achieve competitiveness in global markets. In such a context, global organizations have invested to improve supply chain management capabilities. It is expected that such efforts should have positive impacts on organizational and individual competencies as well as on the related core competencies. However, it must be pointed out that these benefits are not easily accounted. Therefore, this paper proposes the assessment of benefits from a training program developed in a real company, to support its supply chain management. With this aim, this paper presents a set of relevant criteria, which can capture, on one side, the training impacts on the related core competencies, and on the other side, the expected benefits on organizational and individual competencies. Analytic Hierarchy Process is applied, surveying the trained employees and their managers.

MACROERGONOMICS EVALUATION OF A LOGISTIC PROCUREMENT PROCESS IN A PRODUCTION PLANT OF KITCHEN ITEMS

Michaellys Marrero-Oviedo, Universidad Central "Marta Abreu" de Las Villas, Cuba; Alina Díaz-Curbelo, Universidad Central "Marta Abreu" de Las Villas, Cuba; Jorge Coello-Mena, Software

Development Constele. Inc, U.S.

The procurement processes have as a principal function the material productions assurance. The evaluation and continuous improvement play a role in the efficiency, efficacy and effectiveness scope in the organization. The main aim was to construct an index that allows the integration of logistics management metrics, and ergonomic assessment in a procurement process on cookware manufacturing by using the ANP (Analytical Network Process) methodology. Several techniques and tools were used in retrieving the necessary information as: official documents review, the use of checklists, the Delphi methodology, the use of surveys, workgroup techniques and consultation with an expert panel; furthermore through the application of the software SuperDecisions it is possible to determine the evaluation of the integrated index in the aforementioned plant. The macroergonomics index (IEMaE Spanish acronym) calculated allowed us to determine the range in which improvements can be implemented and prioritized according to the weight they represent in the calculated index.

SUPPLY CHAIN RISK MANAGEMENT USING ANP *Elena Rokou, National Technical University of Athens; Konstantinos Kirytopoulos, University of South Australia, Australia*

Supply chain risk management (SCRM) has recently gained interest both from the practitioners and the researchers due to the increased request for efficiency and the diminishing margins for deviations. Organizations aim to achieve their goals for varying levels and types of supply-chain risks. Identifying and dealing with supply chain risks involves a great amount of subjectivity and uncertainty. Analytical examination of the risks related to a specific supply chain is a tedious task due to the lack of available data. This difficulty is accentuated when there are significant variations of the environmental

parameters and/or the amount of available information is not sufficient. The proposed approach aims at providing a method for qualitative risk analysis after the risk identification. The risk identification utilizes the withstanding knowledge related to each echelon of the specific supply chain and to the supply chain as a whole. This data is used to form the risk break down structure that is the main input of the proposed approach. The Analytical Network Process is used for the risk analysis following a multi-criteria approach. The process is applied on the lower RBS level. The risks composing the specific level define the set of alternatives to be ranked. A number of criteria defined by the group of decision makers (supply chain managers and risk analysts) are used for comparing the alternative solutions. The ranking, results on the definition of priorities, for taking mitigation actions. Having in mind that the risk identification and the criteria definition are done once per supply chain and updated when needed, we get a quick way for analyzing supply chains risks. However, as it is expected the more knowledge we get about the specifics of the under question supply chain the higher accuracy has the proposed approach.

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.

Session Chairs:

Elena Rokou, National Technical University of Athens

Ilker Topcu, Istanbul Teknik Universitesi, Turkey

061. Information System

21 Information System

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Independence B

Participants:

COMBINATION OF AHP AND PROMETHEE FOR MEASURING QUALITY OF OBJECT ORIENTED SOFTWARE DESIGN

Petrus Mursanto, Universitas Indonesia, Indonesia

Measuring quality of object oriented (OO) software is challenging mainly because we are facing a number of more or less dependent parameters that characterize the properties of good OO design. This paper proposes a combination of AHP and PROMETHEE for measuring object oriented software design. We have compared AHP and PROMETHEE performance for such purpose in the ISAHP 2011. The result suggested a combination of both methods for better accuracy and more robust measurement. The proposed method combines the AHP's pairwise comparison for defining weights of criteria and employing the PROMETHEE decision aid for selecting ranks of OO software quality. This method has been applied for defining ranks over a number of object oriented software. The result shows that the integration of AHP and PROMETHEE deliver more accurate and robust measurement compared to the result of each method individually.

DETERMINATION OF A TASK'S VALIDITY IN THE MARINE ENGINE ROOM OPERATING PROCESS

Piotr Kaminski, Gdynia Maritime University, Poland

The frequent causes of ships' detentions by port authorities are abnormalities of marine power plant functioning. Each extended ship lay time in port results in a waste of ship operating time thus costs rise to ship owners. This is connected with improper

marine power plant management. In order to avoid this, a ship engineer should have at his disposal computer aided system supporting him in the managing of the marine power plant. Such a system can be worked out on the condition that a mathematical model, which represents the decision – making process of an engineer has been built. One element of the decision making process in managing the marine engine room is to determine how important is each of the tasks which the operators have to do. This estimation is the base to choose the most important tasks and make optimal schedule with them. The present work shows the approach to the rating method of operating tasks using AHP method. Based on practice, a hierarchic structure of factors influencing a tasks validity in the engine room operating process was made. Next a preliminary questionnaire was conducted, which put questions to the experts as chief engineers next. This enabled to define numerical values of suitable coefficients influencing on the validity of operating tasks. The equation contains this all coefficients permit to determinate numerical values of an operating task’s validity in given engine room operating processes.

RANKING CRITICAL SUCCESS FACTORS OF HEALTHCARE MANAGEMENT INFORMATION SYSTEMS USING AHP

Nizar Hussain M, Kerala University, India

The ranking of Critical Success Factors (CSF) of Healthcare Management Information System (HMIS) help practitioners to identify vital factors from the trivial many that are essential for its success. The objective of this study is to rank the CSF of HMIS using a suitable Multi-Criteria Decision Making technique (MCDM). Here, Analytic Hierarchy Process (AHP) is the MCDM used to determine the relative importance of the CSF in influencing the adoption and use of HMIS. In order to rank the factors, this study is planned and performed in two

stages. At the first stage to identify the critical success factors of HMIS, a through literature review is made. At the second stage, a pair wise comparison is designed based on AHP method to collect the opinions of experts and distributed among 15 persons of the organizational experts/academicians. The pairwise comparisons got from this stage are analyzed by AHP. The research findings indicate that the critical success factors in HIS have different priorities and weights. The weightage got from AHP can also be used for ranking of various HMIS installations in different hospitals.

Session Organizer:

Petrus Mursanto, Universitas Indonesia, Indonesia

Session Chair:

Petrus Mursanto, Universitas Indonesia, Indonesia

062. Human Resource Management

16 Human Resource Management

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Independence C

Participants:

AHP IN PERSONNEL MANAGEMENT: CAN THE KEY COMPETENCIES CHANGE WITH

COMPANY'S STRATEGY? *Katerina Kashi, VSB - Technical University of Ostrava, Czech Republic; Jiri Franek, VSB - Technical University of Ostrava, Czech Republic*

Main aim of this paper is to determine key competencies for a top manager in an automotive company. Firstly, the authors deal with the description of competency models, its development and utilization. After, the authors illustrate how the competencies can be decomposed so that AHP can be used for its evaluation. Then individual competencies are ranked. Further, the authors compare the current key competencies ranking with results from last year. At the conclusion of this article, the authors are dealing with the research's results and discussion.

ANALYSIS OF THE FACTORS AFFECTING THE DECISION MAKING PROCESS OF RECRUITMENT AND SELECTION STRATEGIC POSITIONS

Alexis Olmedo, Andres Bello University, Chile; Felipe Rojas, UNAB, Chile; Michael Alejandro Olivares, UNAB, Chile; Paolo Herrera Manriquez, UNAB, Chile

This paper presents the results of an exploratory study that analyzes the main factors of the decision making process of recruitment and selection of strategic positions for companies located in Santiago of Chile, Metropolitan Region of Chile. The methodology developed uses AHP Multicriteria concepts addressing the major theoretical foundations of this methodology. The results of a survey of

organizations in Santiago city in order to obtain the similarities and the most relevant factors for the recruitment and selection of strategic positions are presented, allowing the establishment of an exploratory a common pattern for the process.

DYNAMIC PROJECT PORTFOLIO

MANAGEMENT USING ANP *Petr Fiala, University of Economics, Czech Republic*

Project management is the discipline of planning, organizing, securing and managing resources to bring about the successful completion of specific project objectives. Project opportunities come in time and it is necessary to decide which will be accepted for creating a dynamic portfolio of projects and which will be rejected. The paper presents an approach for dynamic project portfolio management based on the ANP model. The ANP model consists of four basic clusters (projects, resources, criteria, time) with their elements and influences. An important factor of the proposed ANP model is time. Hybrid procedure for dynamics of the project portfolio management is proposed.

THE IMPACT OF CLUSTER SETTING ON THE PERCEIVED IMPORTANCE OF FORMAL

VERSUS INFORMAL REWARDS *Paul Mugurel Poleanschi, Bucharest University of Economic Studies, Rumania*

Motivation is, per se, a key ingredient in every organization and, like beauty is in the eyes of those who are looking, the latent, maybe unconscious subjectivity of managers as decision makers in perceiving the importance of both formal and informal rewards might bias their effective allocation, altering further their efficiency for each and every employee. As an organization disconnected from any business environment, with very few monetary incentives above the fixed wage, military developed a rewarding system with clear formal rewards, sorted

in an ascending order by official regulations and limited in options. As this is the most important motivational tool to keep both the morale and the discipline very high, the rewards' effectiveness is crucial for the commanders as decision makers, in order to obtain the desired motivational level. The main aim of this paper is to determine to what extent the perception of the decision makers' over the formal rewards' efficiency is reinforced by the existence of the informal rewards. To assess the influence of different perceptions on the importance of both formal and informal rewards, the cluster method is adapted. Thus, the results derived from the experiment described in this paper represent an indicator of the sensitivity of the cluster method, in which intangible categories are grouped according to their perceived importance, instead of the physical comparison of entities.

