Friday Forum: Insights to Decisions

Overview, Discussion & Demonstration

AHP Based Multi Criteria Analysis (MCA)

Shashi Bhattarai
Member, International Scientific Advisory Committee
International Symposium on the Analytic Hierarchy Process 2014
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Objective:

- Creating awareness with State-of-the-Art Decision Analysis tool
- Sharing Experience & Knowledge

Expected Outcome:

- Aware with AHP based Decision Analysis-MCA
- Value Addition to Knowledge of IPPs
Outline

I. Overview
   - Real-life Decision Environment
   - Multiple Criteria Decision Making (MCDM)
   - MCDM, MCA and Analytic Hierarchy Process (AHP)

II. Discussion
   - Corporate Users
   - Application Literatures
   - Value proposition to Corporate Decision Makers

III. AHP Application Demonstration
   - Video from Decision Lens
   - Case Demonstration using Expert Choice
“Not every thing that counts can be counted and not everything that can be counted, counts”
~ Albert Einstein ~
Part - I
Overview

Real-life Decision Environment
Multiple Criteria Decision Making
Multi Criteria Analysis & Analytic Hierarchy Process
Real life Decision Environment
“Decision Ecosystem”

Decision Objective

Stakeholders

Criteria

Factors

Actors

Pillars

Dimensions

ALTERNATIVE
Family Decision Environment

Simple Decision Ecosystem

Decision Objective
Best Small Car to Buy

Actors
Spouse, Family, Friends, Financer

Criteria / Factors / Dimensions / Pillars
Price, Running Cost, Comfort, Prestige

Hundai Santro  Maruti Alto  KIA Picanto
A decision problem comprises of numerous **Factors with Conflicting Objectives**

- financial profitability
- economic viability
- technical suitability
- social acceptability
- environmental sustainability
- political stability

Multiple conflicting importance to the factors among **Actors**

- customers
- investors
- politician
- government
- general public
- business managers
- corporate employees

**Every single decision is demanding**

- Profitable, Viable, Suitable, Acceptable, Sustainable and Stable solution

  to all the **Actors** at the same time
Real life decision environment

Becoming more complex

Mixed information
Subjective & Objective

Increased availability
Information & Knowledge

Multiple actors
Conflicting objectives

Striving for success in Business, Industry, Development and Personal activities
Real life decision environment

*Everyone is an ‘expert’*

**Technical Study** indicates that we should locate in **Butwal**

**Market Study** indicates that we should locate in the **Hetunda**

**Considering Climate & Operations,** we should locate in **Dhankuta**

**Security considerations** it should be located in **Kathmandu**

Modern enterprise is complex: **wealth maximization** subject to **risk, liquidity, social responsibility, environmental protection, employee welfare,** so forth.
Multiple Criteria Decision Making (MCDM)

Real life decisions are complicated MCDM in nature

- **Multiple factors** have to be considered, *Subjective as well as Objective*

- **Subjective Factors** may be more important than **Objective Factors** at some decision situation
**MADM - Multi Attribute Decision Making**
- does not need the mathematical programming tool
- decision makers preference is evaluated
- limited number of alternatives

Commonly known as **Multi Criteria Analysis (MCA)**

**MODM - Multi Objective Decision Making**
- mathematical technique of optimization
- infinite or continuous nature of alternatives
- requires mathematical formulation
- constraints needed to be incorporate
Tool for MCA

➢ There exists many theories for Multi Criteria Analysis or MCA

➢ **Analytic Hierarchy Process - AHP**
  is most widely used MCA/MADM/MCDM

➢ **Expert Choice** is most commonly used commercial software for AHP based MCA
  – Decision Support Software
MCA Techniques

Theories

- **AHP**: Analytic Hierarchy Process
- **MAUT**: Multi Attribute Utility Theory
- **SMART**: Simple Multi Attribute Rating Technique
- **PROMETHEE**: Preference Ranking Organization Method for Enrichment Evaluations
- **ELECTRE**: Elimination & Choice Translating Reality
AHP is a structured technique for dealing with complex decisions.

Prof. Thomas Saaty is the architect of the decision theory, developed in the late 1970s.

Despite of high utility for complex decisions, AHP is quite new in Nepalese Development / Corporate Sector.

