IN MEMORY OF PROF. THOMAS SAATY: DEMAND DRIVEN CASES OF THE ANALYTIC HIERARCHY PROCESS APPLICATIONS

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Summary of Talk

The talk, in the form of story is about the most recent AHP applications to **honor Professor Thomas Saaty, the father of AHP/ANP.** The stories are derived from demand responsive, practical and internalized utility of AHP by the users, hosts and enthusiasts from Nepal and Bhutan. The talk is prepared based on how the real life applications were evolved; the situation created for demonstration and need of sensitization perceived on utility of AHP.

Selection of Cases of application with Stories

All the stories are from real life application of AHP, which were the dream of Prof. Satty, he always wanted AHP to reach to common people, addressing to common problems, not merely for academic fulfillment.

The stories are selected and presented in chronological order, most recent one first. The need of AHP application is evolved with the situation people are dealing with in real life. Some stories needed inputs to shape the situation, adding value with AHP. The most recent one was evolved without intervention, surprised me as well! The stories are covered from Nepal and Bhutan. All the stories of AHP applications are response to the demand from the beneficiaries.

There is bigger scale ongoing real life applications of AHP, details of such applications yet to be public are not mentioned here. One among the ongoing is application for option assessment for Mass Transit Transport System for Kathmandu, the capital city of Nepal.

The Stories of Cases of AHP application

Story – 1:

Application of AHP with GIS to predict landslide hazard at Thumba river basin in eastern Nepal – March 2018, 15thNational Convention of Nepal Engineers Association (NEA)

As I was among the speakers and participants in the convention, when I was browsing through the pre-prints of abstract being presented at the convention, I was glad to see a paper on AHP application in hazard mapping problem, I took it simply as another academic exercise, AHP has been a major tool in Master's thesis these days in Nepal.

But, when I was listening to the presentation made by young lady, Ms. Shilpa Koirala (the co-author of the work) and talking to her just after her presentation, I was surprised to learn the work was in their professional exercise. She felt the content lacking with the conventional qualitative method on GIS, so through internet research, she found and learned about AHP. She had noticed that AHP was appropriate tool for dealing with multiple criteria decision making and could be combined with GIS. The co-author was recent graduate of Environment Engineering from Kathmandu University and was working as professional in a hydropower development company (Sanima Hydro) in Nepal.

Based on the finding of study (risk mapping), the energy company management concluded that there is a greater risk of damming at Tamor river due to debris brought by Thumba river, management decided to shift the powerhouse location by 400 m downstream from the confluence. Moreover, the shifting of powerhouse has also increased the project head and capacity of power plant from 54 MW to 75 MW.

This was the first publically available case of AHP application by a company which is a member of Independent Power Producers Association of Nepal (IPPAN). Utility of AHP for power producers was presented four years back and shared the talking deck to IPPAN members.

The story reflects the pleasant moment to see how AHP organically identified its utility while dealing with conflicting situation to arrive at spatial risk ranking with the message of "GIS is necessary but not sufficient". This reminds me of what Prof. Satty was talking to me and wanted to happen!

Story – 2:
Dilemma in choosing a candidate during Nepal Legislative Election 2017 triggered situation for sensitization and demonstration of AHP utility:
"The dilemma created by Sun"

An article on dilemma in choosing a candidate during Legislative Election of 2017 in Nepal felt by an Associate Professor of Kathmandu University Dr. Nawaraj Khatiwada was published in local newspaper.

The author of "dilemma in choosing a candidate" was a voter of Constituency No. 2 in Kathmandu District (where capital city of Nepal is situated), putting his argument on how a voter faces a dilemma in selecting a candidate if there are equally contested in the battle field. The author, teacher in University by profession, argues that he could make his alignment or faith as criteria of selection based on his experience. And he considered competency, charisma, personality, and leadership skills as criteria of comparing the candidates.

Two promising candidates were selected for the comparison; the first one was Mr. Madhav Kumar Nepal (MKN), former Prime Minister of Nepal and former President of NCP UML Party who had the election symbol of Sun. The second candidate was Dr. Surya Raj Acharya (SRA), candidate of Bibeksheel Sajha Party, one of the youngest political Party in Nepal. The term 'Surya' means 'Sun' in Nepali, and therefore, the writer has put the title of the article as "The dilemma created by Sun" with an aim to reflect the content of the article and draw the attention of the wider audience.

The writer has compared the candidates based on the attributes of educational background, publications, major achievements made so far and leadership skills. A comparative picture of these attributes associated with each candidate was presented. The writer concluded the article by saying that this sort of exercise and write-ups would certainly help the voters to make their rational opinion in selecting the most appropriate candidates.

The same article was shared by the author on his facebook page, looking at the facebook post, in an instance, I posted a comment stating "there exists scientific basis to deal with situation, AHP based Multiple Criteria Decision Analysis tool would be most appropriate to deal such kind of decision dilemma" and I would love to demonstrate the AHP application for the situation he have carved in the article. Promptly, Dr. Khatiwada, agreed to host a seminar inviting all interested professionals and also the official of the magazine where the article was published. Dr. Khatiwada hosted the seminar at Nepal Development Research Institute (NDRI), as the author is co-founder the research institute, NDRI. The seminar was live over the facebook page of Dr. Khatiwada.

My presentation with introduction to AHP, the decision dilemma insights was discussed based on AHP hierarchy and dynamic sensitivity analysis.

The seminar was interactive and created sensation on potential of AHP on many aspects of Decision Analysis. Sensitizing the utility of multi criteria analysis with happening case of public interest draws significant attention to multi sector professionals.