Session Organizer:

Petr Fiala, University of Economics, Czech Republic

Session Chair:

Petr Fiala, University of Economics, Czech Republic

063. Strategic Applications and Decision

Making

19 Strategic Applications

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

CASH & CARRY STORE LOCATION SELECTION USING ANALYTIC NETWORK PROCESS: AN APPLICATION IN TURKEY *Tuncay Gürbüz, Galatasaray University, Turkey; Hande Arik, MIGROS, Turkey; Esra Yildiz Albayrak, Galatasaray University, Turkey*

Location selection problem is one of the most crucial decision problems for cash & carry stores. This study gives a multi-criteria model for that decision problem. A real life application is given throughout the study. Interactions among the decision criteria have been taken in consideration in order to better reflect the real life decision environment where the application of the decision model has been performed. Analytic Network Process is used in order to achieve a final decision among the three alternative locations for one of the largest cash & carry chain in Turkey.

MANAGEMENT STRATEGIES FOR TAIWAN RESERVOIR CATCHMENT AREAS: A CASE STUDY IN SHIH-MEN RESERVOIR CATCHMENT AREA *Huang Hun-Feng, Tamkang University, Taiwan*

In Taiwan, there are 113 reservoir catchment areas delineated as public water source protection areas, covering 25% of Taiwan's land area. Many important reservoir areas are vulnerable to global climate change, as water resources is already under increasing ecological, societal, hydrological and economic pressures. In this research, a case study of

Shih-Men Reservoir catchment area management is constructed. Thirteen factors under the categories of “land use”, “water quality protection”, “quantity of water supply and demand”, “water and soil conservation”, “laws and institutions” are identified and corresponding response strategies are proposed. In order to optimize the use of limited government budgets and resources, the factors and corresponding response strategies are assessed and ranked in terms of their comparative impacts. The analytical network process (ANP) is employed in this research for quantifying multiple stakeholders’ perceptions of the above mentioned factors and response strategies. The ANP results show the “national land planning” to be the most important issue, under which “the extent of land use” is the strongest factor. “Public participation” is shown to be the strategy of the highest priority, under which land development’s environmental impacts need to be reviewed, and an information management platform needs to be established so that value added analysis can be performed in support of catchment management strategic planning.

**RUNWAY COMBINATION SELECTION OF
ISTANBUL ATATURK AIRPORT** *Orhan Ertugrul
Guclu, Anadolu University, Turkey; Cem Cetek,
Anadolu University, Turkey*

Rapidly increasing demand for air transportation leads serious capacity problems at major airports like delays and congestions. Especially determining the suitable runways for the airport operations sometimes causes essential problems such as airport ground traffic congestions, air pollution due to exhaust emission and noise pollution. These are the main results of wrong runway selection. Conventional runway selection is done by only wind direction. In conventional method; noise pollution reduction, exhaust emission pollution reduction and ground traffic congestion reduction haven’t been considered.

In our research, we have studied on Istanbul Ataturk Airport. Istanbul Atatürk Airport has three runways for flight operations. These runways are operated for over 100 million passengers annually. Approximately 1200 aircraft operation are executed daily in Istanbul Ataturk Airport. But ground traffics mainly face with the congestions and delays. The reason of these congestions and delays is the wrong combination of runways. Up until now, this selection is done by only wind direction. Besides the wind direction there should be additional criteria for the best selection of runway combination. In this decision making process; noise prevention criteria, exhaust emission reducing criteria and possible critical points that face with the congestions will be used. By the help of these criterias, the selection of the runway combination will be done with Analytic Hierarchy Process (AHP). When we detail on the analysis, we could have reduced the effect of the exhaust emission, noise pollution and the possible delays and congestions with considering these effects.

SALES PREDICTION WITH MILTIAGENT TOWN MODELS AND DECIDING STORE LOCATIONS WITH AHP *Kazuhiro Kohara, Chiba Institute of Technology, Japan; Daiki Sekigawa, Chiba Institute of Technology, Japan*

We propose an integration method that uses the analytic hierarchy process (AHP) and agent-based modeling to predict sales and to choose a new store location. First, we create multiagent town models that include store agents and consumer agents. We then estimate the predicted sales for each store by using a computer simulation based on multiagent town models. Finally, we use AHP to determine the location of a new store.

Session Organizer:

Kazuhiro Kohara, Chiba Institute of Technology, Japan

Session Chair:

Kazuhiro Kohara, Chiba Institute of Technology, Japan

064. AHP/ANP Mixed Methods, Optimization and Applications 5

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

PARAMETERS OF OPTIMUM HIERARCHY STRUCTURE IN AHP *Stan S. Lipovetsky, GfK Custom Research North America, U.S.*

A problem of finding optimal hierarchy parameters for a given number of alternatives is considered. Hierarchical structures are widely used in the Analytic Hierarchy Process, Conjoint Analysis, and various other methods of Multiple Criteria Decision Making. The suggested approach is based on minimizing the objective of total pair comparisons across all the hierarchy structure. For an optimal hierarchy, the minimum effort is needed for eliciting data and synthesizing the local preferences across the hierarchy to get the global priorities or utilities. The obtained analytical and numerical results show how to choose the optimal structuring of the alternatives into groups by sub-criteria, criteria, and hyper-criteria by many-level hierarchy. The obtained results are beneficial for practical managerial decision making in the complex problems with numerous alternatives.

PROPOSING A DECISION MODEL FOR PRIVATIZATION OF NEWSPRINT PAPER INDUSTRY BY APPLYING ANP *Majid Azizi, University of Tehran, Iran; Mohammad Modarres, University of Sharif, Iran*

The present study aims to propose a decision model for privatization of Iran newsprint paper industry by applying ANP. Media role of newsprint paper has a very special and notable situation that must be

adapted in quality and quantity with consumers' requirements. In Iran there is one newsprint paper producer that supplies 70 percent of domestic use. An appropriate privatization in newsprint paper industry will increase the rate of production and necessity of import. In this study, we use incorporation of AHP and ANP. Four possibilities of (1) Encouraging for investment (2) Reformation of rules and regulation (3) Reformation of firms' structure and (4) Liberalization of prices, can be considered as possible solutions for expedition of privatization in newsprint paper industry. The Analytic Network Process and the Super Decision software were used to synthesize and analyze the model. In different situations, all the decisions were affected by external factors; hence, the value-weighted competency model was calculated in the first stage with the influence of external factors on the competency model. Hierarchical designs of decisions were made for each of the competencies and their subsets. Paired comparison matrices associated with the degree of importance of each of the competencies were achieved in the second stage. In the final stage, subsets of competencies' weighing values and their sub-options were identified through combination of the competencies and the best solution was obtained. Finally a sensitivity analysis of the model was also performed.

RANKING THE CROSS-BORDER TECHNOLOGY ACQUISITION MODES, COMBINING TOPSIS AND ANP METHODES FOR MODEL DEVELOPMENT: CASE STUDY OF CAR PART INDUSTRY IN IRAN *Somayeh Sahebi, Islamic Azad University, Iran; Arash Rdmehr, Author, Iran; Zeinab Sahebi, Author, Iran*

Simultaneous with the industries increasing growth, the companies must acquire the new technologies to achieve to core competency, survival and improvement and also effectiveness in market.

Choosing the suitable acquisition mode of required technology is one of the critical strategic decisions in the field of technology management. Due to the importance of technology acquisition, the main objective of this study is to select an appropriate method of technology acquisition in car part industry by multi-dimensional factors of environmental, technological, capability and market. Hence, after extracting the factors from surveying the related literature and conforming the first kind of questionnaire by the chorenbakh alpha's, the elements was ranked by TOPSIS method to reduce the criteria and to choose the appropriate affecting elements in technology acquisition modes. In the next step regarding to ANP method second questioners spread between the experts in the car part industry in Iran and the modes were prioritized and the applied recommendations have been suggested.

SELECTION OF ELECTROCARDIOGRAPH FOR A CARDIOLOGY DEPARTMENT USING ANP

Gulcin Bektur, Eskişehir Osmangazi University, Industrial Engineering Department, Turkey

Selection of materials in health care systems is more critical than the other systems due to materials affect human life and the expenses of materials are met by the states. So, the most effective decisions to be made in the selection of materials. In this study, selection of electrocardiograph(ECG) for a cardiology department is discussed. ECG provides to record the occurred electrical activity of the heart. Many factors must be considered in the ECG selection. This situation requires the use of multi criteria decision making methods, ANP was used due to the take into account relationships between criteria. For determining the most suitable criteria, survey was applied to university staff and SPSS was used for reliability test. In conclusion the most suitable alternative was determined for the department.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Stan S. Lipovetsky, GfK Custom Research North America,
U.S.

065. Sustainability Application

07 Sustainability and Social Responsibility

Paper Session

3:30 to 4:30 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

AN INNOVATIVE MULTI-CRITERIA DECISION METHOD FOR IMPACTS' ASSESSMENT OF UNESCO BRAND *Paola Boati, Politecnico di Torino, Italy*

The UNESCO World Heritage List was created to identify unique and authentic sites from a cultural or natural point of view, whose protection and conservation are important for the entire world community and to which is given an "outstanding universal value". So the World Heritage Status has more and more become an opportunity not only as witness of historical, aesthetic and identity values, but also to use the brand as a tool for achieving a sustainable local development of the whole context. In fact, the inscription on the List brings positive effects on the surrounding context and can create significant impacts also from the environmental, occupational and socio-economic point of view. However, it also brings to light negative aspects, first and foremost a high influx of visitors, due to visibility of the site at an international level, with the consequent damage to the environment and the exclusion of local activities by gains related to the tourism sector. The purpose of this paper is to investigate the role that the inclusion of a site on the UNESCO WHL can have for the creation of local development and sustainability processes within the territory in which the property is inserted, using and mixing different economic valuation techniques to identify and quantify impacts and effects that are created on the context of the site, on local actors involved in its management, visitor and resident

population. The methodology is based on a wide literature review, the comparison of statistical data regarding some Italian cities, some included in the List and other not equipped with this brand and finally the setup of an innovative framework of evaluation, objective and scientifically robust, able to determine, identify and weigh the impacts resulting from the inscription of a site on the UNESCO WHL.