Now seen in Academic exercise in Nepal.
Analytic Hierarchy Process - AHP

Structuring Complexity in Critical Decisions
- Organizes various elements of decision problem into Hierarchy

Measure Judgments / Values
- Guides in judging, via pair-wise comparisons
- Helps to derive priorities, by combining **Intangibles** from experience & intuition, and **Tangible** information such as data or numbers

Synthesize Results
- Competing objectives – Trade-offs
- Different viewpoints – Multiple actors
- **Integrated & Dynamic Sensitivity** with respect to judgments – What if Scenarios
AHP based MCA
Decision Support System

How?
- Create a Hierarchy of Goals & Objectives
- Insert associated Actors, Factors & Options
- Conduct pair-wise Comparisons
- Synthesize to get Results
- Perform Integrated Dynamic Sensitivity Analysis

Why?
- Qualitative & Quantitative evaluations
- Relative comparisons
- Measure of Inconsistency
- Flexibility and Simplicity
- Available Commercial Software
What AHP is NOT!

**AHP** is not **A Black Box** that makes **Decision for You:**

- AHP is Combination of **Art & Science** of Decision Making
- **You Structure A Decision Problem** to fit the problem as you see it
- **You provide** the Judgments
- You got the **Insight**
- **You Make** the Decision

**AHP** only helps you **to get insight** of **your decision problem**
Key Advantage of AHP based Decision Support

• **Integrated Decision Analysis** with Subjective & Objective information in a single framework

• **Insights to Critical Decisions, Sensitivity & Strategic Positioning**

• **Decision Analysis for good Corporate Governance - Informed Decision Making**

• **Institutional memory on Critical Decisions**, learning from past decisions, independent of executives on lead in institutions

• **Overcome issue of Reliability or Unavailability of Information** – with the use of Dynamic Sensitivity of decision with particular information
Part - II
Discussion

Corporate Users / Countries
Application Literatures / Citations
Some Insights on Applications
Value proposition to IPPs & IPPAN
AHP - Commercial Applications
AHP users in US Federal Agencies

AHP @ Multinational Companies
AHP Prominent: Selected Countries

**USA:** Invented, ISAHP 91, 94, 05, 09, 14

**China:** First ISAHP 1988

**Canada:** ISAHP 1996

**South Korea:** ISAHP 2003

**Indonesia:** ISAHP 2003

**Japan:** ISAHP 1999

**India:**

**Malaysia:** ISAHP 2013

**Singapore:**

**Iran:**

**Italy:** ISAHP 2011

**Russia:**

**Swaziland:** ISAHP 2001

**Netherland:**

**Finland:**

**Turkey:**

**South Africa:**

**Brazil:**

**Chile:** ISAHP 2007

**Nepal:**

ISAHP Committee 2005-2014
Only Country from South Asia

Facebook.com/AHPforDecisionMaking
AHP Applications

- Selection of TQM pilot projects
- Web based casting supplier evaluation
- Application of AHP in project management
- AHP to measure the viability of industrial projects
- Selecting appropriate project delivery method
- A multi-criterion approach to Kanban allocations
- Manufacturing blocking discipline: A multi-criterion approach for buffer allocations
- Strategic investment analysis using ABC concepts and AHP techniques
- An application of AHP to bank strategic planning
- An AHP framework for prioritizing customer requirements in QFD: An industrialized housing application
- AHP in the benefit–cost framework: A cost evaluation of the trans-Sumatra highway project
- Ranking of enterprises based on multi-criteria analysis
- Combining AHP & GP for global facility location-allocation problem / quality control systems
- DDM: Decision support system for hierarchical dynamic decision-making
- Planning facilities at the University of Missouri-Rolla
- DSS/AHP method: A mathematical analysis, including analysis on understanding of uncertainty
- Strategy management through quantitative modelling of performance measurement system
- Forecasting the resurgence of the US economy in 2001: An expert judgment approach
- Aggregating AHP models based on similarities in decision makers preference
- A multi-objective methodology for selecting sub-system automation options
- Evaluating space station applications of automation and robotics
- VAFMA: A multi-attribute failure mode analysis
- An action learning evaluation procedure for multiple criteria decision making problems
- Group decision making and AHP exploring the consensus relevant information content
- AHP approach for selecting an automobile purchase
- Multi-criteria assessment of the probability of winning in competitive bidding process
- Visualizing group decisions in AHP
  - The evaluation of air transportation network based on multiple criteria
  - Evaluating attack helicopters by AHP based on linguistic variable weight
  - Evaluating naval tactical missile system by fuzzy AHP based on grade value of membership function
  - An evaluation of success factors using AHP to implement ISO 14001 based EMS
  - AHP: It can work for group decision support system
  - Group preference aggregation with AHP: Implications for multiple issues agendas
  - Equitable allocation of levers for orthotopic transplantation: An application of AHP
  - Sizing the US destroyer fleet
  - Multi-attribute analysis of ISO 9000 registration using AHP
  - A multi-criteria decision model: Application for managing group decisions

