ABOUT A HUNDRED YEARS OF CREATIVITY IN DECISION MAKING

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Can all the methods that people have invented to do decision making be right all the time? This may be the case for trivial decisions, but not for decisions that involve dependence and feedback and that need complete analysis of benefits, opportunities, costs and risks to get an overall justifiable outcome. According to the great philosopher Karl Popper, a theory is scientific only if it can provide grounds for its own falsifiability. In decision making, a theory would not be scientific if it could not provide examples of where it would be false if it does not work. A theory cannot universally explain everything, and must define the limits of its applicability, or give examples of where it would not work. For example, for the AHP (Analytic Hierarchy Process) we could say that just because it is a decision making theory that can be used on intangibles, the question still remains about whether the procedures of that theory can provide a correct estimate when we have tangible measurements to check against. The AHP would not work well in the hands of a neophyte who does not understand the problem being addressed. A decision making theory that claims to be valid for intangibles but not for tangibles is more like garbage in and garbage out. A decision theory should also be able to make tradeoffs possible, and thus be useful in resolving conflicts.

Following is a list of only a few of the decision making methods that are circulating. The kinds of numbers they use and how they combine these numbers is a challenge. What follows is taken from a section in a forthcoming paper (Saaty & Ergu, 2015). Over the past few decades a number of MCDM methods have been developed to deal with the measurement of tangible/intangible (and conflicting) criteria and with the measurement of the alternatives of a decision with respect to these criteria (Kou et al 2013, 2014a). Some of the most popular methods include: the Analytic Hierarchy Process (AHP), the Analytic Network Process (ANP) (Saaty 1972; Saaty 1980; Saaty 2005), Additive Ratio Assessment (ARAS) (Turskis and Zavadskas, 2010), Complex Proportional Assessment of Alternatives (COPRAS) (Zavadskas and Kaklauskas, 1996), Compromise Programming (CP) (Zeleny, 1973), Decision Making Trial and Evaluation Laboratory (DEMATEL) (Gabus and Fontela, 1972), Dominance Based Rough Set Approach (DRSA) (Greco, Matarazzo et al., 1999; Greco, Matarazzo et al., 2002), Elimination Et Choice Translating Reality (ELECTRE) (Roy, Benayoun et al., 1966; Roy, 1990), Evidential Reasoning (ER) (Lowrance and Garvey, 1982), GUESS method (Buchanan, 1997), Goal programming (GP) (Lee, 1972), Grey Relational Analysis (GRA) (Deng, 1989), Inner Product of Vectors (IPV), Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH) (Bana e Costa and Vansnick, 1994), Multi-Attribute Global Inference of Quality (MAGIQ) (McCaffrey, 2009), Multi-attribute utility theory (MAUT) (Raiffa and Keeney, 1976; Humphreys 1977), Multi-attribute value theory (MAVT) (Raiffa and Keeney, 1976), Maximal Entropy Ordered Weighted Averaging

(ME-OWA) (Yager, 1988; Filev and Yager, 1995), New Approach to Appraisal (NATA), Nonstructural Fuzzy Decision Support System (NSFDSS) (Tam, Tong et al., 2002; Tam, Tong et al., 2006), Potentially all pairwise rankings of all possible alternatives (PAPRIKA) (Hansen and Ombler, 2008), Preference Ranking Organization Method for Enrichment of Evaluations (PROMETHEE) (Brans, Vincke et al., 1986; Brans and Mareschal, 2005), Simple Additive Weighting (SAW) (Churchman and Ackoff, 1954), Superiority and Inferiority Ranking Method (SIR) (Xu, 2001), Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) (Hwang and Yoon, 1981), Utility Additive (UTA) (Jacquet-Lagreze and Siskos, 1982), Value analysis (VA) (Keen, 1981), Value engineering (VE) (Zimmerman and Hart, 1982; Parker, 1985; Mudge, 1989), VIKOR method (Opricović, 1980; Opricovic and Tzeng, 2007), Weighted product model (WPM) (Triantaphyllou and Mann, 1989),Weighted sum model (WSM) (Fishburn, 1967; Von Winterfeldt and Edwards, 1986) and on and on ad infinitum.

Many of the original MCDM methods have also been extended or adapted by the creators of those theories and by researchers on these methods. With these variations we have more than a hundred MCDM methods. This wide variety of available methods bewilders potential users, resulting in the difficulty of selecting an appropriate method (Hobbs, 1986).That is, the existence of many MCDM methods itself becomes a decision problem!

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