COMPARABILITY, DECISION THEORY AND THE AHP

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ABSTRACT

Saaty (2011) briefly discusses the three basic laws of Aristotelian logic and suggests a fourth, which he calls the Law of Comparisons. He argues that comparison is both relevant and essential to the other three laws and, in fact, precedes them. This view - comparativism - is however, not without criticism. Here we present a more comprehensive discussion of various problems regarding comparability, focusing on three aspects; (i) the problem of a proper scale; (ii) the problem of a proper aggregation of conflicting criteria and (iii) the debate whether values are subjective or objective. The debate regarding incomparability is varied and intense making a perfunctory or uncritical acceptance of comparativism wrong. However, Saatian Comparativism will be shown to be a solution to the major issues raised by incomparativists. Two conclusions are reached; (i) Saaty's (2011) view is confirmed and (ii) the work of Saaty is not reflected in the incomparability or incommensurability literature and this debate stands to be enriched by seriously considering Saatian Comparativism.

Keywords: Analytic Hierarchy Process; covering value; incomparability; incommensurability; value realism

1. Introduction

In a recent article, Saaty (2011) briefly discusses the three basic laws of Aristotelian logic and suggests a fourth, which he calls the Law of Comparisons. He argues that comparison is both relevant and essential to the other three laws and, in fact, precedes them. Saaty (2011) states that rational thinking involves the basic assumption that things are implicitly comparable. The view that things are implicitly and generally comparable is called comparativism, and a large amount of literature exists on the subject. Authors argue both for and against comparativism from a philosophical as well as a decision theoretical perspective. What is, however, missing from this debate is references to and arguments about AHP/ANP, while on the other hand there are also few references to comparability in the AHP/ANP literature. These two bodies of literature largely exist separately, without overlap or inter-literature critique. Although not explicit, Saaty (2011) seems to present the AHP/ANP as a decision-making methodology that properly applies these four laws and, hence, comparativism. Here we will come to the same conclusion after a more comprehensive discussion of various problems with comparability highlighted in the comparability literature. The discussion will highlight general critiques of comparativism found in the comparability literature and point out how Saatian Comparativism answers these issues, in an attempt to stimulate useful debate between these two bodies of literature.

2. Importance of the incomparability argument

Saaty's (2011) discussion purely states the importance of comparisons, but does not allude to the debate regarding the possibility of not always being able to compare items which is the view in opposition to comparativism (Chang, 1997). The first question is whether a detailed discussion of this comparability/incomparability debate is of any real importance. The consensus amongst pluralist philosophers is that pluralism entails value incomparability (Kekes, 1992; Mason, 2011). Several authors point out that it is important to settle the argument regarding the comparability or incomparability of options because of the critical role comparisons play in practical decision-making, particularly in Rational Choice Theory (Pildes & Anderson, 1990; Broome, 1997, 2000; Eriksson, 2003; Gert, 2004; Hsieh, 2005b; Okapal, 2007, 2010; Kelly, 2008; da Silva, 2011 inter alia). It is difficult to see how one can choose rationally if one cannot compare and say which of the available options are best, i.e. optimal. The importance of comparability is not only explicit in Rational Choice and Decision Theory, but is also implicit in most forms of consequentialism (Chang, 1998, 2013). Rauschmayer (2001) points out that due to the problem of incomparability – which he argues is much more prevalent than often thought – anybody involved in decision aiding has both a scientific as well as a social responsibility to make all assumptions, including the possibility of incomparability, clear when designing or using decision-making tools. The importance of clarifying the incomparability issue is also clear when Aldred (2006) points out that comparability is so entrenched in economics and decision theory that it would shock (sic) economists and decision theorists to learn how widely disputed the comparability view is amongst philosophers.

3. Introducing the incomparability argument

The question is whether it is always possible to compare any two items **a** and **b** or whether there are cases when **a** and **b** are incomparable. Chang (2002a) points out that philosophers typically have one of three reactions to a decision situation in which it is difficult to decide on comparisons, for example: Who is more creative Mozart or Michelangelo or which career is best, accounting or skydiving? First, epistemicists insist that, although it may be difficult or even impossible to determine how the items compare, all things considered, one must be better than the other or they must be equally good. Second, incomparabilists, however, insist that even omniscience will not yield a true comparison in terms of all the relevant considerations; hard cases are difficult precisely because there is no comparison of them – neither is better than the other nor are they equally good. Third, the semantic indeterminists argue that it is indeterminate how the items compare all things considered – it is indeterminate whether one is better than the other or whether they are equally good. On this view the indeterminacy arises because the terms, "better than" or "equal to" are vague and hard cases are borderline applications of one of these comparatives. Wasserman (2004) is one who relates indeterminism and vagueness. Chang (1997) sums it up by pointing out that the epistemicists think that it is true that one item is always better than the other or they are equally good; incomparabilists think it is false that that one item is always better than the other or they are equally good; semantic indeterminists think it is neither true nor false that one item is always better than the other or they are equally good.

Incidentally, a second distinction regards in-comparability and non-comparability of which Harris (2001) says that non-comparability relates to situations where the two items being compared do not share a covering value, e.g. comparing an apple and a concept as to taste – because concepts do not possess the value taste they cannot be

compared to apples in this regard. Incomparability, on the other hand, relates to difficult comparisons where both items exhibit the covering value, e.g. comparing Mozart to Michelangelo as to creativity. Non-comparability will not be dealt with here.