AHP Applications

- **Group decision support** with AHP
- An integrated multi-objective planning model: A case study of Zambian copper mining industry
- Prioritizing development goals in low-income countries
- A method for choosing from among alternative transportation projects
- A hierarchical method for evaluating products with quantitative and sensory characteristics
- An AHP analysis of quality in AI and DSS journals
- A multi-criteria assessment of decision technology system and journal quality
- Aggregating individual judgments and priorities with AHP
- Measuring aggregate process performance using AHP
- Determining key capabilities of a firm using AHP
- A decision aid in public debate on nuclear power
- Applying environmental criteria to supplier assessment: A study in the application of AHP
- AHP in an uncertain environment: A simulation approach
- Site selection for a sure terminal
- An integrated group decision-making approach to quality function deployment
- A decision support model for investment decision in new ventures
- Using knowledge based systems for strategic market assessment
- An extension of AHP for industrial R&D project selection and resource allocation
- Decision counseling for men considering prostate cancer screening

- Optimization models for quality and cost of modular software systems
- The development of a decision support tool for the selection of an advanced technology to achieve rapid product development
- Hierarchical structure of intranet functions and their relative importance: Using AHP for virtual organizations
- Forecasting the capabilities of Korean civil aircraft industry
- Selection of good expert system shell for instructional purposes in business
- Integrating manufacturing strategy and technology choice
- Multiple reservoir system operational planning using multi-criterion decision analysis
- Planning and design of industrial engineering education quality
- A decision aid in warehouse site selection
- An analytic approach to production capacity allocation and supply chain design
- An analytic approach to supply chain development
- A customer oriented approach to warehouse network evaluation and design
- Inventory forecasting with a multiple criteria approach
- An AHP based approach to the strategic management of logistic service
- A decision support system for locating convenience store through fuzzy AHP
- A multi-criteria decision-making approach to university resource allocations and information infrastructure
- Group decision making in a multiple criteria environment: A case using AHP in the software selection

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AHP Applications

- Decision support system for the **composition of the examination problem**
- Application of network theory and AHP in **urban transportation to minimize earthquake**
- Advanced technology manufacturing selection: A **strategic model for learning and evaluation**
- Multiple indices for optimal reactive **power pricing and control**
- Using AHP for **information system project selection**
- **Vendor rating** in purchasing scenario: A confidence interval approach
- **Selection of websites for online advertising**
- Selecting quality based programmes in small firms
- AHP based **synergy allocation to the partners in a merger**
- AHP based **evaluation of AHP software**
- Quality function deployment for the good of the soccer
- **Transportation fuel policy for Singapore**: An AHP planning approach
- An integrated mathematical programming model for **offset planning**
- Multi-criteria decision making in **river basin planning and development**
- Using AHP for **resource allocation problems**
- A **design strategy for reconfigurable manufacturing systems (RMSs)** using AHP
- **Integration of technical, cost and schedule risks** in project management

- **Software selection**: A case study of the application of AHP to the selection of a multimedia authoring system
- An **intelligent maintenance model** (system): An application of AHP and a fuzzy logic rule-based controller in an application of quality function deployment to improve the quality of teaching
- Methodology for **priority setting with application to software development process**
- **Information resource planning for a health-care system** using an AHP-based goal programming method
- An AHP based simulation model for **entry mode decision regarding foreign direct investment**
- An approach for **analyzing foreign direct investment projects** with application to China’s Tumen river area development
- A multi-criteria decision model: Application for managing **rural and urban areas**
- **Multi-objective analysis of hospital delivery systems**
- The **decision by the US congress on China’s trade status**: A multi-criteria analysis
- The **allocation of intangible resources**: AHP and linear programming
- A methodological framework for **evaluating environmentally conscious manufacturing**
- Using AHP and goal programming for information system project selection
- Using AHP and multi-objective programming for the selection of manufacturing systems (MSSs) driven by activity based costing
- A unified framework for the selection of a flexible manufacturing system
- An **analytical bond rating** based on AHP