<u>Story – 3:</u>
Application of AHP for Gross National Happiness (GNH) of Business, at 7th International Conference in GNH with theme of GNH of Business, Thimpu, Bhutan, November 2017.

The concept of measuring prosperity of Bhutan using Gross National Happiness (GNH) indicator was known to me, but I had little knowledge on insight of its measure. When we started working in Bhutan in early 2013 for some consulting assignment with Bhutanese counterparts, and visiting Bhutan two times in 2015, I realized GNH framework / analysis is suitable to be incorporated by AHP. I was talking to my friend Kezang, then Managing Director of infoAge Consulting, Bhutan about the appropriateness of application of AHP for GNH. My friend told me, there will be international conferences on GNH and the event is being organized by the Royal Bhutanese Government owned Center for Bhutan Studies and GNH. Two years later, last year in June, I was informed that the 7th International Conference on GNH is happening in November, 2017 focusing on Business. Instantly, we (with Rana P Singh) prepared and submitted a proposal for

AHP application to look at the appropriate business sector for Bhutan giving highest happiness. Within the anticipated time, we were informed that our abstract was accepted with invitation to participate and present the AHP application to the local as well as international audiences. The invitation was from Government of Bhutan.

Based on the accepted abstract, we needed to work to get analysis and results, needed one more author to distribute the work, we invited Ananta Man Singh (participant of ISAHP2016, London), another individual with passion to work on AHP application. Despite of busy schedule of all the authors, we were able to deliver the full paper and I, along with Ananta, presented the paper with live demonstration.

Gross National Happiness (GNH) is a multi-criteria well-being measurement system in Bhutan. The four pillars of GNH considered are political, economic, cultural and environmental. There are nine domains and thirty three indicators of GNH, which generates the GNH Index, a holistic representation of well-being.

There had been quite a few AHP based research relating to GNH, the work aimed to create a strategic AHP based GNH framework focusing on business / industry sector giving most happiness to its employees. An AHP based framework on GNH with scenario in the business / industry sector was generated and presented with capability of dynamic visualization. The six businesses sectors categorized in the analysis were Agribusiness, Energy (AE/RE), Knowledge & Service, Manufacturing, Timber & Non-Timber Forest Products (T&NTFP) and Tourism.

As per the authors' judgments, Knowledge & Service sector was found to be the best ranked Business sector contributing to happiness, whereas Manufacturing sector was ranked the lowest. Further, sensitivity analysis demonstrated the changes in rankings of the business sectors which took place according to the changes in priorities of domains. This feature was particularly useful in formulating national long term strategies as to encourage preferable business sectors. It was interesting to notice that result of our work correlated with the CBS study presented earlier (using some other method) in the same conference.

The contribution of the paper was in three fold, firstly, a brief review on GNH and AHP related literatures, secondly, development of AHP model with typical dynamic strategy analysis for business using GNH pillars, domains and indicators. Thirdly, a unique contribution for linking country's well-being with business, with ready to use tool in an AHP based computer software for GNH analysis in businesses.

The work was well taken by the entire participants of the conference; minor improvement was made after the conference for the publication of the proceedings of the conference. We have yet to update if there are further work by CBS in this area. The story sets an example for indicative demand response and internalized utility of AHP by the government of Bhutan.

Story – 4:

Application of AHP for Micro Hydropower Plants (MHPs) in Nepal: Demand created with the earlier experience from Rural Water Supply Schemes.

This is the story of transformation of realization of utility of AHP based Sustainability Monitoring Framework from **Proposal based Acceptance** to **Demand driven Call**. The proposal based acceptance was from an INGO, whereas, demand driven call was from Government agency. The initial acceptance was for Rural Water Supply Schemes where as demand driven call was for Micro Hydropower Plants. The transformation was from Rural Water Supply to Rural Energy, specifically from more social purpose to economic good. It is interesting to see the time frame of transformation; it took almost 10 years to see this realization in Nepal.

There was call for proposal for sustainability monitoring framework development for Rural Water Supply Schemes in rural Nepal back in 2006/7, in response of the proposal we proposed to use AHP, the proposal was accepted and assignment was completed. Multiple dissemination of the knowledge work was made, with four publications, including at presentation at ISAHP 2009 in additional to regional dissemination within the network of WaterAid UK. The work of AHP based sustainability monitoring was fully internalized and regarded as high value tool by then Monitoring and Evaluation (M&E) officer Mr. Barun K. Adhikariat (participant of ISAHP2009) WaterAid, Nepal.

Time was passing, in 2015, Alternative Energy Promotion Center (AEPC) in Nepal was looking forward for the sustainability monitoring system for Micro Hydropower Plants (MHPs) being developed by AEPC. The sustainability monitoring of selected MHPs had been conducted multiple times earlier. AEPC was exploring holistic and more robust approach of sustainability framework development which could deal with multiple conflicting criteria / indicator based approach. It had been learnt that AEPC has identified AHP based framework would be most suited for the purpose. In search of the appropriate resource individuals for the AHP based sustainability monitoring framework for MHPs development, we were approached. The AHP based sustainability monitoring framework development started in partnership with AEPC.

Spanning a timeline of over two years (2015-2017), a double stage approach was agreed to move forward. In the first phase, a framework was developed and pre-tested at a MHP. In the second phase, the framework was refined with the findings from pre-testing as well as stakeholder consultation on the pre-tested sustainability monitoring framework. The refined sustainability monitoring framework for MHP was used the pilot at 16 MHPs. The further improvement in the piloted framework is recommended, we are looking forward for large scale deployment of the AHP based Sustainability Monitoring Framework utilization for MHPs in the days to come.