COMPARISON OF HOUSEHOLD LEVEL DRINKING WATER TREATMENT TECHNOLOGIES USING ANALYTIC HIERARCHY PROCESS

Deepthi Yaparla, Environmental and Water Resources Engineering Civil Engineering Department Indian Institute of Technology Madras, India; Anand B Rao, Centre for Technology Alternatives for Rural Areas (CTARA), Indian Institute of Technology Bombay (IITB); Bakul Rao, Centre for Technology Alternatives for Rural Areas (CTARA), Indian Institute of Technology Bombay (IITB)

Almost 20 percent of the world's population lacks access to safe drinking water (DW) and basic sanitation. The Target 10 of United Nations Millennium Development Goals is "to reduce by half, the proportion of people without sustainable access to safe DW, by 2015". In order to reach the goal, many countries are investing in water treatment systems in a big way. However, it has been proved that household system is more effective than centralized systems as it ensures quality of DW at the point of consumption. The current study compares household level drinking water treatment technologies for urban and rural areas of India using Analytical Hierarchy process (AHP), a multi criteria decision making (MCDM) tool. Traditional and commercial technologies suitable for urban and rural households from the consumer perspective have been considered. Preferences given for the choice of technologies are based on literature review, household level survey, market survey and semi-structured interviews with

various governmental and non-governmental officials. The technologies considered for the current study are not only suitable to both urban and rural areas, but affordable (costing up to `10,000 OR \$162) to middle and lower middle class households. The technologies selected include alum, boiling, alum-boiling-straining, SODIS, ceramic candle filters, Biosand filters, Terafil filter, Pure it, Tata Swach, and Aquaguard Compact. Boiling and Aquaguard were top ranked for the urban areas whereas SODIS and boiling were ranked high for the rural areas. The ranking has been found to be sensitive to the attributes such as the initial cost, maintenance cost, durability, reliability and the ability to treat contaminants of the candidate technologies.

DEVELOPING AN ENVIRONMENTAL SUSTAINABILITY INDEX FOR A BUILDING ASSESSMENT AND CERTIFICATION SYSTEM IN CHILE *Jose Tomas Videla, Chile; Claudio Garuti, Fulcrum Ingenieria, Chile*

Instituto de la Construccion, with the participation and contribution of 14 public and private institutions of the construction sector, is developing a national Building Environmental Assessment System and Certification Scheme, “Certificacion Edificio Sustentable”, in order to assess, qualify and certify compliance based on a set of requirements focused on design conditions, on site verification and performance of non-residential buildings. The certification scheme consists of a set of requirements, 14 of them mandatory, arranged in two main categories: Architectural Design and MEP Systems Design. The definition of the weights, scales and thresholds, was based on the Analytical Hierarchy Process (AHP), involving 39 public and private institutions and companies. To implement the system, it is consider the formation of assessment bodies throughout the country, which would give feedback and improve the system requirements at local level,

facilitate on site verification, and increase opportunities for market players.

FAILING THE WALL OF MARGINALIZATION AND PROVIDING ELECTRICITY FOR ALL: DECISION MAKING ON SMART SYSTEMS INTEGRATION USING AHP *Fairouz Iberraken, University of Bejaia, Algeria; Rabah Medjoudj, University of Bejaia, Algeria; Djamil Aissani, University of Bejaia, Algeria*

This paper aims to provide a tool to think creatively and to assist managers in their decision making to solve the problem of electricity unavailability. Three possible issues are exposed: insufficiency of power supply, low level of distribution system reliability and unpaid bills for the case of poor households. These problems lead to a reduced quality of life and create frustration of the population. There is an efforts combination of utilities' managers and the public authorities to support the problem, but the network must be communicating and admits smart meters that can apply the solution based on criteria specific to each situation. So it is appropriate to consider the integration of new technologies to the conventional network giving birth to a smart energy grid. The multi-criteria method of our choice is the Analytic Hierarchy Process (AHP), which is judged transparent and contributing to conflict resolution. It consists on developing the problem in a hierarchy, where tangible scenarios are considered in accordance with some criteria for which experts associate weights, got from a consensus.

Session Organizer:

Rabah Medjoudj, University of Bejaia, Algeria

Session Chair:

Rabah Medjoudj, University of Bejaia, Algeria

066. Gala Dinner - Odyssey Boat

ISAHP

Reception

5:00 to 9:00 pm

Odyssey Boat: Odyssey Boat

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

WEDNESDAY, JULY, 2

**067. Plenary Session: A New Revolution in
Conflict Resolution**

ISAHP

Plenary Session

8:30 to 9:15 am

Grand Hyatt: Floor Independence Level - Independence A

Presenter:

H. J. Zoffer, University of Pittsburgh

Session Organizer:

Enrique Mu, Carlow University, U.S.

068. AHP Theory and Methodology 6

04 AHP Theory & Methodology

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

MANY HANDS MAKE WORK LIGHT OR NOT? A NOVEL TOOL FOR GROUP DECISION

MAKING WITH ANP *Elena Rokou, National Technical University of Athens*

Although every problem has multiple solutions, many restrictions and various ways to be addressed, there are also many techniques, methods and approaches proposed by scholars and practitioners that can be implemented to help increase our decision making effectiveness. The Forum will address this issue by engaging participants to reach a group decision using a new tool in the form of a Microsoft Excel Add-In that supports the Group Analytic Network Process (GANP) and it is integrated with the Super Decisions software. An illustrative case concerning the decision of a city council on how to use a community lot based on given alternatives (among a new parking lot, a hospital and sustainable landfill) and preselected criteria will be used during the Forum. The results of this game will provide significant insights for the group decision making process, explore the proposed techniques and bring out the advantages and disadvantages reported in literature.

MEASURING IN WEIGHTED ENVIRONMENTS

Claudio Garuti, Fulcrum Ingenieria, Chile

This article addresses the problem of measuring closeness in weighted environments (decision-making environments). The relevance of this article is related with having a dependable cardinal measure of distance in weighted environments. Weighted environments is a non isotropic structure where the different directions (axes) may have different

importance (weight) thus, there exist privilege directions. In this kind of structure would be very important to have a cardinal reliable index able to say how close or compatible is the set of measures of one individual with respect to the group or to anyone other. Common examples of this structure is the interaction between actors in a decision making process (system values interaction), matching profiles, pattern recognition, and any situation where a process of measurement with qualitative variables is involved.

**MINING METHOD SELECTION METODOLOGY
BY MULTIPLE CRITERIA DECISION
ANALYSIS - CASE STUDY IN COLOMBIAN
COAL MINING** *Jorge Ivan Romero, Escuela
Colombiana de Carreras Industriales, Colombia; Felix
Antonio Cortes Aldana, Universidad Nacional de
Colombia, Sede Bogota, Colombia*

The purpose of this paper is to present an application of the AHP technique to a mining method selection problem faced by a Colombian mining company; in this case we use five decision makers. Next, a final aggregation of criteria priorities by AHP and ENTROPY is proposed for include subjective and objective weighting. Next, VIKOR method is performed to present a compromise solution; VIKOR is used to solve the problem without decision makers dependence; the weights for VIKOR are aggregated using an a priori w_j subjective weighting obtained from AHP method. Whereas entropy weighting provides a dynamic and objective assessment of all criteria, AHP weighting determine all decision makers preferences. Finally, an analysis of the results is carried out to derive conclusions in relation to the effects of the modeling processes of both techniques.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chairs:

Claudio Garuti, Fulcrum Ingenieria, Chile

Elena Rokou, National Technical University of Athens

069. ANP in Supply Chain Management

10 Supply Chain Management

Panel

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Franklin Square

In this session three papers will be presented. First paper is about third party logistics (3PL) companies. These companies are becoming an important part of today's supply chain. A framework is proposed to select the best 3PL service provider using Analytical Network Process for an aerospace company located in a large Western Washington city. Second paper identifies and prioritizes capabilities that are most likely to provide competitive advantage. Scholars have traditionally used Ordinary Least Squares (OLS) to understand the relationship between capabilities and firm performance. However, OLS is limited in its limited to explain the interdependences and connectedness amongst multiple firm capabilities themselves which is possible with ANP modelling. Thus in this paper integration of OLS and ANP methods in explaining interdependences amongst firm capabilities and their effect on firm performance are proposed. Third paper is literature review on multiple criteria models used in supply networks. To evaluate developments and directions of this research area, this paper provides a content analysis of the papers reviewed that address sustainability aspects in the supply networks. It was found that a preponderance of the publications and models appeared in a limited set of six journals, and most were analytically based with a focus on multiple criteria decision making. Our preliminary research indicated that the tools most often used encompass the AHP and ANP as well as life cycle analysis. This provides insights toward future research directions and needs.

Participants:

SELECTION OF A THIRD PARTY LOGISTICS SERVICE PROVIDER FOR AN AEROSPACE COMPANY: AN ANALYTICAL NETWORK PROCESS APPROACH *Birsen Karpak, Youngstown State University, U.S.; Ozden Bayazit, Central Washington University, U.S.*

Third party logistics (3PL) companies are becoming an important part of today's supply chain. These companies offer services that can allow businesses to outsource part of all of their supply chain management function. As companies saw the benefits of outsourcing delivery and warehousing functions, the number of third party logistics companies began to rise offering an ever increasing number of services. Therefore deciding to outsource company's logistics operations is a challenging task and represents a multi criteria decision making problem. In this research, a framework is proposed to select the best 3PL service provider using Analytical Network Process for an aerospace company located in a large Western Washington city.

ANALYTICAL NETWORK PROCESS (ANP): METHOD FOR HELPING MANAGERS LEARN, IMPROVE FIRM CAPABILITIES AND GAIN A COMPETITIVE ADVANTAGE *Ramesh Dangol, Youngstown State University, U.S.; Mona Bahl, Youngstown State University, U.S.; Birsen Karpak, Youngstown State University, U.S.*

A key challenge for managers is to consistently develop firm capabilities. Learning and knowledge sharing required for capability development is facilitated through co-operation with participants of the supply chain system of a firm. However, a key challenge for managers is to identify and prioritize capabilities that are most likely to provide competitive advantage. Scholars have traditionally used Ordinary Least Squares (OLS) to understand the relationship between capabilities and firm performance. However, OLS is limited in its limited

to explain the interdependences and connectedness amongst multiple firm capabilities themselves which is possible with ANP modelling. Thus we propose integration of OLS and ANP methods in explaining interdependences amongst firm capabilities and their effect on firm performance. However, we also caution against the cognitive bias limitations inherent to the ANP model.

AHP/ANP FOR SUSTAINABLE SUPPLY

NETWORKS *Birsen Karpak, Youngstown State University, U.S.; Stephen Taraszewski, Youngstown State University, U.S.*

The aim of this research is to summarize existing research on multiple criteria models for supply networks and find the state of the art of AHP/ANP contributions towards sustainable supply networks. This provides insights toward future research directions and needs. Globalization places demands on supply network management beyond pure economic issues. Cost minimization, revenue or profit maximization by itself are not sufficient; for example: fair labor conditions, diversity, safety, and environmentally friendly product development (greener product design) and production (cleaner process technology) are also important. Competition is no longer among the companies; it is among the supply networks. Based on our preliminary research we found out that environmental dimension still dominates, social aspects are widely ignored; social criteria need further exploration; among the multiple criteria methodologies used in sustainable supply chains AHP used most and recently articles using ANP to manage sustainable supply chains are rising. We could not find any study using any multiple criteria approaches including AHP and ANP in sustainable supply network management. We content that this is a promising area for AHP/ANP community.