**Resource allocation**

**Intelligent maintenance management**

**Integrated risk assessment**
AHP Applications

- ERP Software Selection
- Steers the Direction for Special Warfare Training
- San Diego Padres Reach World Series
- Streamlines Clinical IS Acquisition
- Environmental Impact Evaluations (EIE)
- Decisions in Offshore Development Projects
- Measuring and Interpreting Information
- Budget Allocation at Woods Hole Fisheries
- Selecting Working Fluids - An Engineering Application
- Managing National Park Service Resources
- Formulating Policies for the Sea of Japan
- CASE
- Internal Control Judgments by EDP Auditors
- Decision Making with SAS Software
- Quality Management
- Budget Allocation
- Management in Non-Profit Organizations
- Expert Military Judgments
- Ranking Architecture Alternatives for the FAA
- Development and Dissemination of Medical Guidelines
- Optimizing Quality Costs
- Selection of Water-Supply Projects Under Drought
- Investment Analysis Applications
- New Bridge to Environmental Application
- Choosing the Lunar Lander Propulsion System
- Police Officers Evaluation
- Downsizing Military Facilities
- Patient versus Physician Preferences
- Selection of Flood Control Projects
- Management Reorganization
- Productivity in Software Development
- How to Get Funds
- Marines Step Smartly
- Tactical R&D Project Prioritization
- Assessing the Risk of an FAA Emergency Communications
- Accounting Research using the AHP
- Strategic Planning in the Military
- Strategy Implementation
- Selecting Teams to Respond in Medical Disasters
- Promoting Shared Health Care Decision Making
- Developing a Merit Compensation Plan in an Academic Setting
- Prioritizing Telecommunications for Long Range R & D Planning
- Easing the Traffic in Istanbul – At What Price?
- Deciding Which Navy Master Jet Bases to Close
- Customer and Company Values Count in Value-Based Analysis
- Banks Place Their Bets on Technology
- Fantastico! Says Argentine Congress
- Make Green Decisions on Environment and Bottom Line
- Inter-American Development Bank Checks Expert Choice Software with Interest and Approval
- Decision Making to keep Savannah River Site Remediation Flowing
AHP Applications
Selected published work on AHP - Shashi Bhattarai

Professional decisions

Medical Decisions
Post Evaluation of Medical Decision using AHP – with Dr. K Sharma (2011 & 2013)

Banking Decisions

Decision Support for Consultants
Coping with Information Overload: Need for Smart Decision Making - (2003)

Sustainability Decisions

Infrastructure Development Decisions
AHP application in Water Supply & Sanitation in Developing Countries – with Markus Starkl (2005)

Management decisions

Development decisions
Some insights on AHP Applications

Larsen & Toubro

INSTITUTE OF PROJECT MANAGEMENT

6) Proposal Engineering and Analytical Hierarchy Process (AHP)

Proposal Engineering & Project bidding have gradually become very decisive.

In today’s competitive scenario, it requires special attention and thorough expertise in the field of proposal preparation.

Through this Programme, participants learn about different aspects of Project Proposal & Bidding such as Fundamentals of proposal engineering, proposal preparation, what to bid, when to bid, Developing an Optimal Bidding, Validation & Suitability in Practice of a Competitive Bidding Model etc.

The course will cover the use of Analytical Hierarchy Process (AHP) tool – Expert Choice-developed by Dr. Ernest Forman based on Dr. Thomas Saaty’s concept of AHP and Eigen vectors.
## Analytic Hierarchy Process - A Primer

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<th>Public Finance</th>
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<td>Open to</td>
<td>Senior Officer; Manager</td>
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<tr>
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<td>Duration</td>
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<td>Fee</td>
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<tr>
<td>Who Should attend</td>
<td>You are a Div 1 or 2 Government Procurement (GP) officer or equivalent who is involved in managing tenders for high-value goods and services.</td>
</tr>
<tr>
<td>Remark</td>
<td>This course is open to Singapore Public Officers only.</td>
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Risk Analysis of BOT Finance Mode on Hydropower Projects based on Analytic Hierarchy Process---Case Study of Xi He Hydropower Station in Anhui Province

Yan WANG\textsuperscript{1,}\textsuperscript{a}, Songjiang WANG\textsuperscript{2,}\textsuperscript{b}

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Keywords: AHP method; BOT; risk evaluation