Traditional Decision Theory bases preference modelling on two fundamental preference relations, i.e. preference and indifference. If two items **a** and **b** are compared three possible relationships may be obtained; either **a** is preferred to **b** (**a**P**b** or **a**>**b**); or **b** is preferred to **a** (**b**P**a** or **b**>**a**); or neither is preferred – a situation of indifference - expressed as **a**I**b** or **a**~**b**. These relationships are often modelled as three fundamental relations, i.e. "better than" (equivalent to **a**P**b**); "worse than" (**b**P**a**) and "equal to" (**a**~**b**). The thesis, that if two items are evaluatively comparable, then **a** must be better or worse than **b**; or **a** and **b** must be equally good, is called the Trichotomy Thesis (Chang, 2002a). According to this thesis the conceptual space of comparability between two items is spanned by the trichotomy of relations "better than", "worse than" and "equal to". Part of the appeal of this thesis is in a tidy assimilation of evaluative (e.g. kindness, beauty) comparisons to non-evaluative (e.g. mass, length) comparisons that proceed in terms of "more", "less" or "equal" amounts of some attribute. The Trichotomy Thesis (TT) is almost universally accepted and is assumed by all the major writers on the topic of measurement, decision and game theory, but it is argued that in many cases none of these relations hold between two items **a** and **b**, and that, in such cases, the items should be deemed incomparable (Klocksiem, 2010; Harris, 2001; Aldred, 2002). Chang (1997, 2002a) notices problems with the TT in its simple form but still rejects the possibility of incomparability. She believes that two items can be evaluatively compared without any of the trichotomy relations necessarily holding between them, and suggests that there is conceptual space in the intuitive notion of evaluative comparability for a fourth relation to hold between two items, i.e. parity. Providing a definition of parity or rough equality - these terms are often taken as similar - is not straightforward, given the persistent controversy over the notion (Griffin, 1997; Wasserman, 2004; Aldred, 2006). Chang (1997, 2002a) maintains that parity is a positive value relation, that is, another relation that requires, or defines, comparability, in addition to "better", "worse" and "equal". She terms parity the relation of options being 'on a par', and points to examples such as where an agent must choose between a career as a lawyer (**l**) and one as a clarinettist (**c**). It may be that the two are comparable, but neither is better than the other, and yet a small improvement in one, a slight improved legal career ($\mathbf{l}^+$), does not make it better that the other (Chang, 1997). In this formulation she does not specify which relation holds between $\mathbf{l}^+$ and **c**; but she simply denies one, thus it appears that $\mathbf{l}^+$B**l**, **l**RE**c** but not that $\mathbf{l}^+$B**c**. Wasserman (2004) says that Chang is wrong to reject the TT and argues that by acknowledging the vagueness inherent in some comparisons the need for relations like rough equality or parity disappears. In Qizilbash's (2000, 2005) view, vagueness of predicates is not only widespread but also leads inevitably to situations of difficult comparability, but accepts that parity is a comparative relation and, hence, incomparability does not follow if none of the standard trichotomy relations hold. Gert (2004) argues that it is not necessary to define the fourth relation of parity if the terms "better than" or "worse than" are redefined in terms of majority consensus. In his opinion, choosing **a** over **b** (ie **a**>**b**) would be justified if the majority would not be surprised by that choice. If no majority exists, i.e. neither choosing **a** over **b** nor choosing **b** over **a** would be deemed irrational by a majority of observers, the items **a** and **b** should be seen as "equal". The notion that community consensus represents truth is a general and long standing view in philosophy and is discussed elsewhere (von Solms, 2011). Harris (2001), on the other hand, argues against Chang's (1997, 2002a) views, but not by trying to

show how the TT can be defended but rather that restricting relations to comparable ones (be that three or four) is wrong and that the existence of incomparability must be accepted. Aldred (2002) mentions five mutually exclusive value relations between two items **a** and **b**: **a**B**b** **b**B**a** **a**E**b** **a**RE**b** **a**IC**b** where B implies "better than", E implies "equal to", RE implies "roughly equal to" and IC implies "incomparability". The first four are equivalent to the relationships of traditional decision theory and constitute the area of comparability. Aldred (2002) uses IC as strict incomparability.

Consequently, the possibility of incomparability, in contrast to Saaty's (2011) general comparability view, warrants closer evaluation. This evaluation will proceed via three routes: (i) the lack of a common measurement scale; (ii) the lack of a proper aggregation method when multiple criteria are involved and (iii) the debate whether values and scales are objectively given or subjectively derived.

4. Comparability and commensurability: The problem of a scale

The dictionary definitions of comparable and commensurable are confusing, but the preponderance of evidence indicates that comparable refers to the examination of items to determine how they may be similar, different, better or worse; while commensurable implies measurable by the same standard or scale of values in terms of size, degree, importance or quality. However, Roget's Thesaurus, a widely-used English Language Thesaurus, gives comparable and commensurable as alternatives (synonyms) of each other. A wide ranging debate exists in the literature in which these two terms are defined as similar, related or different, making any discussion on the topic confusing.

Aldred (2002) mentions incomparability along with incommensurability and indicates that these two terms are often confused and while he argues for keeping incomparability and incommensurability distinct, Qizilbash (2000, 2005), on the other hand, equates these two terms. This begs the question as to how the relationship between incommensurability and incomparability should be understood.

On one hand the two terms are conflated. Raz (1986, 1997), for example, defines incommensurability in terms of incomparability when he says that **A** and **B** are incommensurate if it is neither true that one is better than the other nor true that they are of equal value. Warner (1998) represents a view similar to Raz arguing that reasons are incommensurable when (and only when) they are not comparable as better, worse or equally good. Heuer (2004), too, points out that the Razian account of incommensurability relies on the impossibility of comparison and that incommensurability itself is established by failure of comparison, by the fact that neither of two options is equal in value to, or better than the other. Broome (2000) is another author who sees incommensurability as existing when none of the trichotomy relations are obtained between two items or values. Grimm (2003) states that conflating incomparability and incommensurability is widespread and points to Griffin (1997) who states that what nearly everyone, on reflection, means by the incommensurability of values is their incomparability – that there are values that cannot be acquired on any scale, that they cannot even be compared as to greater, less or equal.

On the other hand, some authors find the conflation of incomparability and incommensurability mistaken. Grimm (2003), for instance, does not believe that incommensurability necessarily implies incomparability. Chang (1997) states that things are incommensurable, when they cannot be precisely measured along some

common cardinal scale of units of value, and incomparable when no positive value relation holds between them – they cannot even be ranked on an ordinal scale. She says that comparability is a necessary but not sufficient condition for commensurability. Pildes & Anderson (1990) agree with this Changian definition of incommensurability, while da Silva (2011) states that incommensurability is not equal to incomparability and that it is specifically the latter that is very important in legal decision-making. Sunstein (1997) makes a very clear distinction between the terms incomparability and incommensurability in opposition to the views of Raz (1986, 1997). Aldred (2006), too, defines incommensurability and incomparability in Changian terms, with the former as measurement and the latter as ranking. Hsieh (2007) uses these terms in an interestingly different way. For him, incomparability ordinarily describes two or more concrete bearers of value of which no positive comparative evaluative judgment is true, while he uses the term incommensurability to describe the way in which two or more abstract values stand in relation to one another. Considering in greater detail the relationship between the incomparability of bearers of value and the incommensurability of abstract values, will be done later (in Section 5) because it is relevant to multi-criteria problems.