Session Organizer:

Birsen Karpak, Youngstown State University, U.S.
Session Chair: *Mona Bahl*, Youngstown State University

070. Strategic Applications Study

19 Strategic Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

A REVIEW AND CRITIQUE OF HYBRID MADM METHODS APPLICATION IN REAL BUSINESS

Jiri Franek, VSB - Technical University of Ostrava, Czech Republic; Katerina Kashi, VSB - Technical University of Ostrava, Czech Republic

Since its introduction the MADM techniques had witnessed a great development and popularity among scholars. Their application range from very basic towards more sophisticated using MOLP and fuzzy operations. However, many scholars and authors have researched various possibilities of MADM practical use but it seems the real business hasn't caught up with the same enthusiasm. Hierarchical and network thinking is very important for any strategists and entrepreneurs. Nevertheless, contemporary attitude towards decision making is not in favor of rigorous process. The most frequent plea is that the speed and efficiency should prevail when the real business environment is much more dynamic and turbulent. So entrepreneurs and managers have difficulties in filling in the questionnaires for comparing the criteria and alternatives. The lack of agreement in the criterion evaluation and compromise thus limits the application of MADM techniques. Another problem is associated with a large number of evaluation criteria that is often needed and the network of interdependencies. This paper deals with a review of applications that can be considered as useful in real business and based on

empirical research proposes a suggestion of specific tasks that could be used and accepted in real business. The paper consists of summary of relevant literature then follows short description of applied methods, description and results of empirical research and concludes with proposal of several business tasks that could be facilitated by selected MADM methods.

DEVELOPING A BUSINESS PERFORMANCE MANAGEMENT MODEL *Ahmad Hasan Maharma, Project Manager, Palestinian Territory*

Dynamicity environment of telecommunication industry, high-level of competition and increased customers' expectations has made necessity of getting awareness of attaining a comprehensive performance evaluation, confident, trustable and flexible. Paltel Group as a market leader in Palestine, should take advantage of methods and patterns consecutively with the aim of consecutive evaluation and improvement of their performance. This study found Business Performance Management is an incredible method as it helps organizations to plan, monitor, analyse, and manage business more effectively by providing a comprehensive view for enterprise. With a shared purpose, a consistent data model, real-time information, easy-to-use tools, and streamlined processes, it's much simpler to align operational procedures with strategy. And through increased insight, make faster decisions and boost performance to achieve business goals. This research has contributed to providing decision makers with a systematic approach for establishing a visual strategy map with a consideration of the involved causal relationships among Key Performance Indicators (KPI's). Planning leadership team from Paltel Group in cooperate with the researcher review the past performance of the business and decide on future intent or direction for the business. Meanwhile, Review and formulate Paltel Group Strategy to identify business strategy and construct Balance

Scorecard (BSC) and strategy map to measure financial and non-financial indicators. Proposed framework in this research would be a useful and valuable reference to measure actual performance against target values, and facilitate review and divide results to understand the post actions taken resulting in the current position. This research proposes a model based on the Analytical Hierarchy Process (AHP) and BSC for evaluating the performance of Paltel Group, The analytic hierarchy is structured by the four major perspectives of the BSC including financial, customer, internal process, and learning and growth, followed by performance indicators.

MULTICRITERIA APPROACH FOR EVALUATION OF SCENARIOS GENERATION MODELS APPLIED TO THE MEDIUM-TERM HYDROTHERMAL OPERATION PLANNING

Hugo Ribeiro Baldioti, PUC-Rio, Brazil; Bruno Agrelino Ribeiro, PUC-Rio, Brazil; Reinaldo Castro Souza, PUC-Rio, Brazil

Multicriteria approach is used in the context of evaluation of synthetic scenarios generation models, aiming to rank them according to their performance by considering solely the stochastic aspects. Alternative inflow time series scenarios are generated via stochastic linear models fitted to existing historical data. These studies are motivated by the ongoing necessity of investigating improvements in the current models. The idea is the development of an index capable of sorting several alternative models that have been proposed in the literature. For that, Analytic Hierarchy Process (AHP) has been used in this paper in order to assist the adoption of the best scenarios generating model. The problem is first hierarchically structured in four levels, which is the base for the complete proposed model that includes also the four Brazilian energy subsystems and the two groups of scenarios used in the simulations and the optimization stage. The selected subcriteria are

grouped into criteria which represent statistical tests chosen to assess the models that are being judged (alternatives). The weights generating process was obtained through the participation of Brazilian electrical sector specialists [National Operator of the Electrical System (ONS) amongst others], aiming at producing a consistent and reliable method for selecting the procedure that carries the specialists consensus opinion. The suggested approach produced efficiency at ordering the models and indicates, through attributes sensitivity analysis, the robustness of the method.

**USING AHP TO REVEAL AN AUDIENCES
AUTHENTIC NEEDS AND DEVELOP A
STRATEGY TO ACHIEVE COMPETITIVE
ADVANTAGES** *David Beecher Brauer, Durham
University Business School, UK*

Organizations of all types need to address a common problem of limited capital. This creates an additional burden that the decision-makers of organizations have to manage. Key decisions need to result in the best outcomes for the use of the capital.

Organizations that do poorly with these decisions will increase their hazard of mortality. They need to use tools that will increase the positive outcomes of their decisions. Most often organizations view the criteria that their stakeholders value as known attributes.

Some of the most notable failures of businesses in the past decades can be directly linked with organizations not knowing the importance that their key stakeholders placed on certain attributes. Kodak developed a digital camera in 1975 and did not assess the value this technology would have for its customers. In 1985, Coca-Cola thought by expanding their niche width to include "New Coke", success would follow. They did not foresee that the audience would not see this as authentic Coke. This paper addresses the issues organizations have identifying the selection criteria, as well as the magnitude of the

criteria of their audience. Audiences have the final decision of which products they will consume. My study will show how the Analytic Hierarchy Process, herein after referred to as AHP, can be used as a diagnostic tool to reveal the attributes that an audience views as vital in meeting their needs and having the product or service viewed as authentic. The results of the AHP can then be used by the organization to develop a strategy that should increase the organization's competitive advantages.

Session Organizer:

David Beecher Brauer, Durham University Business School, UK

Session Chair:

David Beecher Brauer, **Durham** University Business School, UK

071. Analytic Hierarchy Process and Multicriteria Decision Making 1

25 Miscellaneous

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

AN APPLICATION OF INCOMPLETE PAIRWISE COMPARISON MATRICES FOR RANKING TOP TENNIS PLAYERS

Jozsef Temesi, Corvinus University of Budapest, Hungary; Sándor Bozóki, Institute for Computer Science and Control, Hungarian Academy of Sciences; László Csató, Corvinus University of Budapest, Hungary

Pairwise comparison matrices (PCM) are important tools in multi-attribute decision making. Our paper presents a special application of PCMs: ranking of professional tennis players based on their results against each other. The selected 25 players have been on the top of the ATP rankings for a shorter or longer period in the last 40 years. Some of them have never met on the court. That property of the comparisons led us to a special class of PCMs: to the application of incomplete pairwise comparison matrices. One of the aims of the paper is to provide ranking of the selected players, however, the analysis of incomplete pairwise comparison matrices is also in the focus.

HUMAN VALUES ASSESSMENT IN HIGHER EDUCATION INSTITUTION THROUGH AHP

Astrid Maria Oddershede, usach, Chile; Patricia Salome Jarufe, Universidad Diego Portales, Chile

This paper presents an application of the Analytic Hierarchy Process (AHP) to determine the human value structure in institutions of higher education. The study is part of a research project which seeks to incorporate human values in higher education. The evidence indicates that nowadays the inclusion of

these values are becoming a main concern, consequently we need to determine those that mainly have to be incorporated regarding the institution. Given that the involved stakeholders have their own values, aspirations to fulfill and perceptions, many conflicting objectives emerge. A multicriteria model has been developed to identify a value assessment structure bearing in mind their judgments. The AHP methodology reflected to be a useful tool to structure and manage the decision problem taking into consideration the dimensions that affect directly the configuration of values. A case study has been explored in the Chilean higher education, as a first approximation in private and public universities.

IMPLEMENTATION OF ANALYTIC HIERARCHY PROCESS IN SOLVING TRAFFIC PROBLEMS

Danijela Baric, University of Zagreb Faculty of Transport and Traffic Sciences, Croatia

The paper presents the analysis of implementing the Analytic Hierarchy Process (AHP) in solving the problems in the area of traffic. The traffic sector is one of the most important sectors of the present times and an efficient traffic system requires continuous planning. The projects of investing into the traffic infrastructure are investment projects that are characterized by a number of specifics. These are the projects that have an extremely long lifetime (some thirty years), they are not profit-oriented, as a rule they are financed by the state of the local administration, and they are primarily of use for the social community. The decision-making process, which includes also making decisions on investments is an extremely complex one, and the decision-maker has to envisage the future, and consequently make the decisions in a modern and flexible manner. The methods used in the process of evaluating the investment projects in traffic are numerous, and usually distinguished by the optimization criteria. The projects, namely, cannot be evaluated through

the prism of a single criterion, nor based on several criteria either. The most common optimization criterion is of economic character; however, for the purpose of long-term and high-quality solutions it is necessary to introduce, apart from the economic criterion also other optimization criteria such as the technological, technical, ecological and many others. Therefore, in such situations it is essential to implement the methods of multi-criteria decision-making which will eventually result in making the optimal decision. It will be determined in the paper to which extent the AHP method for decision-making regarding traffic problems is implemented and for which categories of traffic problems.

