The Past and Future of AHP/ANP: An ISAHP2020 Perspective

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The AHP/ANP future seems bright for the next generation of scholars and practitioners judging from the themes emerging from the ISAHP2020 virtual conference in December. In this essay, I will visit the academic themes and messages derived from the keynote and plenary speakers who presented their ideas at the conference. Their presentations are available at ISAHP Events/Keynote/Plenary/AHP Roundtable (2020).

Leadership in Complex Situations

Our keynote speaker for ISAHP2020 was Dr. Blaženka Divjak, Her topic was "Leadership in Complex and Chaotic Situations." She was, until recently, the Croatian Minister for Science and Education (June 2017 - July 2020) and led four major reform processes during her mandate. She has also chaired the EU Council of Ministers for Education and Council of Ministers for Research and Space during the Croatian presidency (January - June 2020). In that period, she led the process of adopting several Council conclusions related to future teachers, future jobs and brain circulation as well as coordinating the EU response to the COVID-19 crises in education and research.

What was remarkable about Dr. Divjak's presentation was the way she mapped her journey from decision-making researcher (as university professor) to practitioner (as Minister of Science and Education in Croatia) and back to being a researcher. True to this approach, she used the Cynefin framework that sorts the issues leaders are facing into five contexts (simple, complicated, complex, chaotic and disorder) defined by the nature of the relationship between cause and effect (Snowden & Boone, 2007). This is a sense-making model (Snowden, 2002) that simultaneously addresses knowledge and decision-making (French, 2013). Using this framework, she shared with the audience her experience and leadership challenges as Minister of Education and later as chair of the EU council of ministers of 27 countries prior to and during the pandemic, which she described as moving from a complicated to a complex situation. Dr. Divjak recommended that leaders in complex situations must be open to new "out-of-the-box ideas" as well as learning by doing, among other suggestions. She ended by explaining how the AHP/ANP (Saaty, 1980; Saaty, 2005) can help decision-making in complex situations, for example by exploring the decision maker's values (French, 2013).

Dr. Divjak's address is a good example of how to combine rigor with relevance, and MCDM analysis with important decisions. Dr. Divjak proposed a sense-making model as the theoretical framework for the decisional context, along with the AHP/ANP as the multicriteria decision making analysis method to revise complex decisions in the context of the pandemic. It was an excellent presentation in strategic leadership and decision-making that I am certain will be revisited for years to come.

Three Developments of the AHP

The second day of the conference, Dr. Alessio Ishizaka, full professor in decision analysis and head of the supply chain, information systems and decision aid department

at NEOMA business school in France, talked about three important developments of the AHP: calibrated Fuzzy AHP, AHPSort and GAHPO.

He showed that MCDA research and publications have been systematically expanding and that the AHP/ANP is leading the pack (Wallenius, Dyer et al. 2008). Dr. Ishizaka started with the development of calibrated AHP, using as an example of bank current account selection (Ishizaka et al. 2013). This approach is based on Fuzzy AHP (Van Laarhoven and Pedrycz, 1983) which is a combination of Fuzzy Set Theory (Zadeh, 1965) and AHP (Saaty, 1980) and was developed, in the view of its creators, to take into account uncertainty and imprecision in evaluations. Fuzzy Set Theory requires the definition of a membership function and Ishizaka et al. (2013) proposed a way to calibrate the membership functions with comparisons given by the decision-maker on alternatives with known measures. He explained this technique based on a published case measuring the most important factors in selecting a student current account. While Dr. Ishizaka addressed the issue of how to construct the membership function in Fuzzy AHP, it must be noted that Fuzzy AHP is not without detractors. For example, Saaty and Tran (2007) argued that when judgments are allowed to vary in choice over the values of a fundamental scale, as in the AHP, these judgments are themselves already fuzzy. Still, the reality is that Fuzzy AHP has firmly established itself as a hybrid methodology that is widely used in many situations.

The second development highlighted by Dr. Ishizaka was AHPSort (Ishizaka et al., 2011). When the number of alternatives increases, the number of pairwise comparisons also increases drastically. AHPSort, a variant of the AHP, sorts the alternatives into pre-defined categories. AHPSort facilitates decision-making within large-scale problems. Dr. Ishizaka explained the two-stage method using a real case study for supplier selection. First, the large number of candidates is sorted into two classes (accepted or rejected) by comparing pairwise each alternative to the limiting profile established for each screening criterion. This generates a shorter list of adequate suppliers. Then, a single supplier is selected with the AHP from among the accepted suppliers using suitable evaluation criteria. The screening criteria ensure the minimum adequacy of the supplier while the evaluation criteria are used to rank the alternatives and require in-depth research into the candidates. Some members of the audience argued that the AHP has a solution for the case of a large number of alternatives, the use of an absolute scale based on ratings for the alternatives. However, in my opinion, AHPSort offers the opportunity to keep the cognitive advantages of pairwise comparisons by using it at the following two levels: first, for sorting and next, for evaluation. Also, separation of screening criteria from evaluation criteria (at least in the given example) allows the use of the AHP for both the qualification and evaluation stages.