It is often argued that commensurability is taken to imply measurement along a common cardinal scale - often monetary (Chang, 1997; Aldred, 2002, 2006; Gowdy & Erickson, 2005). Sunstein (1997) makes it clear that commensurability requires cardinal metrics and that ordinal rankings – which he calls comparability – are not cases of commensurability, but nevertheless important in decision-making. Rauschmayer (2001) defines incomparability in terms of the relations of preference and indifference but quotes the definition of Sunstein (1997) for incommensurability. His view is, however, not exactly the same as that of Sunstein's as Rauschmayer (2001) allows commensurability to be based on both ordinal and cardinal scalable values, while Sunstein (1997) requires cardinal metrics exclusively. Chang (2013) also argues that commensurability requires a cardinal (interval or ratio) scale, while comparability requires only an ordinal scale. Similarly, Luban (2001) defines two types of commensurabilities; R-commensurability and O-commensurability. He says that formally items are commensurable with respect to a certain property (distance, fame, etc) when that property induces a function – more precisely, an isomorphism – placing the items in one-to-one correspondence with elements in some ordered set. This ordered set provides the common measure of the items. The ordered set, in turn, can possess whatever mathematical structure one wishes to impose on it. For purposes of economic analysis it is common to assume the set to possess all the properties of the real numbers and, along with the usual axioms, the function assigning a real number to each item of interest is regarded as a utility function. Luban (2001) defines R-commensurability as: items are R-commensurable if and only if they can be assigned real-valued utilities. If no such utility function exists, the items are R-incommensurable. R-commensurability is what is usually meant by commensurability and correspondingly, the incommensurability-of-values thesis is typically taken as the denial that disparate goods are R-commensurable (Luban, 2001). But he points out that it is important to realize that items may be commensurable in a weaker sense, if their common measure (musical complexity, creative talent, etc.) does not possess the rich mathematical structure of the real numbers. Such goods may be ordinally commensurable, for example, if they are isomorphic to some set whose structure consists of an order- or partial-order relation. This can be called O-commensurability leading to an ordinal ranking of the items. Aldred (2002, 2006) clearly distinguishes commensurability as measurement by a cardinal scale from comparability as comparisons on an ordinal scale. Mather (2002) distinguishes between cardinal measurement and ordinal ranking but labels both as

forms of commensurability – metrical and ordinal commensurability, respectively. Eriksson (2003) states that, to practical reason, (cardinal) incommensurability is bad enough, but worse is (ordinal) incomparability, since this possesses a clear threat to reason-based decision-making. Griffin (1997) captures this idea when he says:

> "(W)hen many of us insist, for instance, that complex decisions about the environment cannot be reduced to cost-benefit analysis because some of the clashing values are incommensurable, we do not just mean that those values cannot be got on to additive cardinal scales, but they cannot be got even on to the ordinal scales that economists are by and large content to work with. … The serious threat to practical reason comes not from, say, a mere breakdown in addition or from the appearance of a lexicographical ordering, but from a breakdown in ranking. That threat is the most important one to confront."

In summary, the relationship between incommensurability and incomparability is complex with the literature either conflating or differentiating the terms. The consensus that is developing however seems to be that commensurability is cardinal measurement while comparability is ordinal ranking of alternatives. If we accept these as working definitions, we are faced with the question of whether rational decision-making can be based on either. From the arguments above it seems as if the answer may be yes; preferred alternatives can be identified either through some form of cardinal measurement or through ordinal ranking and rational decision-making is only under threat if neither process is possible.

This solution however, is only superficially valid because at least three objections threaten its validity; (i) a Measurement Theory objection that cardinal measurement is only available for selected variables and, hence, has a very limited application in decision-making; (ii) the Social Choice objection that ordinal aggregation – either across multiple criteria or multiple decision-makers – is subject to Arrowian impossibility and (iii) the philosophical argument that pluralism implies that no scales – be they cardinal or ordinal – exist to commensurate or compare diverse options. We return to these points in Sections 5, 6 and 7 respectively.

5. Measurement theory: The problem of quantification

The first threat, the Measurement Theory objection regarding cardinal measurement, can be dealt with briefly. The view that only quantitatively measurable data is of real scientific value is promoted within the Traditional Measurement Theory (TMT) in opposition to the Representational Measurement Theory (RMT) (Barrett, 2003; Michell, 1997, 2003, 2008; Acton, 2003). von Solms (2013) discusses this debate and reaches the conclusion that not only must the general critique of the TMT aimed at RMT be rejected but, more importantly, the insistence of the TMT proponents that only tangibles (quantitative variables) can be measured must be rejected because it excludes immediately the possibility of any real world decision-making in which intangibles always play an important role (Forman & Selly, 2001; Saaty, 2001, 2010, 2013; Jackson, 2003; Saaty & Sagir, 2009).

6. All-things-considered judgments: The problem of aggregation

The Social Choice objection requires a more comprehensive discussion. Over and above the problem of a scale there is a second problem in the incomparability debate relating to the complexity of choice situations which manifests in two aspects (Ellis, 2008). First, difficult situations are characterized by comparisons where the evaluations of options need to be based on multiple aspects of evaluation. Second, a related insight is that evaluations, on such multiple criteria, require some form of aggregation to achieve a single overarching relation amongst alternatives. Although

both these themes are found in the comparability literature, solutions are either not discussed or those offered are not satisfactory. Some philosophers are skeptical of the integration (i.e. to aggregate multiple criteria evaluations into an overarching result) and the best developed form of this argument is that some values are incommensurable, they resist integration and so they cannot be brought together to form a single assessment (Ellis, 2008, 2012). Ellis (2008) acknowledges that in principle incomparability may have nothing to do with composite (multi-criteria) values, but that in practice the existence of multiple irreducible ends is at the heart of the incomparability issue. Rauschmayer (2001), too, links the problem of incomparability to that of MCDM when he says that generally speaking, the value system of the deciding individual will contain different values (criteria, points of view), which cannot be reduced to a single measure and, hence, is one of the reasons for the incomparability of decision options. Several authors argue that, particularly in environmental and sustainability decisions, the evaluation procedure cannot rely on a single numeraire (commensurability) but must be based on weak comparability operationalized through multi-criteria evaluations because the world is characterized by deep complexity and that neither the problem situation description nor the viewpoints of decision-makers can be expressed using a single perspective (O'Neill, 1997; Martinez-Alier et al, 1998; Geldermann et al, 2000; Munda, 2004). O'Neill (1997) provides a clear definition of weak comparability by saying that it is based on the idea that the same value can, at the same time, be a good **X** and a bad **Y**, i.e. different descriptions of the issue may lead to different outcomes because a unique single comparative term is not available for the comparison. His example of weak comparability is that the same area can be described both as a pretty scene and as a bad habitat because the invader plants growing there may make the area pretty to look at but not a suitable habitat because of the replacement of natural indigenous vegetation.