Abstract. Using AHP method, this paper proposes a risk evaluation index system to analyze the risky factors concerning the BOT financing mode for Xi He Cascade hydropower station on the basis of a quantitative and qualitative analysis. Research shows that the AHP methods can serve as an effective tool to risk evaluation and management of hydropower projects.
Hydro-power is one of the inexpensive, but a reliable source of alternative energy which is foreseen as the possible answer to the present crisis in the energy sector. **However, the major problem related to hydro-energy is its dependency on location.** An ideal location can produce maximum energy with minimum loss. Besides, such power-plant also requires substantial amount of land which is a precious resource nowadays due to the rapid and uncontrolled urbanization observed in most of the urban centres in the World. **The feasibility of such plants also depends on social acceptance as well as the level of environmental casualty and economic benefit, all of which is also spatially dependent.** Decision making algorithms are applied to identify better solution if a problem has more than one alternative explication. Nature based algorithms are found to be efficient enough to catalyze such kind of decision making analysis. That is why the present study tries to utilize nature based algorithms to solve the problems of location selection for hydropower plants. The study employed six different types of nature based algorithms to select one of the locations among many available for installation of hydropower plant in the **North Eastern part of the Indian subcontinent.** The locations are selected based on their in stream resources and included in the decision making as alternatives. **A methodology of criteria selection, determination of weightage and applications of bioinspired algorithms are adopted to produce utmost exertion of the available natural resources with minimum hostility and wastage of the same.**

**Content Level » Professional / practitioner**

Appropriate Scale of Hydropower Development for Overall Benefit to the Nepalese Society

Factors
- Environmental
- Socio-Economic
- International
- Technical

Sub Factors
- Nature
- People
- Culture
- Reliability
- Cheap Power
- Political Stability
- Private Investment
- Foreign Trade
- Economic Balance
- Independence
- Impacts
- Conflict
- Risk
- Infrastructure
- Technology

Alternatives
- Promote Small Scale Hydropower Projects
- Promote Medium Scale Hydropower Projects
- Promote Large Scale Hydropower Projects

Actors
- Business People
- General People
- Government
- Environment Concern People/NGOs
- Political People
- Energy Concern People/NGOs
- Donor / Loaning Agencies

Level - 1
Level - 2
Level - 3
Level - 4
Level - 5
Analytical Hierarchy Process (AHP) Module

Space Systems Engineering, version 1.0
Some insights on Applications

Shashi Bhattarai & Shivjee Roy Yadav (2009)

**AHP Application in Banking:**

**Unfolding Utility in A Situation of Financial Crisis**

Proceedings of ISAHP 2009, University of Pittsburgh, USA
July 29 - August 1, 2009.

[www.isahp.org](http://www.isahp.org)
Failure-based Maintenance Decision Support System using Analytical Hierarchical Process

M. A. Burhanuddin, Sami M. Halawani, A.R. Ahmad, & Zulkifli Tahir

Welcome to Decision Support System in Computerized Maintenance Management System

In general, the maintenance system is designed to assist in the planning, management, and administrative functions required for effective maintenance. These functions include generating, planning, and reporting of work orders; the development of traceability history; and the recording of parts. In order to improve the effectiveness of the units, maintenance decision support system (DSS) is extremely needed to simplify the maintenance management process and to reduce the time needed to make a maintenance decision. This application focuses on maintenance decision support system for data analysis in small and medium industries (SMIs). The problems are based on the factors that influence the effect of machinery failure. The objective is to design and develop DSS modules with some algorithm extension for implementing the problems factors...
Barriers to the Adoption of Renewable and Energy-Efficient Technologies in the Vietnamese Power Sector

Nhan T. Nguyen, Minh Ha-Duong, Thanh C. Tran, Ram M. Shrestha, and Franck Nadaud

Abstract—This paper provides a discussion of the major barriers to the deployment of geothermal, small hydro and advanced coal power generation technologies in Vietnam. It ranks their severity by applying the analytical hierarchy process to data from a survey of 37 domestic experts and stakeholders. Key barriers to a wider penetration of small hydro generation technologies are insufficient capital, a lack of domestic suppliers and unsatisfactory government policies. Barriers to geothermal power are related to information and awareness problems, a lack of R&D and industrial capability, a weak policy framework and the remoteness of geothermal sites. For advanced coal power technologies, the barriers are weak industrial capability, high electricity production cost and a lack of technical knowledge. The experts consulted in this study view changes in government actions as the key to overcoming the abovementioned barriers. They recommend investing more in R&D activities, improving R&D capacity through joint-venture schemes and reforming investment policy/legislation for the electric power industry as the most appropriate solutions.