**PRIORITIZATION OF PROBLEMS FACING
COCOA FARMERS IN COUNTY CARONI
TRINIDAD AND TOBAGO** *Elroy Lester Wilson,
University of the West Indies; Hazel Patterson-
Andrews, University of the West Indies Trinidad and
Tobago*

The cocoa industry has played a fundamental role in the economy of Trinidad and Tobago since it was established in the 19th century. The industry has contributed to the country's economy by providing employment and development for rural households. Trinidad is known for its extensive research in cocoa and is acknowledged internationally as a holder of the world's most valuable cocoa gene bank. The island is recognized by the International Cocoa Organization as one of the 17 producers of fine flavor trinitario cocoa and receives a premium price on the international market. Though the country is a producer of fine flavor cocoa production has declined from 7,030 tones in 1961 to 700 tones in 2010(FAO, 2012). The number of active farmers has also declined from 5724 farmers in 1982 to 1214 farmers in 1999 (Pemberton and Ragbir 2005). The industry has been affected by pest and disease; reduce labor supply and high cost of production within recent

times. Due to the continuous decline within the Trinidad and Tobago cocoa industry, the twin island state has been unable to produce the amount for cocoa that was once produced for export on the international market. The Analytic Hierarchy Process (AHP) is used as a multi-criterion decision making tool to prioritize the problems that are affecting the cocoa industry in order of their importance to the farmers in county Caroni Trinidad and Tobago. The results of this research prioritize the major constraints that prevail in the cocoa industry that are contributing to the continuous decline of the cocoa industry in Trinidad and Tobago.

Session Organizer:

Astrid Maria Oddershede, usach, Chile

Session Chair:

Astrid Maria Oddershede, usach, Chile

072. AHP/ANP Mixed Methods, Optimization and Applications 6

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

SINGLE MACHINE SCHEDULING WITH SEQUENCE-DEPENDENT SETUP TIMES BY USING AHP AND MULTI-CHOICE GOAL PROGRAMMING *Derya Deliktas, Dumlupınar University, Turkey; Orhan Torkul, Sakarya University, Turkey; Ozden Ustun, Dumlupınar University, Turkey; Safak Kiris, Dumlupınar University, Turkey*

This study proposes a multi-choice goal programming for the single machine scheduling problem of minimizing the weighted number of tardy jobs, total weighted completion time and makespan with sequence-dependent setup times. In this problem, there are n candidate jobs for processing in a single machine, each job has a weight, a due date, a processing time, and also sequence-dependent setup times exist between two consecutive jobs. In the first stage of the proposed methodology, job weights of each job are determined by using Analytic Hierarchy Method (AHP) method. In the second stage, 0-1 mixed integer non-linear programming model is built by considering three objective functions and the ideal point is obtained by minimizing the objectives individually. Then, the multi-choice goal programming is used to allow the decision makers to set multi-choice aspiration levels for each goal.

STRATEGY FOR AGRICULTURAL DEVELOPMENT IN ZANJAN CITY, IRAN: APPLICATION OF SWOT-AHP METHOD

*Mostafa Nazari Nasab, science and research branch
islamic azad university, Iran; Majid Azizi, University of
Tehran, Iran*

Decision making and strategy selection for agricultural development in non-developed countries is always a major model and get it on the capital of their country. In these countries select the Strategy regardless to the characteristics of different regions, existing similar problem in Iran. Agricultural mechanization is an index for evaluation of agricultural development. This research was part of a study that wants to analysis agricultural development of Zanjan province in Iran by use system analysis methods. Zanjan province is in northwestern of Iran. This province has seven cities (Zanjan, Abhar, Eijroud, Tarom, Mahneshan, Khodabande, and Khoramdare). Zanjan city is center of Zanjan province. This city is pole of onion and rice production in Zanjan province. In this study investigated the agricultural mechanization of Zanjan by use SWOT-AHP hybrid method. Finding four factors (Strengths, Weaknesses, Opportunities and Threats) for agriculture of Zanjan by use SWOT analysis and then using these factors as alternatives in AHP method. Hierarchy model of this research has goal, factors and alternatives. The goal is recognizing the important and Effective factors of agricultural development in Zanjan. Results of pair compressions showed techniques is the most important criteria in Zanjan and Economics and management and planning are the second and third criteria in this city so use these criteria in the AHP model. Local weights were calculated for criteria and alternatives and overall weights were calculated for only alternatives. Results showed ST strategy is more important strategy in the Zanjan. One of the ST strategies is “Use the sample and cheap machines”.

SYSTEMIC APPROACH FOR HISTORICAL MONUMENTS MAINTENANCE DECISION SUPPORT

Mirosław Dytczak, AGH University of Science and Technology, Poland; Grzegorz Ginda, AGH University of Science and Technology, Poland

Public financial resources are necessary for providing different economic, social, cultural and environmental services for the society. Note, that current troubles appearing in world-wide economy result in the severe limitation of availability of financial resources. Appropriate level of provision of public services is thus threatened. Historical monuments are example of objects that provide very specific services. Nature of the monuments makes their maintenance expensive, however. The implementation of efficient management of historical monuments becomes necessary, therefore, to provide the best possible effects while including limited resources. The management efficiency can be improved by means of identifying possibilities of providing additional financial resources by historical monuments. Such resources would facilitate maintenance of the monuments and help in maintaining other monuments. Note, that historical monuments are in general considered incomparable. However, the limited availability of financial and other resources results in the qualification of the selected historical monuments only for the conservation and the maintenance. Thus, the necessity of monument valuation arises. Diversity of monument attributes requires application of the systemic, intangibility-aware approach in this regard. The appropriate approach is presented in the paper

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Derya Deliktas, Dumlupınar University, Turkey

073. Disaster Management

13 Disaster Management

Paper Session

9:30 to 10:30 am

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

A METHOD OF RISK ANALYSIS AND THREAT MANAGEMENT USING AHP: AN APPLICATION TO AIR DEFENSE SYSTEM

Gurinder Malik, DRDO, India; Sumanta Das, DRDO, India

Efficient risk analysis and threat management is the indispensable necessity of modern air defense system. The paper is a half-way between the analytic hierarchy process(AHP) and the practical reasoning to model and analyze the risk and threat related to military air defense application. These models are applied for decision making tasks of command and control (C2) for assessing and prioritizing the threat of hostile targets for efficient risk management. According to the characteristics of the threats, a method based on the fuzzy set theory, AHP and the technique for order preference by similarity to ideal solution (TOPSIS) is presented in this paper. The target's threat attributes are first represented using the fuzzy set theory and the subjective opinions of experts are quantified and ranked following the solutions of AHP process which are obtained through the TOPSIS for prioritizing the threat. The models are implemented in a simulated environment. The simulated system runs without any human intervention, and represents state-of-the-art model for C2 autonomy. The use of fuzzy set theory, AHP and TOPSIS for autonomous decision making task is particularly useful in view of futuristic risk and threat management in the battlefield. This method is easy to implement in practice and good at real-time processing.

SITUATIONAL AWARENESS WINDOWS FOR DISASTER MANAGEMENT – A SYSTEMS APPROACH USING DSM AND AHP

*Navneet
Bhushan, Crafitti Consulting Limited, India*

The rapidly globalizing world is creating complexities that demand unprecedented capabilities from decision-makers who find themselves in the middle of situations that can lead to disasters rapidly. These situations are called crises and/or disasters. These situations are characterized by extremely intertwined interplay of many factors in a volume of time and space. Decision-makers need capabilities to understand the interplay of these factors in time and space, comprehension of their meaning, and rapid projection of their interplay in near future to be able to comprehend and potentially conceive courses of action that lead to robust mitigation of crisis/disaster or managing the impact of crisis/disaster if the events have occurred. These capabilities have been termed as situational awareness (SA). A comprehensive SA is important in all decision making scenarios, however, it is critical in case of disaster and crisis situations as the disaster (man-made or natural) by definition lead to extreme loss for the affected community. Combining the 9 windows or 9 screens or system operator from the methodology of TRIZ (Russian acronym translated as Theory of Inventive Problem Solving), Dependency Structure Matrix (DSM) with the Analytic Hierarchy Process (AHP), this paper describes a comprehensive framework for SA called SAWS (Situational Awareness Windows). The paper also provides a case study with an application to disaster management for bio-war situation that is the most likely weapons of mass destruction (WMD) that non-state actors may use in their attempt to terrorize.

STRATEGIC PLANNING IN CRISIS SITUATIONS

Gurinder Malik, DRDO, India; Arun Dayal, DRDO, India; Varun Kumar Singh, DRDO, India; Rajiv Gupta, DRDO, India

This Strategic planning plays a very important role for decision makers, who study defense planning issues, in exploring the merits, demerits of various alternative actions, strategies proposed to handle the crisis situation. The decision maker has to make decision keeping in mind many factors such as military, international affairs, Socio-economy and Government policy. This paper proposes a methodology to find out the optimum set of strategies using Dependency Structure Matrix (DSM) and Analytic Hierarchy Process (AHP). In this paper, Tension/Threat Index as a metric has been defined and used to evaluate the effect of strategy on the crisis situation in the three dimensions viz. Military, Diplomatic and Government Policy. Analytic Hierarchy Process has been used to analyze various strategies proposed by the experts in the above three dimensions. Various strategies are compared with respect to the factors and sub-factors to understand the expected payoff of each of them in handling the crisis situation. Dependency Structure Matrix (DSM) is used to capture the relationships and dependency of these strategies. A methodology is defined to find out the best possible set of mixed strategy/actions to handle the crisis situation. As a case study, the proposed methodology is applied and found suitable for conducting Seminar/Crisis Games to analyze two/multi nation conflicts scenarios.

THE IMPACT OF PERSONAL FACTORS ON GIS ADOPTION IN CRISIS MANAGEMENT

ORGANIZATIONS *Azita Asadi, Universiti Putra Malaysia, Malaysia; Govindan Marthandan, Multimedia University; Majid Fathizahraei, Multimedia University, Malaysia; Murali Raman, Multimedia University*

The ever increasing crisis across the different regions of the world over the years led to increasing human vulnerability to various risks. For this reason, research has been geared towards identifying the impact of individual factors of managing risk at the various stages of crisis management; which are important benchmarks for assisting decision makers in putting in place the most feasible choices for minimizing human risks associated with crisis situations. In this paper, Analytic Network Process (ANP) is used to prioritize the impact of individual factors on Crisis Management. The study identified Attitude, Subjective norms, and Knowledge and experience as the three individual factors that influence Crisis Management. From the result of the study, it was shown that the prioritization of these factors varies between individuals and among stages.

Session Organizer:

Navneet Bhushan, Crafitti Consulting Limited, India

Session Chair:

Navneet Bhushan, Crafitti Consulting Limited, India

074. Wednesday morning break

ISAHP

Break

10:30 to 11:00 am

Grand Hyatt: Floor Independence Foyer - Credenza A

Session Organizer:

Rozann W. Saaty, Creative Decisions Foundation, U.S.