Any comparison must proceed with respect to an evaluative covering consideration. ***X*** cannot be better than ***Y***, tout court, but can be better than ***Y*** only with respect to, say, well-being, beauty or morality (Martinez-Alier et al, 1998; Chang, 2004a; Hsieh, 2005a). Just as it makes no sense to say that one stick is greater than another, tout court, it makes no sense to say that one item is better than another, tout court. One stick can be greater than another with respect to length but not mass, and one item be can better than another with respect to beauty but not morality. Comparability is a three-place relation: ***X*** is comparable with ***Y*** with respect to ***C,*** where ***C*** is the covering consideration. This covering consideration can be simple (uni-dimensional) or complex (multi-dimensional). In the complex case ***X*** is better than ***Y***, all things considered, if there is some set of values ($c_1,c_2,...,c_n$), which together comprises ***C***, that are the things to be considered (Chang, 2013). The complex case includes the view that values can form a hierarchical structure. For example, Grimm (2003, 2007) defines two different values, general and contributory – general values represent overarching values with several contributory values which together constitute each general value. He presents two examples. First, in selecting a basketball team the general value could be 'excellence at basketball' with contributory values 'defence', 'shooting' and 'passing'. Second, for awarding a prize in painting, the general value could be 'artistic ability' with its contributing values 'mastery of perspective', 'use of colour' and 'expressiveness'. Boot (2007) distinguishes between covering values and contributing values as follows*:* covering value is a value with respect to which options are compared while a contributory value is a value contributing to a covering value (e.g. 'analytical skill' or 'originality' contributing to the covering value 'philosophical talent').

Covering values often contain more than one contributory value (Harris, 2001). In such complex (multi-criteria) cases, the fact that one alternative (say **A**) can be better than another (say **B**) in terms of some and worse in terms of other criteria (contributing values), is used to identify the alternatives **A** and **B** as incomparable (Munda et al, 1994; Chang, 1997; Geldermann et al, 2000; Rabinowicz, 2008). Rauschmayer (2001) calls this the problem of bi-directionality and points out that it is well known in the literature of the MCDA (Brans & Mareschal, 2005), while Ellis (2008) refers to such cases as conatively mixed. Boot (2007) argues that not all cases of multi-criteria comparisons are problematic, and indicates that if (i) the covering value is one-dimensional or (ii) the covering value is multi-dimensional provided there is no bi-directionality of contributory values, multi-dimensionality does not pose a problem. Seung & Bonevac (1992) state that when two items are compared using a single value-measure (e.g. comparing apples and oranges according to sweetness) the resultant ranking is an algorithmic ranking. If, on the other hand, two items need to be compared using multiple criteria (e.g. comparing apples and oranges on sweetness, juiciness and nutritional content) an algorithmic ranking can only be obtained in the case that one alternative is ranked above the other on all criteria. If, however, apples are ranked above oranges on sweetness; oranges above apples on juiciness and apples and oranges are rank similar on nutrition no algorithmic ranking can be obtained because no super-measure exists that can be used to aggregate the disparate rankings and the only alternative in such cases is indeterminate ranking, which is based on intuition (Seung & Bonevac, 1992). The question is now, how can the problem of bi-directionality be resolved or avoided?

The first approach to address the aggregation problem is philosophical in nature. A necessary feature of comparativist theories is to describe how all the factors are put together because this unity is demanded by the notion of an All-Things-Considered (ATC) judgment. For ATC judgments to be possible they have to have a unity in virtue of which their components (the various factors) have the normative relations they do (Okapal, 2007, 2010). Chang (2004a) clearly feels the need for some form of aggregation to move from individual Covering Values to an ATC judgment and suggests the More Comprehensive Value (MCV) as the integrative factor. She, however, does not discuss or present any practical ways in which the ATC can be obtained (Okapal, 2007, 2010). On the contrary, she identifies the unifying attribute of MCVs as a profound mystery. Chang (2004a) explains the nature of comprehensive factors using a jigsaw puzzle metaphor according to which the correct solution relies on the picture that is created once all the pieces are in place. Her MCV view is like a jigsaw puzzle where the picture is what tells how the pieces go together and Comprehensive Values would be, metaphorically, this picture (Chang 2004b). It is insightful to listen to Chang's (2004a) own presentation:

> "The 'picture' that puts values together is the unity of a more comprehensive value. Although it is hard to explain just what this 'picture' is, it is important to emphasize that the mystery of what makes values hang together is not peculiar to the more comprehensive values approach. Any normative theory that recognizes values is saddled with the problem of explaining their unity…. We have no account of what it is about such values in virtue of which their components (sic) values hang together in the way that they do."

MCV judgments are multi-criteria judgments in which several values together make up the final judgment, which is not found via an aggregation across criteria but via the intrinsic normative structure of the covering value. Chang (2004a) argues that there seems to be no practical way to establish the unifying principle except that she

explicitly argues against it being in subjective criteria weighting[1]. Okapal (2007, 2010) agrees that the Changian approach lacks clarity in the details and presents – what he calls – a sophisticated orthodox approach. But this approach also provides little practical guidance as to how aggregation is achieved via normative-level criteria, interaction principles and judgment. Mason (2011) argues that there is a problem in understanding quite what a synthesizing category or covering value is, and how the covering value determines the relative weightings of the constituent values. One possibility is that it does it by pure stipulation - as a martini just is a certain proportion of gin and vermouth. However, stipulation does not have the right sort of explanatory power (Mason, 2011). Tiberius (2008), too, criticizes the More-Comprehensive-Value approach by indicating that it is unclear what kind of explanation the MCV can offer for the respective weights of different conflicting values. Although such mysterious attributes may be philosophically interesting, this is an extremely unsatisfactory notion for practical real world decision-making and relies implicitly on the assumption that covering values are objectively given and not subjectively derived by the decision-makers, a theme we return to in Section 7.

The second approach lies in the attempt at aggregating ordinal rankings. As mentioned above, the suggestion was that the threat of (cardinal) incommensurability could be avoided by using ordinal ranking to achieve comparability. This is, however, problematic.