Keywords—Analytical hierarchy process, renewables, energy efficient technologies.
Housing corporations are not after a financial gain but allocate (consciously if not unconsciously) a part of their available capital in order to achieve a range of social objectives. The real problem is that it is often very difficult to compare these objectives. Do we choose for an extra affordable house or do we spend more on livability? Answering these types of questions remains difficult as long as there is no objective way to compare the objectives. This article describes a method to compare objectives using pairwise comparisons following Saaty’s Analytic Hierarchy Process (AHP).

This method can be used to support the decision making process at a corporation level, … …

Hereby, an optimal balance of allocated capital and the score of the objectives can be achieved at every decision making level.
Applying Analytic Hierarchy Process in Firm's Overall Performance Evaluation: A Case Study in China

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Xi'an City, (710069) China

ABSTRACT

The Analytic Hierarchy Process (AHP) has been proposed in recent literature as an emerging solution approach to large, dynamic, and complex real world multi-criteria decision making problems, such as the strategic planning of organizational resources and the justification of new manufacturing technology. This paper presents an application of the AHP in firms' long-term overall performance evaluation through a case study in China. An effective evaluation of firm's overall performance is a key step for firm's long-term strategic planning process. As such, the methodological approach of evaluating firm's overall performance has attracted recent research interests, especially for firms under its unique economic, financial, and marketing conditions in China. The result of this study shows that such an AHP application can assist managers to effectively evaluate firm's overall performance in their long-term strategic planning process even under complex economic and marketing conditions.
Property Risk Scoring: the reporting of investment risk to clients

FIBRE
Findings in Built and Rural Environments

Sixty second summary
In 2000 the Investment Property Forum (IPF) and the Investment Property Databank (IPD) looked at the assessment and management of risk in the property investment industry. The key risk factors identified were:

- Demand for this type of product.

RICs Research

University of Aberdeen

www.rics.org

Property Risk Scoring

Norman Hutchison and colleagues employed a number of approaches in order to formulate and test a system for property risk scoring. The first of these is the application of the D&B model to property investment; the second focuses on the PRS model and the use of the Analytic Hierarchy Process, to identify the key risk factors to include; and the final strand was to test the result on valuers and bankers.

What is Analytic Hierarchy Process?

Analytic Hierarchy Process (AHP) is a procedure that enables decisions to be made on the relative importance of a range of factors. AHP lets you attach weights to factors, in order to identify how important these individual factors are in making a decision. The importance of the factors to be assessed is obtained through interviews with experts, who assess all of the factors against each other (known as a ‘pair-wise comparison’) and identify which they consider to be the more important. The results from this process is a percentage weight (out of a total of 100%) attached to each factor, with a higher percentage representing a greater degree of importance, letting you rank the importance of the various factors. The computer software package Expert Choice was used in the research.

The researchers adopted AHP as a suitable technique to calibrate the risk scoring model.
PRIORITIZING ISSUES OF MALAYSIAN VISION 2020: AN APPLICATION OF THE ANALYTIC HIERARCHY PROCESS

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For more resources Join the AHP page in http://facebook.com/AHPforDecisionMaking
Corporate Value Proposition - IPPs

creating synergy out of existing capacity, knowledge and network
sophisticated decision analysis tool to do better, even doing good

Integrated Critical Decision Analysis with subjective & objective information in a single framework
• to get **Insights to Critical Decisions, Sensitivity** with factors & **Strategic Positioning** (selecting a project, investor, partner, service provider etc.)
• coping with **Economic Crisis** (course of action in recession etc.)
• capital budgeting / Resource allocation, **Ranking, Priority setting, Benchmarking**, Strategic planning, and more with **Transparency**

Evaluation of Past Decisions
• getting **insight of good decisions** – identify critical success factors
• getting **insight of bad decisions** – get sensitivity of failure factors
• maintaining **Corporate memory of good decisions & its insights** - learning from past decisions, independent of executives on lead
Part - III

Demonstration
AHP Based Commercial Software

Decision Lens

Video >>>
Promotional Documentary

Expert Choice

Expert Choice >>>
Dam Decision – Build or Not Build Decision
Did we meet the expected Outcome?

- Aware? with AHP based Decision Analysis
- Added value? to knowledge with IPPs

Thank you!

Discussion and Feedback ....