075. AHP Theory and Methodology 7

04 AHP Theory & Methodology

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Farragut Square

Participants:

SELECTION OF CHAIN-MATERIAL IN AUTOMOBILE SECTOR USING MULTI ATTRIBUTE DECISION MAKING APPROACH

*Harwinder Singh, Guru Nanak Dev Engineering
College Ludhiana, India; Raman Kumar, Chandigarh
University, India*

The selection of material is a multi-attribute decision problem. In this research work, Analytical Hierarchy Process (AHP) has been implemented to compute subjective weight of criteria and MATLAB programming has been used to compute objective weight of criteria. An attempt has been made to rank out materials on their performance index by using subjective weights as well as objective weights. The use of MATLAB avoids healthy mathematical calculations and it minimizes the possibility of error in statistical calculation. An example has been demonstrated to show the effectiveness of proposed methodology in selection of material. The alternatives have also been ranked and the 2nd alternate (AISI 1075) has been termed as best chain material.

USING ANALYTICAL HIERARCHY PROCESS (AHP) Hussain Sinjar Alsamary, Applied Science University, Australia

This study comes to Use the Analytic Hierarchy Process (AHP) approach to build shares portfolio in kingdom of Bahrain shares' market. So that, we want to find out to what extent the Analytical Hierarchy Process approach is helpful taken in the account the importance of the investment decision to the investors as individuals or fund manager. We

perform this assessment depending on the information of Bahrain stock market activities' handbook and some experts who have good experience in financial planning and some colleagues in university who are teaching financial and investment decision courses. The results demonstrated that (AHP) can help the decision maker to rank the sectors of the stock market according to their relative importance. The rank is more likely influenced by the relative importance of balance sheet, income shares trading, profitability and leverage& liquidity. The study sheds importance insight into an area of multi-criteria decision making

USING PRINCIPAL COMPONENTS ANALYSIS FOR AGGREGATING JUDGMENTS IN THE ANALYTIC HIERARCHY PROCESS

Natalie Scala, Towson University, U.S.; Jayant Rajgopal, University of Pittsburgh, U.S.; Luis G Vargas, University of Pittsburgh, U.S.; Kim LaScola Nedy, University of Arkansas, U.S.

Often it is appropriate to have more than one decision maker perform the pairwise comparisons that are part of the Analytic Hierarchy Process (AHP). With group judgments one would hope for broad consensus among the decision makers, in which case one would aggregate judgments via their geometric mean. However, consensus may not always be reached and significant dispersion may exist among the judgments. The question arises as to what would be an appropriate aggregation scheme in such situations. Too much dispersion violates the principle of Pareto Optimality at the comparison and/or matrix levels, so that the group may be homogenous in some comparisons and heterogeneous in others. We propose a new aggregation method when the raw geometric mean cannot be used and the decision makers' judgments cannot be revised. Our method makes use of principal components analysis (PCA) to combine the judgments into one aggregated value for

each pairwise comparison. We show that this approach is equivalent to using a weighted geometric mean with the weights obtained from the PCA.

Session Organizer:

Luis G Vargas, University of Pittsburgh, U.S.

Session Chair:

Natalie Scala, Towson University, U.S.

076. Strategic Applications

19 Strategic Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence BC

Participants:

ANALYSIS AND EVALUATION OF

ALTERNATIVE SITES FOR A NEW HEAVY CRUDE UPGRADING PLANT IN COLOMBIA

Mario Castillo, Universidad de los Andes, Colombia;

Astrid Johanna Bernal, Universidad de los Andes,

Colombia; John Ríos, Universidad de los Andes,

Colombia; César Bejarano, Ecopetrol S.A., Colombia;

Óscar Martínez, Ecopetrol S.A., Colombia

The work presents a general methodology and supporting models to analyze and select alternative sites for a heavy crude upgrading plant in Colombia.

As a central part of the application of the methodology an Analytic Hierarchy Process (AHP) model was constructed, with two hierarchies (Risks and Benefits). The results of the analysis were used to formulate a specific recommendation to the Colombian Petroleum Company (Ecopetrol) concerning the best alternative.

ANALYSIS OF AGRICULTURAL

MECHANIZATION IN ZANJAN PROVINCE, IRAN: APPLICATION OF SWOT-AHP METHOD

Mostafa Nazari Nasab, science and research branch

*islamic azad university, Iran; Majid Azizi, University of
Tehran, Iran*

Decision making and strategy selection for agricultural development in underdeveloped and developing countries is always like a major model and get it on the capital of their country. In these countries select the Strategy regardless to the characteristics of different regions, existing similar problem in Iran. This research was part of a major study that wants to analyze agricultural development

of Zanjan province in Iran by use system analysis methods. Zanjan province is in northwestern of Iran. Zanjan province has seven cities (Zanjan, Abhar, Eijroud, Tarom, Mahneshan, Khodabande, and Khoramdare). Finding four factors (Strengths, Weaknesses, Opportunities and Threats) for agriculture of Zanjan province by use SWOT analysis and then using these factors as criteria in AHP method. Hierarchy model of this research has goal, factors and alternatives. The goal is select the best city according to agricultural development. Criteria are SWOT factors. Alternatives are cities of Zanjan province. Local weights were calculated for criteria and alternatives and overall weights were calculated for only alternatives. Overall weights of alternatives were obtained: Khodabande 0.290, Khoramdare 0.137, Abhar 0.135, Eijroud 0.124, Zanjan 0.120, Mahneshan 0.115, and Tarom 0.081. Results show Khodabande has suitable status according to aspect of agricultural development better than other cities also Results of this study showed government is effective to development of agriculture in different cities.

THE APPLICATION RESEARCH ON WUHAN IRON AND STEEL CORPORATION SUSTAINABLE DEVELOPMENT DECISION-MAKING IN LOW-CARBON ECONOMY WITH ANP

Ling Zhang, Wuhan University of Science and Technology, China

Firstly, the paper introduces the reason why we choose the topic, the background of the Wuhan Iron and Steel corporation (a Chinese corporation) sustainable development decision-making in low-carbon economy. Why we choose the ANP method to deal with the decision problem. Secondly, the paper would introduce the ANP method, what is ANP, the characters of ANP, the computing process of ANP. Thirdly, ANP would be applied to deal with the decision issue of Wuhan Iron and Steel corporation sustainable development strategy in low-carbon

economy background. Fourthly, findings and conclusion.

**STRATEGIC MODEL OF TIN MINING INDUSTRY
IN INDONESIA (CASE STUDY BANGKA
BELITUNG PROVINCE)** *Rudy Irawan, Bogor
Agricultural University (IPB), Indonesia*

Indonesia has abundant natural resources such oil, gas and mineral. Bangka Belitung Province is one of abundant tin mineral and was mined in 1668. Beside, tin mining industry created conflict interest among stakeholder in Bangka Belitung. An aim our study was to make strategic model of tin mining industry which solved conflict among stakeholder in Bangka Belitung. Method was used in-depth interview expert in mining industry to create strategic model framework. Then, the study used tool analysis Analytical Network Process (ANP)

Session Organizer:

Mario Castillo, Universidad de los Andes, Colombia

Session Chair:

Mario Castillo, Universidad de los Andes, Colombia

077. Analytic Hierarchy Process and Multicriteria Decision Making 2

25 Miscellaneous

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Independence DE

Participants:

QUANTIFYING PERCEPTIONS OVER THE STUDENTS' MAIN REWARDS IN HIGHER EDUCATION: MOTIVATIONAL THEORIES VERSUS SPECIFIC CONSTRUCTS *Razvan Bucur, Bucharest University of Economic Studies, Romania; Adriana Agapie, Bucharest University of Economic Studies, Romania; Shahrazad Hadad, Bucharest University of Economic Studies, Romania*

For a carefully designed hierarchy, if it makes sense for explaining the alternatives involved, we expect that variations in the perceived importance of the alternatives will not be significant. That, if checked, constitutes an argument of the robustness of the AHP method in general and in particular on the motivational theories in education. The paper presents and compares the results of two experiments that were conducted in a Romanian university. Two hierarchies on what motivates a business student were designed: the first one was inspired from Adamus's (2013) AHP model on the motivational theories in education, while the second one was constructed through consensus by students. In the context of the particularly chosen criteria and sub-criteria, the results indicate that students care more about the overall rewarding goal of getting a diploma than about specific intermediary steps in achieving it, like getting good grades.

**SITUATIONAL AWARENESS EFFECTIVENESS
USING AHP** *Rahim Jassemi-Zargani, DRDC Ottawa,
Canada*

The integration of system-of-systems (SoS) data into shared situational awareness (SA) involves a complex interplay between a collection of sensors, network architectures and exploitation capacity. To achieve the desired level of SA (i.e., information superiority) and improve the sense-to-act cycle requires an environment that is agile, interoperable, robust and efficient. To that end, this paper presents an integration concept evaluation methodology based on an Analytical Hierarchy Process (AHP) that uses technical and cognitive elements to assess the degree to which an ISR concept can facilitate shared SA in a military setting.

**USING THE ANALYTIC HIERARCHY PROCESS
IN UNIVERSITY RANK AND TENURE
COMMITTEE DECISIONS** *Cynthia Mari Busin
Nicola, Carlow University, U.S.; Enrique Mu, Carlow
University, U.S.*

This study develops a model for rank and tenure decisions using an AHP ratings model. Up to know decisions have been made by means of meeting discussions among the rank and tenure members. This decision model, based on current approved policies by the committee, is expected to provide objectivity and transparency to the rank and tenure committee decisions.

WIKIPEDIA AND AHP/ANP *Louis F. Sander, U.S.*

As one of the five most visited sites on the Internet, Wikipedia is positioned to be instrumental in moving AHP/ANP into the realm of everyday decision makers. AHP has had a useful article in the English Wikipedia since 2008; it has been stable since early 2011. Versions in several other languages have been created, usually based on the one in English. This paper encourages the AHP/ANP community to use

and expand AHP/ANP's presence on Wikipedia, providing a basic roadmap for that to happen. It briefly describes the English AHP article and its genesis, and identifies resources available for replicating it in other languages. These include links to useful graphics with easily-changed English labels. It points out AHP/ANP-related articles in the English Wikipedia and identifies those that are waiting to be written. Wikipedia calls itself "the encyclopedia that anyone can edit," and basically that is true. Nevertheless, there is skill and understanding that one must have before becoming an effective editor. This paper identifies them and gives pointers and cautions about acquiring and using them.

INTERNAL CAPABILITY BASED ON AHP AND EXTERNAL LINKAGES IN THE INNOVATION OF IN ASEAN FIRMS *Masatsugu Tsuji, University of Hyogo, Japan*

Based on survey data from four ASEAN economies, this paper identifies the content of internal capability at the technological level, in managerial organization, and through human resources. To make this concept more tractable for analysis, the index of internal capability using AHP (Analytical Hierarchy Process) was used. This paper also examines using regroups estimation methods how external sources such as MNCs, universities, and public organizations enhance internal capability. This paper also attempts to identify the transmission mechanisms through which external sources influence internal capability.