First, ordinal comparability also runs afoul of bi-directionality as demonstrated by examples in Roy & Vincke (1984) and Seung & Bonevac (1992). One approach to decision aiding, trying to accommodate incomparability rather than avoid it, is outranking (Bisdorff, 2004). The American MAUT tradition is based on the principle of general comparability, thus representing an epistemicist tradition while the outranking methods of the French school of MCDM accept that not all items are necessarily comparable, hence, representing a more incomparabilist tradition, within which incomparability is accepted as inevitable and honoured as representing decision situations more realistically (Simpson, 1996; Coello Coello, 2000; Brans & Mareschal, 2005; Geldermann et al, 2000; Vincke, 2000; Bouyssou, 2001). Within the outranking methods two candidates **A** and **B** are deemed incomparable in cases where the problems are multi-criteria comparisons and contradictory (bi-directional) evidence of which candidate is preferred emanates from different criteria (Roy & Vincke, 1984). The significance of the notion of incomparability lies – as in the Seung & Bonevac (1992) case - not in the multi-criteria aspects of the problem, but rather in the aggregation aspect, i.e. in trying to find an overall preference from the conflicting information. The infrequent existence of a dominance relationship and the resulting high incidence of incomparability necessitate the search for additional information to help reduce the number of incomparabilities. Different outranking methods use different sets of additional information to achieve this (Brans & Mareschal, 2005). Aggregation of ordinal rankings can be attempted either using a dominance relationship as in the outranking methods, or a different approach is to attempt to integrate diverse options based on ordinal rankings and some associated decision rules (Greco et al, 2005; Dembczyński et al, 2007).

Second, ordinal aggregation has serious problems of its own. In a multi-criteria environment, Rauschmayer (2001) argues, incommensurability can occur at two levels; first, when comparing options in terms of criteria – called criterial

[1] Here the focus is on the lack of clarity as to how the covering value facilitates aggregation, the objection to subjective criteria weighing will be discussed below in Section 7**.**

incommensurability and second, aggregate incommensurability when attempting to find the relative importance of the criteria. If incommensurability is assumed to be a serious issue in rational decision-making, and the decision maker can only make use of ordinal data at both these levels, decision between options will not be possible. From this Rauschmayer (2001) emphasizes that the way in which MCDM aggregation is done critically affects the success of decision outcomes and concludes that (i) both criterial as well as aggregate incommensurability leads to incomparability; (ii) ordinal aggregate commensurability leads - at best - to limited comparability and (iii) only cardinal criterial and aggregate commensurability guarantee general comparability. Because the weighting of criteria before comparing options on the different criteria is necessary, but an ordinal weighting process is problematic - ordinal weighting makes no sense other that providing a ranking of the criteria (Vargas, 1994). Ordinal rankings are informationally poor and cannot provide an adequate basis for a proper comparison process (Sen, 1995). These problems emanate from Social Choice Theory and include Arrow's impossibility theorem and the Condorcet and Borda voting paradoxes (List, 2013; Arrow, 1951). Both outranking methods and methods using ordinal ranking plus decision rules are linked to Social Choice Theory (Greco et al, 2005; Munda, 2012). These problems are exacerbated in the Group Decision-making (GDM) environment. Nooteboom (1984) shows that intransitivity flows from preference orderings when multiple (conflicting) criteria are involved and points out that this is similar to Arrowian Impossibility in Social Choice Theory. The latter deals with diverging inter-personal preference orderings while the former relates to intra-personal preference conflicts. May (1954) suggests an intra-personal analogue to Arrow's impossibility theorem showing that an individual's response to a plurality of values will, given certain additional assumptions, lead to intransitive preference orderings. Hurley (1985) challenges May's (1954) assumptions – specifically, universal domain and independence of irrelevant alternatives - as implausibly strong in the intra-personal case; but her work does not exclude the possibility that values may disobey the canon of rationality that insists on transitivity (Edmundson, 2009). Pildes & Anderson (1990) identify radical incommensurability as resulting when individual or collective value judgments fail to converge on a confident, complete ranking of the options at stake. This indicates that incommensurability is not only a phenomenon – as it commonly appears in the incomparabilist literature – of an individual that cannot compare items or options, but clearly also a problem due to incomparability being caused by multiple judges not agreeing. So, even if individuals could compare options but as a group cannot come to a substantive consensus – either on which values to apply or how options rate on these values (criteria) – this could be seen as instances of incomparability. Kornhauser (1998) states that arguments concerning incommensurability have a formal structure that parallels the structure of arguments concerning the appropriate aggregation of interests of different individuals and, incidentally, calls the inability of an individual to come to a consolidated all-things-considered judgment in a multi-criteria situation radical incommensurability. The structure of the problem of incommensurability thus parallels the problem of collective choice. Bouyssou et al. (2000) agree saying that aggregating the opinion or the preferences of voters or individuals of a community into collective or social preferences is a problem quite similar to devising comprehensive preferences of a decision-maker from a set of conflicting criteria in MCDA. The discord amongst the views of different group members is analogous to the discord amongst the perceptions of a single decision maker and similarly leads to indecision – only in GDM both intra- and well as inter-member indecision could be present simultaneously. If ordinal ranking is applied to multi-criteria problems the Arrowian-type inconsistencies are magnified (Arrow & Raynaud, 1986). The complication in

Group Decision-Making is that both the aggregation of group members' individual ordinal rankings and the aggregation of different criteria rankings (if done ordinally) are subject to Arrowian inconsistencies (Hurley, 1985, 1989; Coello Coello, 2000; Boot, 2009). As long as ordinal scales are used in multi-criteria or GDM situations the demon of incomparability will remain.

An attempt to avoid the problem of ordinal ranking is to use a lexicographic approach. Assigning lexical priorities means that one value gets absolute weight in relation to another and always receives priority in case of value conflicts (Boot, 2007). The Lexical Priority Approach avoids the problem of determining equivalence relations between values because a lexically prior value, however small its amount, always gets priority to another value, however large its amount. Boot (2007) argues that a scheme of lexical priorities seems more capable of resolving value conflicts than the Relative Weight Approach because the former does not require a (subjective) equivalence relation which is problematic in cases of heterogeneous values. However, the Lexical Priority Approach has its limitations because, as Boot (2007) demonstrates, there are few, if any, values that earn an unconditional lexical priority to other values and we have to fall back on balancing the relevant values by assigning relative weights in order to be capable of rationally resolving value conflicts. Chapman (1998) states that a Lexical Priorities Approach honours incommensurability better because it does not try to commensurate criteria that do not have a common measure. He suggests a method where the criteria are used singly and in a particular order, called the conceptually sequenced argument. This method, however, results in different selections depending on the order in which the criteria are used, indicating that although no relative weight is explicitly allotted to criteria, the order acts as if the first criterion is allocated more weight than the criteria used subsequently. Chang (2001) points out that the view of Raz (1986) on constitutive incommensurability and that of Anderson (1997) on hierarchical incommensurability are similar to each other. Both views are similar to Boot's (2007) lexical incommensurability, arguing that certain values are, by nature, of a higher status than others and that this makes any attempt at comparison between higher and lower values wrong. The paradigm example involves friendship and money. Comparing friends to monetary gain bars the comparer from being a (true) friend because it is constitutive of friendship that friends are to be considered more important than mere monetary gain (Raz, 1986; Anderson, 1997). Chang (2001) says that the arguments of many authors (including Raz and Anderson) in favour of constitutive incommensurability can be answered with an account of emphatic comparability in place. She concludes that if a certain token of one value is seen as lexically (or constitutively) higher than a token of another value, instead of regarding this as a case of incommensurability, it could more accurately be seen as a case of comparability with the higher value regarded as emphatically better than the lower value (Chang, 2001, 2013).