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98510-55544
Select and Prioritize IT Projects based upon Corporate Strategic and Tactical Objectives (1.000)

Customer (.263)
- Commitment/Need (.263)

Strategy (.286)
- Profitability (.111)
- Process Improvement (.114)
- Employee Satisfaction (.061)

Technology (.228)
- Core Competency (.079)
- Cost Competitiveness (.075)
- Integration (.074)

Delivery (.223)
- Schedule (.072)
- Budget (.073)
- Quality (.078)

EXHIBIT 1. IT PROJECT SELECTION MODEL

Raymond Zilinskas, PhD
Director, Chemical and Biological Weapons Nonproliferation Program, CNS

Eduardo Fujii
Senior Programmer, Analyst

Ferenc Dalnoki-Veress, PhD
lead Investigator, Scientist-in-Residence

Jim Bishop
Eva Cheng
Chris McKallagat
Amy Klebesadel
Rory Stanley
Jack Stejskal
Elizabeth Wolcott
Graduate Research Assistants
DSS and MIS

- Data Integrated
- Single framework
- Supporting Sensitivity analysis

AHP based Decision Support System
Integrated Decision Analysis

Management Information System
Information in Isolation
Define the objective

Collect relevant information

Generate feasible options

Implement and evaluate

Make the decision

Focus of the Talk

Intuition

Guts

Blink

Hunch
Selection / Prioritization / Strategic positioning

• **Best Strategic Partner** — Objective?, Value?, Regulation?, Competitive advantage?, Visibility?, Synergy?, Risk?, Due diligence? Resources? HR factor?, Expectations?, Culture & Chemistry?

• **Integrated Insights** — Risk?, Return?, Competitive advantage? Subjective & Objective information?, Actors or Stakeholders?, Trade-offs?

• **Resource allocation?** Where to put how much money? Prioritizing assets utilization?

**Decision Analysis**

• **Framework** — Insights?, Corporate confidence (inside & outside / with own & clients)?, Corporate memory?, Evaluation, Learning & Feedback?

• **Tools and Technique?**
Demanding:
A Balanced Score / trade-off
In-depth analysis, covering Subjective & Objective factors
as well as Actors in a Single Decision Framework
instantaneously generating Insight & Results.

Decision may be for Infrastructure development, Investment, Risk assessment, Procurement, CRM, HRD, ..., much more at Institution & Individual level.
AN ANALYTICAL DECISION APPROACH TO RURAL TELECOMMUNICATION INFRASTRUCTURE SELECTION
A thesis submitted to the University of Manchester for the Degree of Doctor of Philosophy
in the Faculty of Engineering and Physical Sciences
By YOUSEF ALI GASIEA
2010
A DECISION-MAKING MODEL FOR SELECTING THE GSM MOBILE PHONE ANTENNA IN THE DESIGN PHASE TO INCREASE OVERALL PERFORMANCE

*Electromagnetics Research*  Vol. 25, 249-269, 2012

<table>
<thead>
<tr>
<th>Main factor</th>
<th>Sub-factor</th>
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<tbody>
<tr>
<td>Antenna Specifications</td>
<td>Operating frequency bands</td>
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<tr>
<td></td>
<td>Antenna gain</td>
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<td></td>
<td>Radiation pattern</td>
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<td></td>
<td>Polarization</td>
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<tr>
<td>Antenna Operation</td>
<td>No. of operating frequency bands</td>
</tr>
<tr>
<td></td>
<td>Modes (or standards) of operation</td>
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<td></td>
<td>Safety for human</td>
</tr>
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<td></td>
<td>Size</td>
</tr>
<tr>
<td>Antenna Cost</td>
<td>Cost of design</td>
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<tr>
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<td>Cost of manufacturing</td>
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<td>Market maturity</td>
</tr>
<tr>
<td>Antenna Technical Maturity</td>
<td>Technical know-how</td>
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<tr>
<td></td>
<td>Ease of design</td>
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<tr>
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<td>Ease of fabrication</td>
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<td>Usability</td>
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ENHANCING THE SELECTION OF COMMUNICATION TECHNOLOGY FOR RURAL TELECOMMUNICATIONS: AN ANALYTIC HIERARCHY PROCESS MODEL