Session Organizer:

Enrique Mu, Carlow University, U.S.

Session Chair:

Louis F. Sander, Carlow University, U.S.

078. AHP/ANP Mixed Methods, Optimization and Applications 7

05 AHP/ANP Mixed Methods, Optimization and Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - Lafayette Park

Participants:

TARGET SETTING FOR INDIRECT PROCESSES: A NEW HYBRID METHOD FOR THE CONTINUOUS IMPROVEMENT MANAGEMENT OF INDIRECT PROCESSES

Sebastian Ihrig, TU Munich, Germany; Alessio Ishizaka, University of Portsmouth, U.K.; Alwine Mohnen, TU Munich, Germany

Indirect processes are increasingly contributing to the total cost of production in highly competitive and technology intensive industries. However, they are less assessable than direct processes due to complex organizational management structures. Companies seeking improvements in indirect areas are therefore demanding for methods to decide where, to which extent and how improvement activities should take place in indirect processes. To facilitate this task, the Target Setting for Indirect Processes (TSIP) method was developed. The development of the method followed the constructive research approach (CRA). It combines the analytic network process (ANP) with methods from managerial accounting research, namely activity-based management, and from the product development area, namely value control chart (VCC), in a kaizen budgeting framework. This new hybrid method was developed and validated in close co-operation with a global first tier automotive supplier.

USING TRACKING COLUMNS TO IMPROVE OPTIMIZATION WITH A GENETIC ALGORITHM

Gavin Byrnes, Decision Lens, U.S.

It has been established that a genetic algorithm can be used in linear programming to optimize within an AHP framework. This optimization process frequently reveals a bias towards cheap projects (even if they are poor-performing), which hurts its value in practice. Tracking columns and multiple pools are two methods of combating this bias. Tracking columns allow for more control over optimization by adding or removing constraints on the number of alternatives funded overall, from different groups, or to require certain additional thresholds for more realism. Multiple pools can be used to earmark resources for specific types of projects, allowing for a more balanced portfolio.

WEIGHTED EUCLIDEAN CENTERS AND INTERVAL RECIPROCAL MATRICES

Luis G Vargas, University of Pittsburgh, U.S.; Ami Arbel, School of Engineering at Tel Aviv University, Israel

This paper addresses the derivation of a Euclidean center and its application to interval reciprocal matrices. A Euclidean center is defined as the point in decision space from which one can inscribe the largest sphere contained by the constraints. We extend this concept by introducing its weighted version, which we term the weighted Euclidean center. We show that by assigning weights to the different decision variables we can traverse the entire decision space. In addition, we show that the concept of a weighted Euclidean center and that of the achievement scalarizing function introduced by Wierzbicki are intimately related.

Session Organizer:

Mujgan Sagir Ozdemir, ESOGU, Turkey

Session Chair:

Luis G Vargas, University of Pittsburgh, U.S.

079. Civil and Urban Applications

15 Civil and Urban Applications

Paper Session

11:00 to 12:30 pm

Grand Hyatt: Floor Independence Level - McPherson Square

Participants:

IMPLEMENTING AHP APPROACH TO SELECT A PROPER METHOD TO BUILD HIGH-RISE BUILDING (CASE STUDY: TEHRAN)

Amir Hesam Zamani Kia, Iran; Mehdi Mahdavi Adeli, Faculty Member, Iran

Tehran is one of the most densely populated cities in the world and one of the most important problems of it is the lack of suitable land for the building, so there is a strong need to build high-rise buildings. High-rise buildings desperately need to improve the integration, planning and control of construction quality, etc. This has led to the creation of innovative and modern techniques in the high-rise building industry that each of these methods has its own advantages and disadvantages, but despite the pressing need, a comprehensive research has not yet been done on the appropriate way for high-rise buildings in Tehran. It is tried in this research, given the effective criteria on high-rise building, to select the best option, considering the methods that there is the building possibility in the current situation. In this paper, at first 15 most important effective criteria for decision making to select proper method of high-rise building in Tehran was identified through questionnaire. Then AHP methodology and Expert Choice software was used to choose the best industrial method for high-rise building in Tehran. In this survey the most appropriate method for high-rise building in Tehran was identified in the condition of applying all the identified criteria that they are respectively: tunnel formwork, concrete buildings (traditional), steel bolt and nut, steel buildings with

welded joints, Reinforced concrete structures with continuous frame.

PROVIDE A MODEL TO SELECT PROPER DELIVERY SYSTEM FOR RAILWAY

PROJECTS IN IRAN *Kobra Gharouni Jafari, Student, Iran; Esmatullah Noorzai, Student, Iran; seyed reza Makkiabadi, Student, Iran; Rouhollah Heshmat Nejad, Contractor, Iran*

Railway construction projects due to extent of dimension and nature of activities related to the preparation, implementation, maintenance and exploitation of these projects and effects from how we execute them and considerable utilization of economic resources are of particular importance and they typically are considered of the most important and influential infrastructure projects in countries such as Iran. Hence making any significant improvement in the construction of railway projects results in significant benefits in national economy. One of the most important and strategic factors in success of infrastructure projects is Delivery System Selection Process. Thus the identification of effective criteria for the selection of a proper delivery system in railway projects is of utmost importance which if properly be selected, proper progress in the implementation of these projects will be reached. The survey purpose is to present a model for choosing a proper delivery system for railway projects. In this paper 15 influential criteria on selection of proper delivery system for railway projects were obtained in three main Delivery Systems: Design and Build (DB), Design-Bid-Build (DBB), and Construction Management (CM) using theoretical studies, questionnaire and personal interview and impact of each criterion on alternatives was measured. Then a model for choosing the optimal delivery system and ranking criteria were designed by AHP technique and EXPERT CHOICE software that is one of the best methods to choose the delivery system. Finally, to

assess the validity of the model, results of model were compared with the actual results of the case studies. The results show that the proper delivery system for railway construction projects in Iran is CM. This research could help contractors, consultants, owners, policy makers, and decision makers working in railway construction projects in selection and proposing appropriate delivery system.

SYSTEMIC BUILDING LCA *Mirosław Dytczak, AGH University of Science and Technology, Poland; Grzegorz Ginda, AGH University of Science and Technology, Poland*

Life Cycle Assessment (LCA) is a universal framework for systemic evaluation of products influence on natural environment. It has been also extended to cover different specialized areas e.g. buildings. Buildings are specific products of construction processes. They are meant to provide diverse services to their users and must conform to different requirements. They comprise complex technical systems, therefore. The provided services and established requirements often deal with contradictory goals. Note, that some features of the buildings, as well as, the interrelations between components of the buildings, and between the buildings and natural environment may be intangible. Feedback may also appear. It is difficult, therefore, to evaluate performance of buildings credibly. The modifications of the core LCA approach are proposed, therefore, in the paper. They are intended to support the reliable application of LCA methodology in the case of buildings. The proposed modifications apply ANP and DEMATEL to cope with possible intangibility and feedback. The utilization of these two universal approaches allows to obtain reliable results for LCA-based building evaluation.

**THE IDEA OF THE OLYMPIC WINTER GAMES
IN 2022 IN KRAKOW** *Wiktor Adamus, Jagiellonian
University Krakow, Poland*

Sport as such was already present in lives of primitive people but it had no elements of conscious competition. Ancient man very carefully observed the world, its laws and regularities in order to adapt and survive in balance with surrounding universe [L. Kulmatycki, 2009]. Nowadays sport is not just for its own sake but it has a social value. Sport practicing brings lots of positive external effects: better health [Cawley, 2004], better results of studying [Cornelisen & Pfeifer, 2007], better performance on the job market, [Lechner, 2008], more intense social contacts [Downward i Riordan, 2007] decrease in criminal offences [Caruso, 2010]. Political and economic systems, different religions, ethnic groups do influence sport differentiation but still sportsmen do compete in a peaceful and friendly manner. Olympic essence includes not only propagation of sport as it is not an autotellic value but it serves its mission through its connection with culture elevating the quality of lives of participants.

Session Organizer:

Grzegorz Ginda, AGH University of Science and
Technology, Poland

Session Chair:

Wiktor Adamus, Jagiellonian University Krakow, Poland

080. Lunch and Closing Plenary

ISAHP

Lunch

12:30 to 1:30 pm

Grand Hyatt: Floor Independence Level - Independence

FGHI

Meeting highlights will be presented and the symposium will be officially closed.

Session Organizer:

Enrique Mu, Carlow University, U.S.

081. Accepted Papers that will not be presented

25 Miscellaneous

Panel

1:30 to 2:30 pm

Grand Hyatt: Floor Independence Level - Franklin Square

These papers have been accepted but will not be presented in the symposium.

Participants:

AN EMPIRICAL IDENTIFICATION OF VENDOR SELECTION PROCESS VIA DEPLOYMENT OF MULTIPLE ATTRIBUTE DECISION MAKING (MADM): COMPARISON AMONG SWEDISH

AND IRANIAN COMPANIES *Mostafa Deldoost, Ferrara University, Italy; Antonella Petrillo, University of Naples "Parthenope", Italy; Fabio De Felice, University of Cassino and Southern Lazio, Italy*

Decision making is a fundamental tool for managers; enable them to make logical decisions in critical situation between various options. This article concentrates mainly on the seller selection problem, or in some cases it also refers to vendor or supplier selection problem (SSP) and demonstrates how multiple attribute decision making (MADM) methods can be effectively used for vendor selection decision in project management procurement processes and supply chain environment. A case study has been carried out within the two different countries (Sweden and Iran) in order to help managers to choose the best alternatives among their preferences, practically.

