Fuzzy based Decision Support System for E-tourism Investment Risk Analysis

Authors:
Binaya Paudel, Alamgir Hossain
b.paudel@bradford.ac.uk
Presenter: Khaled Almejalli

Outline
- Introduction
- Fuzzy Logic based Intelligent Decision Support System for E-tourism Investment
- Case Studies
- Analysis and Evaluation
- Conclusion and Future Work

Research Aims and Objectives
- Aim
  - To develop an intelligent Decision Support System for E-tourism Investment
- Objectives
  - To investigate influencing factors for E-tourism investment through literature review
  - To combine influencing factors with limited input parameters.
  - To gather expert knowledge in the form of rules
  - To explore the typical decisions
  - To develop decision support system using fuzzy logic
  - To explore the merits of model through case studies

Tourism - Definition
Tourism comprises the activities of person traveling to and staying places outside their usual environment for not more than one consecutive year for leisure, business and other purposes.

International tourism comprises the activities of any person on a trip between two or more countries while he/she is enroute away from his/her usual place of residence for more than 24 hrs but not more than one consecutive year for leisure, business and other purposes [UNCTAD, 1998]

E-tourism - definition
- E-tourism is the application of ICT in tourism sector.
- E-tourism is the combination of three distinctive bundes: IT, Business and Tourism
- Diffusion of ICT in tourism enables tourism enterprises and organization.
- ICT leads toward development of new skill, new technology, and new services.

Figure shows E-tourism concept

Impact of E-tourism
- Increase the efficiency and effectiveness of tourism organization
- Increase competitiveness and quality of tourism services
- Decrease intermediaries cost
- Benefit for tourism stakeholders
- Infrastructure development
- Product innovation
- Relationship development among stakeholders
E-tourism Investment Decision

- Investment decision is the complex problem
  - Need risk identification
  - Need prioritization
  - Lots of factors need to be considered
  - Need experienced expert with local knowledge
  - Experts are expensive and the decision is time consuming
  - Therefore, DSS can be useful to overcome some of these problems

DSS model

- DSS model investigated:
  - Model to determine investment Risk through investment possibility on E-tourism investment
  - Fuzzy logic used as the decision technique

Fuzzy logic

- Part of Artificial Intelligence
- A reasoning technique for arriving at decisions on the basis of incomplete information
- Fuzzy logic is an important tool for decision making
- Fuzzy logic expert system is applicable because it can be closer to human observation.

Fuzzy Decision Models

Factors Affecting E-tourism

- **Investment Amount**
  - Cost of initial investment
  - Cost of system maintenance
  - Source:
    - Public investment
    - Private investment
    - Foreign investment
- **Human Skill**
  - Education level of people including trainings
  - Rate of employment

Factors Affecting E-tourism

- **Infrastructure**
  - ICT development along with substantial knowledge of ICT
  - Business development with substantial business opportunities
  - Tourism development with healthy and competitive tourist sites
- **Instability**
  - Political instability
  - Human and manmade instability
  - Environmental instability
E-tourism Possibility Model

Mathematical equations

- **Investment amount** = Percentage of GI + Percentage of PI + Percentage of FI
- **Human Skill** = Education Rate * 1.4 + Employment Rate * 1
- **ICT Infrastructure** = \( \frac{2 \times \text{Number of Telephone Lines Distributed} + \text{Number of Computers in the Region} \times 10 + \text{Number of Internet Cafe Facility} \times 500}{\text{Total Population}} \)
- **Tourism infrastructure** = 50% of tourist arrival (number of tourist sites + number of star hotels and tourist type hotels + number of tour and travel agent) / number of tourist arrival
- **Business infrastructure** = 20% business use ICT
- **Infrastructure** = value obtained from ICT \( \times 0.267 \) + value obtained from Tourism \( \times 0.0067 \) + Percentage of Business use ICT in their business \( \times 1.5 \)
- **Instability** = Percentage of Political Instability * 1 + Percentage of Manmade Instability * 1.2 + Percentage of Environmental Instability * 0.08

Fuzzification of influencing factors

- Simple trapezoidal and triangular membership functions used based

Fuzzy operations

- Rules are derived based on discussion with tourism experts, literature and authors experience
- Example rule:
  - If investment amount is ‘H’, human skill is ‘L’, infrastructure is ‘H’, instability is ‘M’, then the risk is ‘M’
- Defuzzification: Centre of gravity method defuzzification method used.

Case Studies for risk determination

- Three case studies considered
- Input parameters determined
- Results obtained
  - 0.73 possibility gives low risk for Developed Region
  - 0.55 possibility gives medium risk for Developing Region
  - 0.21 possibility gives high risk for Underdeveloped Region

Conclusions and Future work

**Conclusions**
- Conceptual model gives meaningful result.
- Normalization technique by using in terms of equations is useful.
- Research on E-tourism investment is very limited.
- Among the various techniques fuzzy logic expert system or knowledge based system is used.
- Very limited influencing factors are used for model development.
- Fulfills the requirement of the master thesis.
- Developed approach can be considered for similar problem in other areas.

**Future work**
- Different techniques will be used for decision making and comparison.
- Other many influencing factors will be investigated and will use for model development.
Thank you!

Questions?