T. N. Andrew, P. Rahoo, and T. Nepal

Appendix 1: Model for selection of technology for rural telecommunications

1. Capital expenses
   - Purchases
   - Deployment
   - Recovery

2. Operating expenses
   - Maintenance
   - Training
   - Testing
   - Spares
   - Theft

3. Internal rate of return
4. Management platform
   - Bandwidth
   - Scalability
   - Flexibility
   - Compatibility

5. Functionality
6. Security
   - Spares
   - Training

7. Maintenance
8. Installation time
9. Parallel infrastructure
   - Power
   - Roads
10. Terrain factors
   - Topology
11. Climatic conditions
   - Forestry
12. Other operators
13. Installed base
14. Granularity
   - Affordability
   - Social respon.
15. Demand
16. Commitments
   - National
   - Local
17. Community of interest
   - Internal
   - External
18. Regulatory issues
   - EIA issues
   - Wayleaves
19. Technical standards
Abstract

Strategic planning is one of the most complex and ill-structured tasks faced by banks. It usually requires adopting a course of action from a large set of alternatives with uncertain long-term outcomes which depend, to a large extent, on unknown and turbulent environments. In deriving these strategies bankers usually try to achieve multiple, and sometimes conflicting objectives such as profitability, growth, liquidity, and market share subject to constraints on credit and exchange risks and regulatory requirements. Moreover, specific strategies are normally determined by a board of directors whose members have different backgrounds, judgments and personal goals.

This paper describes the application of the AHP methodology to the evaluation of bank Mergers and Acquisitions (M&A) strategy. The model developed for this important problem was tested with the assistance of the board of directors of a billion dollar bank holding company.

Although it is difficult to generalize from one experiment dealing with a single issue, there was nothing unique in the situation where the test was performed. Hence it is safe to assume that the AHP methodology can be applied to other complex and ill-defined strategic issues faced by other banking institutions. Compared with existing techniques on the one hand, and with qualitative managerial judgement on the other hand, the AHP provides a useful, simple and powerful tool for dealing with strategic planning in banking.

Keywords: Decision making; Analytic Hierarchy Process (AHP); bank strategic planning; mergers, acquisitions
New Spanish Banking Conglomerates. Application of the Analytic Hierarchy Process (AHP) to their Market Value

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Abstract

The Spanish financial system is undergoing profound changes, as a consequence of the present international financial crisis and the directives laid down by the European Central Bank (ECB). One of the most important of these changes is the emergence of new financial/banking conglomerates from the mergers of various savings banks and their transformation into IPSs (Institutional Protection Systems). Therefore, determining the value of these financial conglomerates and shares in these is of great interest. This study proposes a scheme which combines the multiple criteria AHP method with the valuation ratio of the International Valuation Standards. This new methodology can be seen as a comparative method or market approach and it only requires a limited number of comparable companies, with their corresponding qualitative and quantitative variables. For this study this valuation method has been applied to the de facto mergers of savings banks.
Why do intra-regional debt investments remain low in Asia?¹

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AsianBondsOnline also surveyed Asian investors to identify which factors influence their offshore bond investments. It used an analytic hierarchy process (AHP) as a model.² Figure 2 shows the hierarchy map of the decision problem. The general objective is to gain insight on the motivations and priorities of the decision to invest in the LCY bonds of foreign countries. Investors pursue a top-down decision-making approach by initially considering the macro perspective before reviewing the detailed aspects of each macro criterion, and eventually synthesizing this information based on the underlying motives of the decision-making process. The next considerations relate to investment

"Figure 2: Hierarchy of Priorities in LCY Bond Investment Decisions"

MACRO CONDITIONS
Economic and Political Stability
Underdeveloped Financial Markets

INVESTMENT FACTORS
Risk-Return Profile for Portfolios
Asset Correlation
Lack of Investment Opportunity
Market Size
Liquidity

STRUCTURAL STRUCTURES
Legal and Regulatory Environment (Tax Treatments)
Openness (Capital Controls)
Governance (Transparency, Disclosure Standards)
Trading Barriers

RISK  RETURN  DIVERSIFICATION

LCY = local currency.  
Source: AsianBondsOnline.

² The AHP was developed in the 1970s by Thomas L. Saaty as a structured technique for organizing and analyzing complex decisions. We have also completed an analytic network process (ANP) to test the robustness of the survey model.
Using an **Analytic Hierarchy Process (AHP)** - like method, we present an alternative that is theoretically and practically superior to the most common index-creation scheme, especially when using relative measures. This method overcomes the problem of aggregating ratio-scale metrics and thus, is useful in wide array of social science and operations management contexts.