DEVELOPMENT OF AN INNOVATIVE AHP-BASED DECISION SUPPORT SYSTEM IN THE FIELD OF IT SERVICE MANAGEMENT *Martin Jantscher, FH JOANNEUM, University of Applied Sciences, Austria; Christopher Schwarz, FH*

JOANNEUM, University of Applied Sciences, Austria;

Erwin Zinser, FH JOANNEUM, University of Applied Sciences, Austria

The order in which service engineers in the field of IT service management decide to resolve incidents is crucial concerning the impact on the business performance of the IT service provider. A possible solution to reduce negative impacts is to support service engineers by means of a decision support system that calculates priorities for the incidents based on their business impact. Considering these priorities in their decisions, service engineers can help reduce such negative impacts on the IT service provider's business. The aim of this study is to incorporate the Analytical Hierarchy Process (AHP) method into a software to prioritize incidents according to the severity of their business impact. As a result a decision support system called Incident Prioritizer (IP) was developed. It uses the AHP method to calculate priorities for incidents based on typical criteria that are relevant in the field of IT service management to assess the business impact of incidents. These criteria are commonly defined by the management of an IT service provider organization and reflect the management's understanding of the business impact that is caused by incidents. The results of the work suggest that the AHP method can be successfully applied for the given problem of incident prioritization. A decision model was introduced that consists of one level of criteria that should reflect the factors that contribute to the business impact of incidents. The introduced decision model was intentionally kept simple by using only a few relevant criteria. At the same time it is extensible by adding further criteria as needed.

SIMULATION MODEL FOR DISASTERS AND EMERGENCIES MANAGEMENT FOR SAFETY AND SECURITY IN INDUSTRIAL PLANTS

Fabio De Felice, University of Cassino and Southern Lazio, Italy; Antonella Petrillo, University of Naples

"Parthenope", Italy; Francesco Longo, University of Calabria, Italy; Laura Cirillo, University of Calabria, Italy

The main goal of the work is to carry out research and developments activities to deal with the complexity resulting from emergency management in industrial plants and critical infrastructures. The project rises from a simultaneous consideration of the two aspects: efficient procedures are needed both on the emergency site and in hospitals; these procedures should be combined with a proper critical patients routing toward the most suitable First-Aid Facilities and with a reduction of human errors during the emergency management. In the process of evaluating emergency alternative problems, there usually exists incomplete and uncertain information, and the decision makers cannot easily express their judgments on the candidates with exact and crisp values. Many MCDM approaches have been proposed to help decision makers to solve problems in uncertain environment. In this paper, the AHP and simulation approach are incorporated to solve group multi-criteria decision making problems with incomplete information. The proposed method involves four steps: (1) identify the focal elements of each decision maker according to the emergency scenario; (2) construct the decision model according AHP approach; (3) rank the emergency alternatives; (4) construct the simulation model.

Session Organizer:

Enrique Mu, Carlow University, U.S.

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036 – Conflict Resolution

02 Government & Politics

022 – Government & Politics 1

029 – Government & Politics 2

03 Fuzzy AHP Approach

054 – Fuzzy AHP

04 AHP Theory & Methodology

007 – AHP Methodology and Application

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021 – AHP Theory and Methodology 2

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ABOUT WASHINGTON DC

By Gwen Kirkpatrick, Georgetown University

ISAHP2014 is happy to welcome you to Washington, District of Columbia, the nation's capital city. The ISAHP2014 meeting at the Marriott Wardman Park is in one of the city's most pleasant locations, the Woodley Park neighborhood, with the Metro just steps away and with easy access to shops and restaurants. The National Zoo, a beautiful space for people of any age, is a short walk from the hotel.

As the nation's capital, Washington has changed in recent years to become a vibrant, multilingual, and multicultural city, with notably improved local government and municipal financial stability. The city has escaped the worst of the recession, although its neighborhoods still offer stark contrasts in economic disparity, and attempts to reform and improve its schools have gained national attention. Washington's overall increase in prosperity and the entry of many new businesses into the city have created debates about gentrification and how it pushes long-standing low-income residents farther out into the suburbs in Maryland and Virginia, a debate familiar to cities undergoing growth.

Transportation in DC: Traffic in DC is usually heavy and drivers are aggressive, but public transportation is quite efficient. Find maps, directions, and schedules for buses and the Metro on wmata.com. You can purchase tickets online. The Metro stations display instructions for buying tickets, but they are not always easy for newcomers to comprehend. Station attendants or veteran passengers can usually answer questions. Credit cards as well as cash can be used at many locations. Washingtonians are generally hospitable, but they are unforgiving about Metro escalators: stand on the right and walk on the left. If you prefer to bicycle, the District of Columbia's Department of Transportation and Arlington County in Virginia launched Capital Bikeshare in 2010 to help decrease car emissions and increase healthy activity. The number of bicycle stations is constantly increasing because the service is very popular. For membership, pricing, and station locations, visit Capital Bikeshare at capitalbikeshare.com.

Tourism: A useful website for visitors is washington.org/find-dc-listings/attractions. There you can order free guides and search for attractions, transportation, restaurants, tours, and events.

Family favorites in Washington are the National Zoo nationalzoo.si.edu and the Air and Space Museum airandspace.si.edu on the National Mall, both with free admission. (For hard-core air and space fans, the Steven F. Udvar-Hazy Center near Washington Dulles International Airport is the companion facility to the museum on the Mall.) Another family favorite is the Museum of Natural History on the Mall (mnh.si.edu).

For those who haven't visited Washington for a while, an extraordinary and beautiful museum constructed less than a decade ago is the American Indian Museum, "home to one of the largest and most diverse collections of Native art and historical and cultural objects; exhibitions are designed in collaboration with Native communities from across the hemisphere" (nmai.si.edu). Latin Americanists interested in indigenous cultures throughout the Americas will find historical displays as well as an important presence of contemporary indigenous cultures. The emphasis on contemporary cultures distinguishes the museum from most museums devoted to indigenous cultures. On the Mall near the Capitol, the building itself is a beautiful structure of sandstone with curving walls meant to evoke flowing water. (Its interior design has not received the same acclaim.) The museum's cafeteria, specializing in American foods, is rated as the best on the Mall.

For art lovers, museums on the Mall with free admission include the National Gallery of Art nga.gov/, the Freer and Sackler Galleries asia.si.edu, the African Art Museum, and other art museums. A full list is at si.edu/Museums. (For the National Gallery, the Gallery Place Metro stop is closer than the Smithsonian stop.) Two important art museums that charge admission are the extraordinary Phillips Collection near Dupont Circle and the Corcoran Gallery of Art on 18th Street

near the Mall. The National Museum of Women in the Arts is near the Metro Center metro stop.

For researchers, the Library of Congress building has been magnificently restored and merits a tour. Its Reading Room is known as the most beautiful room in Washington. (The library is very near a Metro stop or you can walk from Union Station.) The National Archives building, also an important research site, faces the Mall.

A stunning nighttime tour is a visit to the monuments, especially the Lincoln and Jefferson Monuments. (You will need an organized tour or your own transportation.) At any time of day, the Vietnam Memorial is a powerful tribute to those lost in that war. Recently constructed are the monuments to World War II veterans and to Korean War veterans. The most recent addition is the memorial to Dr. Martin Luther King. The Holocaust Museum is just off the Mall. The Washington Monument is closed for repairs after the earthquake of August 2011.

The historic core of Georgetown is easily walkable. Also in Georgetown, the Dumbarton Oaks Research Library and Collection (doaks.org) specializes in antiquities, especially pre-Columbian. A visit to the extensive and beautiful Dumbarton Gardens should be very rewarding in late May. The Georgetown Waterfront (on the Potomac River) has undergone a transformation. There is a boardwalk, restaurants, a nearby park, and bicycle trails. For those who like to shop, Wisconsin Avenue and M Street are the core areas in Georgetown.

Just outside of DC and accessible by Metro, Arlington Cemetery (arlingtoncemetery.mil) receives many visitors each year. A bit farther out, a short trip by bus or car to George Washington's Mount Vernon (mountvernon.org) offers a beautiful drive near the river.

Old Town Alexandria is accessible by boat or by Metro. Boats leave from Georgetown and other locations. Although not as fast as the Metro, the boat gives you a chance to get your bearings geographically, and it's just nice to be on the water.

Historically dense and easily walkable, Alexandria offers architecture from the colonial period and a lesson in American history from its streets and museums. It also includes shopping areas, art galleries, antiques, clothing shops, and restaurants.

The past decade has seen an upsurge in theater activity in the area. There are several area theaters devoted to Spanish-language productions. The *Washington Post* [washingtonpost.com](http://www.washingtonpost.com) has up to date information.

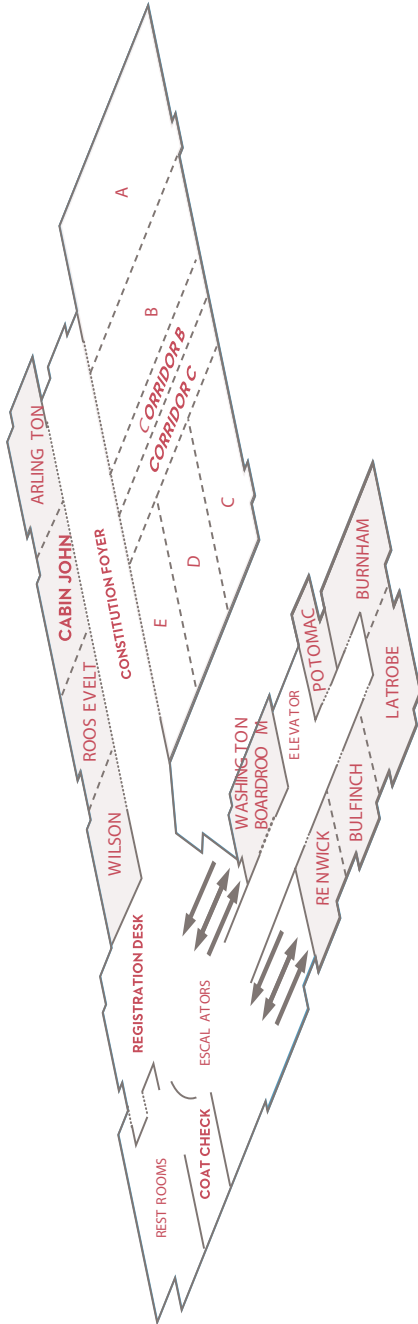
Washington is rich in universities: in DC are American University, Catholic University, Gallaudet University, George Washington University, Georgetown University, Howard University, Trinity Washington University, and the University of the District of Columbia. There are also many specialized educational institutions such as the Corcoran School of Design and Arts. Just outside of DC are two major universities: the University of Maryland and George Mason University, as well as many other institutions.

Baltimore, Philadelphia, New York, Boston? You'll have plenty to do in Washington, but just in case. . . . In addition to air travel, trains depart from Union Station (Metro Red Line). Buses are a much less expensive alternative, as low as \$20 to New York. The Greyhound terminal is near Union Station; other companies pick up at various sites around the city.

We hope you will enjoy your stay in Washington and take extra time to explore the city! Combining an exciting ISAHP2014 event with Washington's many cultural offerings will make your experience memorable.

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