In summary, the impracticality of the MCV approach ; the limited applicability of the Lexical Priority Approach and the Arrowian impossibility problem in ordinal aggregation approaches brings us back full circle to the use of cardinal scales and the incommensurability issue (Tiberius, 2008; Okapal, 2007, 2010; Mason, 2011; Chang, 2001, 2013; Boot, 2007; Hurley, 1985, 1989; Vargas, 1994; Coello Coello, 2000; Forman & Selly, 2001; Saaty, 2001, 2010).

7. Incomparability, objective or subjective values and scales?

We have come to an impasse. On the one hand, using cardinal scales to commensurate objects or actions was found to run afoul of the incommensurability thesis; while on the other hand, ordinal comparisons were shown to falter on aggregation into all-things-considered analysis due to Arrowian impossibility. This leaves rational decision-making in a quandary because without some form of rating or ranking the best alternatives cannot be identified making rational choice impossible. One aspect of the incommensurability debate that is relevant here but not normally explicitly discussed is whether values are to be seen as objectively given or subjectively found. The answer significantly impacts if and how comparisons are performed and comparison scales developed. In our earlier discussions, questions of what incommensurability or incomparability involves were discussed along with questions as to how these issues affect choice, but exactly why incommensurability and incomparability exist was not evaluated. In the debate regarding objectivism or subjectivism in value, the possibility of identifying a source for the problems of incommensurability and incomparability presents itself. Before turning to a possible solution for the incommensurability/incomparability impasse some discussion of the objectivism/subjectivism debate will prove fruitful.

In general ethics, philosophers actively and explicitly debate whether good is objective or subjective. On the one hand are arguments for value anti-realism, i.e. subjectivism about values (Mackie, 1977; Thomson, 1997; Fehige, 2006; Heathwood, 2014), while on the other hand strong arguments are raised for value realism (Railton, 1986; Arneson, 1999, 2010; Oddie, 2005; Bradley, 2014). Arneson (1999) says that in this philosophical debate, different questions have been asked under these two descriptions, that of good as objective or subjective. Subjective theories of human good are sometimes taken to be those that make welfare depend at least in part on some mental state. The intended contrast is with objective theories of well-being which make the well-being of an agent depend entirely on states of the world apart from the state of mind of the agent whose well-being is under review. This, Arneson (1999), claims is a coherent usage, but potentially confusing. He prefers to let the contrast between objective and subjective mark the contrast between (i) views which hold that claims about what is good can be correct or incorrect and that the correctness of a claim about a person's good is determined independently of that person's volition, attitudes, and opinions and (ii) views which deny this. Oddie (2005) defines value realism as the thesis that value claims; (i) can be literally true or false; (ii) that some such claims are indeed true; (iii) that their truth is not simply a matter of any individual's subjective attitudes or even of the attitudes of some larger collective. The Subjective Theory of Value, on the other hand, is a theory of value which advances the idea that the value of a good is not determined by any inherent property of the good, nor by the amount of labour required to produce the good, but instead value is determined by the importance an acting individual places on a good for the achievement of their desired ends (Rorty, 1991; von Mises, 1998; Heathwood, 2014).

Linking this debate with the one regarding incomparability, Rauschmayer (2001) indicates that the philosophical debate about Incomparability is marked by three oppositions of which the second is about the origin of value(s); i.e. whether they are objective or subjective - values are somehow given and not subject to conscious change (objective), or they are constructed by practical reason in the decision process (subjective). Mather ([2002) distinguishes between real and rational incommensurability where real incommensurability results due to objective

evaluative facts in reality outside of (and beyond) human knowledge and belief, while rational Incommensurability implies that the ranking of items cannot be made by human judges according to the rational principles. Boot (2007) concludes that it is often impossible to rationally and objectively (instead of intuitively and subjectively) weigh the different types of values involved in a decision situation and to rationally and objectively resolve their conflicts. He argues that this impossibility is due to incomplete comparability of the relevant options, which in its turn, is largely caused by incommensurability of the relevant values.

However, different authors' objectivist/subjectivist stances are not always explicit in the incommensurability/incomparability literature. Often the case for (or against) commensurability is phrased in terms that imply an objective view of value. So, for example, is incommensurability often defined as the case where two values (**A** and **B**) are incommensurable because no measure exists by which both **A** and **B** can be measured (Raz, 1986, 1997), or it is also seen in, for example, the question 'Was Mozart more creative than Michelangelo?' (Laitenin, 2008; Klocksiem, 2010). In both these cases the impression is created (albeit not explicitly stated) that the measurement (or comparison) of objects must rely on a pre-existing objective fac*t* as to their relative value - a fact that must be discovered from the structure of reality rather than established via the preferences of decision-makers. Boot (2007) is more explicit than most, indicating that comparisons can be done either in a subjective or objective way, but identifies subjective comparisons as cases of incomplete comparison. To the extent that judgments are not merely based on objective amount comparisons but also on subjective importance comparisons, they are not the result of a completely rational comparison.

That any plausible theory of practical reason must be comparativist in form is a frequent point made, over a number of years, by Chang (1997, 2004c, 2012, 2013). It is no wonder then that Okapal (2010) believes Chang to have developed the most detailed comparativist view. Okapal (2007, 2010) criticizes this view, not because of its comparativism, but rather in terms of its insistence on covering values at the expense of other more orthodox views. For our purposes, however, it is the light that this critique sheds on the debate about the objectivity or subjectivity of value that is of importance. Ruth Chang not only publishes widely within the incommensurability/incomparability field but she is also frequently critiqued by other authors (and her views can fruitfully be considered as a starting point when discussing the objectivity/subjectivity issue (Chang, 1997, 2001, 2012, 2013; Anderson, 1997; Broome, 1997, 2000; Gert, 2004; Boot, 2007, 2009; Okapal, 2007, 2010) . Okapal (2007, 2010) reads Chang (1997, 2002b, 2004c) as arguing for a situation that values are somehow given and fixed in decision-making situations. The Changian MCV approach is a case in point as aggregation is found via the intrinsic normative structure of the covering value and not via any subjective criteria weighting because the criteria (covering values) possess an inherent, objective unifying principle even if individual judges do not know what it is (Chang, 2004a). Okapal (2007, 2010) characterizes the core idea in the Changian system as that for any given choice situation a single, comprehensive factor exists that determines choice. Interpreting the jigsaw puzzle metaphor of Chang (2004a, 2004b) in a literal (strong) way, Okapal (2007, 2010) reaches the conclusion that this implies that the Changian Comprehensive Value Approach accepts these factors as static, complete and given to the decision-maker, and that this precludes any genuine disagreement, because in any disagreement (at least) one of the parties must be wrong. The impression that Chang (2002b) proposes an objectivist approach also seems clear from her own statement that by 'the justification of choice' she has in mind the all-in,