Dr. Ishizaka finished his exposition by discussing the Group Analytic Hierarchy Process Ordering (GAHPO) method (Ishizaka and Labib, 2011). Unfortunately, technical issues did not allow him to present this third AHP development properly during his plenary session.

Issues and Insights for the Future
The third day of the conference, Dr. Bill Wedley was the plenary speaker. He began by stating the "Magic or Black Box" nature of the AHP/ANP. I had never thought of the

AHP/ANP this way, but he explained his rationale. The method is easy to use and intuitive and has a way of fascinating all who see it performed. However, as the models get complex they become a black box for many. Dr. Wedley proposed opening this black box by discussing nine themes related to the AHP/ANP. Central to all these themes is the following quote, "And therein lie both the **advantages and dilemmas** of AHP [and ANP]. We do not need explicit knowledge of the underlying unit of measure to derive a ratio scale, yet the derived scale has a unit." (Wedley & Choo, 2011; emphasis added). Dr. Wedley continued by stating that by "advantage" he means that we can get scales from measurements (the pairwise comparisons) without having any previous standard unit. Although each pairwise comparison has a unit, we do not know the ultimate unit of the scale that evolves from the comparisons. The "dilemma" is that the sum-to-unity priorities have an obscure unit. The priorities are used, too frequently, without recognition of the unit. Accordingly, we often aggregate units incorrectly. Dr. Wedley argued that the AHP/ANP community has not paid enough attention to the units of their scales. Next, he discussed the different proposed themes.

Dr. Wedley's presentation was really an exciting tour over the major themes in the AHP/ANP. It would not be possible to cover his discussion in enough detail and fortunately, a video recording of his presentation (as well as those of the other presenters) is available for the interested reader. Still, I will summarize two themes that were central to his presentation.

First theme: Do AHP priorities have a unit? Dr. Wedley considers this theme to be the most important in his presentation. He started using an example from Saaty and Shang (2011) and then proceeded to explain the units in the case of ideal and relative priorities. In the case of ideal priorities, if we have priorities (p_{ct} , p_{sgt}) representing the size of two objects such as a cherry tomato (p_{ct}=0.25) and a small green tomato (p_{sgt} = 1), it is clear that the last object is the unit. However, if we express their priorities in a distributive mode (p_{ct}=0.2, p_{sgt} = 0.8), the unit is an undefined abstract object (the combination of both the cherry tomato and the small green tomato). If we extend the example by adding a third object such as a lime, we can have a new set of priorities for the three objects; however, the unit will be different than before because it will now be a new undefined abstract object (which can be imagined as the morphing of the cherry tomato, small green tomato, and lime into one). We have changed the units! Furthermore, when aggregating, things get complicated because the unit of the priority vectors changes when we multiply by a criterion weight or a rescaling factor. To nail this idea in the minds of the audience he quoted Zahir (2007), "Although the sums are all equal to one, what is often ignored is that "one [1] here is not necessarily equal to one [1] there." Dr. Wedley concluded by stating that we should not ignore the unit, nor take it for granted. He admonished us to, "Follow what happens to the units."

Second Theme: Use the full intensity of ratios. Dr. Wedley emphasized that the strength of the AHP/ANP is precisely their use of ratios and rather than converting ratio scales to interval scales with false zeros, it is better to think of the decision in terms of ratios. For example, Vargas (2016) proposed voting with intensities. Dr. Wedley also mentioned Mu's (2017) work on eyewitness identification where the questions to the eyewitness are shifted from the likes of "Is this the person you saw at the crime scene?" to "How many times is suspect A more likely to be the person you saw at the crime scene than suspect

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B?" He also offered polling, which has recently had very poor performance, as a plausible area to improve by applying the AHP ratio-based approach, as well as in corporate strategies where often those adopted by consensus subsequently fail. He suggests asking for strength of conviction to assess whether people are between lukewarm or extremely committed to a strategy.

Dr. Wedley concluded his presentation with a call to action. He stated that to continue to ignore the priority units is dysfunctional and he emphasized the need to apply the AHP using the full power of its ratio scale rather than trying to devalue it by converting it to a lesser interval scale. He believes that this recognition of the power of the full intensity of ratios could catapult the AHP/ANP to new heights. Dr. Wedley feels positive that the power of ratios has not been fully exploited and because of this there is a bright future for the AHP/ANP. After having listened to these wonderful speakers, as well as participating in several sessions for the three days of the conference, I certainly agree with him!

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