normative, undefeated, objective ground of or reason or warrant for choice. This, however, remains obscure because, a few paragraphs later, she says that although she focuses on the objective justification of choice the same arguments can be adjusted to apply to justification subject to an agent's foibles (sic). She mixes statements of objects having value with statements regarding agents having reasons to value these objects in a way that makes it difficult to see whether she is arguing for intrinsic (objective) value or more subjective value instilled by the agent's valuation (Chang, 2004c). For example, she often refers to 'evaluative facts' about objects and actions but it is not clear as to where the facts are located. An example she uses is the choice to eat ice cream – it is not clear whether she sees the value of this as based on the physical and chemical properties of the ice cream (objective) or on the agent's (subjective) valuing the taste and pleasure of enjoying an ice cream. Chang (2004c) identifies desire-based accounts, in which all practical reasons are grounded in the present desires of the agent; justification has its source in the fact that an agent wants it. In opposition to these she identifies value-based accounts, reasons for acting are provided by facts about the value of something, where being valuable is not simply a matter of being desired. It is not the fact that an agent wants something that makes having it valuable – it would be valuable even if the agent does not desire it.[2] Chang (2004c) feels that the conflict between these two stories is striking because it is so stark; desire-based theorists think that all reasons are grounded in desires while their value-based opponents tend to think that none are, and as with many such conflicts, the truth may lie somewhere in the middle – the position she argues for. Chang (2013) is concerned that evaluation is often done in the abstract rather than in terms of substantive considerations. She says that there is good reason to think that values do not rank themselves in the abstract but are rather ranked by substantive covering values. This, however, still sounds as if the covering values do the ranking independent of the decision-maker's preferences or goals and it seems that Grimm (2007) reads the Changian view as objective, i.e. that measures exist and rank options vis-á-vis humans measuring and ranking.

In a more explicit discussion, Hsieh (2007) states that values are incommensurable if and only if there is no true general overall ranking of the realization of one value against the realization of the other value. This (as mentioned above) is the definition of value realism - the thesis that value claims can be literally true or false and that their truth is not simply a matter of any individual's subjective attitudes (Arneson, 1999, 2010; Oddie, 2005). Richardson (1994) defines strong commensurability as the thesis that there is a true ranking of the realization of one value against the realization of the other value in terms of one common value across all conflicts of value. A denial of such a singular common value, however, does not rule out what Richardson (1994) calls weak commensurability - the thesis that in any given conflict of values, there is a true ranking of the realization of one value against the realization of the other value in terms of some value. Another conception of value incommensurability denies both strong and weak commensurability claiming that in some conflicts of values – in cases where the gain in one factor cannot compensate for the loss in another factor - there is no true ranking of values. Hsieh (2007) points out that several authors argue for different external (non-comparativist) sources of commensurating value. He concludes, however, that even if these are external

[2] Chang (2004c) identifies versions of the Value-Based view, according to which it is not strictly the evaluative fact that provides the reason but the facts upon which the evaluative fact *supervenes*. The Supervenience debate is vast and complex (Dorsey, 2012) but will be ignored here, because our argument stands whether Objectivism is based on Evaluative facts or on the facts on which they supervene.

sources of commensurating value, it does not follow that they provide a systematic resolution to value conflicts because two individuals can still resolve the same value conflict differently. The fact that it may be rational to resolve the same value conflict in different ways, points to the possibility of value incommensurability, i.e. that no true ranking of options exists. The aspect of truth is not always clear within the incommensurability/incomparability discussions but is central to the general ethics debate. Value realism relies on the idea of truth, specifically, truth as correspondence with facts. Truth, however, is an elusive concept and particularly the realist interpretation is widely criticized (Rescher, 1973; Checkland & Scholes, 1990; Rorty, 1991; Jackson, 2003; Bowden & Swartz, 2004; Mingers, 2008). Mather (2002) points out that the concept of truth is ambiguous, and - particularly the realist version - is probably beyond the reach of human decision-makers. Mather (2002) tries to circumvent the problems the realist version of truth presents to decision-making by distinguishing between real and rational truth; real truth resides in moral realism while rational truth implies that the truth of propositions are determined by human judges in deliberative processes applying rational principles. Arneson (1999) mentions that one criticism of the objective list theories is a skeptical doubt that there is no rational way to determine what putative goods qualify as entries on such a list. Although he does not discuss it any further, he acknowledges that this doubt is a genuine worry. Crisp (2013), on the other hand, does criticize Objective List Theories for, inter alia, this exact reason. The problem of how to understand truth leads to the view that mistaken decisions are often based on a lack of full information or the presence of cognitive bias and several authors, consequently, argue for a full information account of the good (Railton, 1986; Arneson, 1999; Carson, 2013). Railton (1986) defines a person's non-moral good as consisting in what he would want himself to want, or to pursue, were he to contemplate his present situation from a standpoint fully and vividly informed about himself and his circumstances, and entirely free of cognitive error. These full information accounts are not without critics (Rosati, 1995; Murphy, 1999). The criticisms vary but what must be accepted here is that such an idealized decision-maker is of no use in practical decision-making because, given that the real truth is guaranteed only by ideal cognitive circumstances – by optimal coherence with a perfect data base that we do not have, rather than by apparent coherence with the sub-optimal data base we actually do have, we have no categorical assurance of the actual correctness of our inquiries, and no unqualified guarantee that they provide the real truth (Rescher, 1973). The problem and limitations of a realist view of truth in the context of decision-making were identified and discussed elsewhere (von Solms, 2009, 2011).

The debate regarding objective/subjective incommensurability or incomparability is important also regarding the establishment of scales. Are scales given by the structure of reality, i.e. do different values exhibit fixed, predetermined amounts of value derived from a universal hierarchy of values? Can values be measured on fixed, predetermined scales or failing that must they be deemed incommensurable - in principle - because no universal scales exist in nature? Alternatively, the subjective side of the debate argues for measurement or comparisons that rely on human preference and choice. The implication of this is that scales must be developed by decision-makers using logical and rational principles – Mather's (2002) rational commensurability.

In summary, incommensurability or incomparability based on an objectivist comparativism leads to serious problems because accepting that measurement or comparisons must proceed via existing scales or hierarchies and accepting that, in many cases, such scales or hierarchies are not available, practical decision-making is

seriously compromised. This problem is arguably attested to by authors in the incommensurability/incomparability literature when attempts are made to escape the dilemma. The first line of argument is to avoid comparativism by substituting other bases of choice, e.g. agency or practical reason and a second line of argument is to include indeterminate choices into comparativism via terms like parity; rough equality; clumpiness or vagueness (Raz, 1986, 1997; Anderson, 1997; Chang, 2002a; Griffin, 1997; Hsieh, 2005a; Broome, 1997, 2000; Harris, 2001). A subjectivist solution, discussed above, is Social Multi-Criteria Evaluation (but this is based on weak comparability which involves ordinal multi-criteria evaluations which was shown to falter on Arrowian impossibility. In the light of these problems, Saaty's (2010, 2011) form of comparativism should now be considered as an alternative solution (Munda, 2004; O'Neill, 1997).

8. A solution to the problems of incomparability – Saaty's comparativism

The first problem identified above was that of scale; the debate regarding incommensurability vs. incomparability. Working definitions emanating from this debate resulted in using incommensurability in cases where no cardinal scale exists to measure options while incomparability exists when no ordinal ranking can be achieved amongst options. By using cardinal scales (ratio/absolute) based on comparisons, Saatian Comparativism bridges this incommensurability/incomparability gap. By realizing the possibility of establishing cardinal scales through a process of pairwise comparisons and appreciating the mathematical requirements of this process, AHP achieves commensurability via comparability. Saaty (2010) argues that many people think that measurement needs a physical scale with a zero and a unit to apply to objects or phenomena. He points out that this is not true. Surprisingly, he says, accurate and reliable relative scales - that do not have a zero or a unit – can be derived by using human understanding and judgments. Decision-makers can apply their minds and understanding to make comparisons; and these comparisons can be made on a meaningful scale.

The second issue discussed was the argument – mainly from Traditional Measurement Theory – that we cannot measure intangibles and that true measurement is only possible for objects that can be shown to be quantitative. Saatian Comparability does not only argue against the view that intangibles cannot be measured but also provides a mathematically sound alternative in which intangibles are included along with tangible variables in measurement via comparisons and, hence, in decision-making (Saaty & Sagir, 2009; Saaty, 2010, 2013).

The third problem was that of aggregation in culti-criteria decision-making situations. The problem of multiple criteria decisions was shown to emanate from attempts to combine evaluations on diverse (conflicting) criteria. This problem, named bi-directionality, is a result of the use of ordinal scales where proper weighing of criteria importance is not done adequately. The problem – Arrowian impossibility - identified in Social Choice Theory presented by voting-style ordinal evaluations, is conclusively removed in Saatian Comparativism by the use of absolute scale values (Saaty & Vargas, 2005; Saaty & Peniwati, 2008). GDM presents a similar problem when preferences of a single decision-maker are combined into an overall group preference structure, but here too Saatian comparativism provides for aggregation via consensus or geometric mean calculations or via a combination approach in the 3-phase application of the AHP (Forman & Peniwati, 1998; Saaty & Peniwati, 2008; Saaty, 2010; von Solms & Peniwati, 2001).

The last, and possibly the most important, aspect of the incomparability debate was that of whether values and preferences are subjective or objective. The search for an objective, eternal and universal hierarchy of values applicable to all decision-makers in all decision situations leads inevitably to an acknowledgement of incomparability as we find that such a hierarchy does not exist, or is at least not available to human decision-makers. In contrast, Saatian Comparativism is based on the acceptance of the futility of searching for 'pre-determined' cardinal scales, ordinal hierarchies or lexical priorities as a general method. On the contrary, the human need for and ability to compare is not taken seriously enough and we must accept the innate ability of human agents to express preferences through comparisons. Instead of seeking for universal ranking of values the AHP focuses on providing decision-makers with a way of prioritizing issues in a specific decision situation relevant to the specific environment of the particular situation, the objectives of the people involved in that decision and the issues at the heart of this decision (Saaty & Peniwati, 2008). The AHP depends on the knowledge and experience of people and varies from problem to problem. Saaty (2010) says that the AHP relies on judgments and is therefore subjective because judgments can differ from one person to another, while Saaty & Vargas (2012) say that the AHP provides the objective mathematics to process the inescapably subjective and personal preferences of an individual or a group in making a decision. In Saaty's (2000) own words:

> "What does it mean to be objective? If all reality is a matter of interpreting stimuli and information according to our needs and goals, then it is meaningless to speak of universal objectivity. Facts, numbers and other stimuli are regarded by each person according to a certain purpose. Unless purpose and the experience behind it are identical for all people, it is futile to insist that they all look at a datum with the same sense of priority or urgency. What we need is to persuade each other of the usefulness for all concerned to see things from the standpoint of some interpretation. ... We are all conditioned and biased by our family, environment, the teachers who teach us and the books we read."

No wonder then that Vargas (1994), when comparing AHP to MAUT and outranking methods, specifically mentions that the composition principles are just as subjective as the concept of independence on which they are based. He claims that the basic distinction with the AHP is that from the start, it assumes that all is relative and subjective.

9. Conclusion

The debate regarding incomparability was seen to be varied and intense making a perfunctory or uncritical acceptance of comparativism wrong. Many reasons for incommensurability or incomparability were highlighted. The first conclusion reached from our discussion is that Saaty's (2011) view - that comparison forms an important aspect of logic - is confirmed and although incomparability seems a serious problem, a solution seems to exist in Saatian Comparativism. A second issue that became apparent during our review of the literature is that the work of Tom Saaty is not reflected in the incomparability or incommensurability literature as far as the current author could establish. The only references to AHP are found in (i) the outranking literature arguing that the AHP is based on general comparability while the ORMs honour and incorporate incomparability and (ii) the decision theoretical literature where mostly the mathematical or axiomatic aspects of AHP that are discussed. The incommensurability/incomparability literature is void of any mention of the philosophical and logical contributions made by Saaty to the comparability debate and to the sound mathematical methodology underpinning his views. The

comparativism debate can only be enriched if, on one hand, the AHP/ANP literature recognizes the problems and concerns regarding comparativism raised by the incommensurability/incomparability authors. On the other hand, the comparability literature should seriously consider Saatian Comparativism and the solutions it proposes. This paper is an attempt to help initiate a fruitful dialogue between these groups.

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