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HOMOGENEITY AND CHOICE AGGREGATION IN THE ANALYTIC HIERARCHY PROCESS

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Summary: In this paper, we pay attention to a particular dilemma of group decision-making. On one hand the AHP is said to be based on the homogeneity of judgments and that choice aggregation – via the geometric mean – should be used only if the input judgments are homogeneous. On the other hand examples of the use of AHP are found for cases where the input judgments were heterogeneous as measured by the Compatibility Index. The need for multi-stakeholder group decision-making – involving high heterogeneity - gives additional reason for re-evaluation of a homogeneity requirement in the AHP. Homogeneity as AHP fundamental, different ways of measuring Homogeneity and the problems of using debate and consensus to harmonize judgments are discussed. No satisfactory (unique) aggregation rule exists for heterogeneous inputs, neither in the Social Choice nor the Subjective Expected Utility frameworks, and the question is asked whether this also holds for the AHP. No solution is suggested – this is indicated as an open area for future research.

1. Introduction

The AHP is often used as a group decision-making (GDM) method and has several advantages in GDM [Peniwati, 1999]. Aggregating the individual views of group members into a single view for the group is an essential process of GDM. It is, hence, important to evaluate how AHP facilitates this process. Chwolka & Raith [2000] distinguish two processes; the first is that of debate and consensus formation, which they call *choice harmonization*, while the second – called *choice aggregation* - uses the geometric mean of individual judgments as a means to resolve a lack of consensus. In the latter case AHP is seen as being based on the homogeneity of judgments [Mardle et al, 2004]. In practice this requirement is, however, difficult to meet. From a group dynamics perspective problems exist both in groups exhibiting a high degree of cohesion and homogeneity – the groupthink phenomenon - and in processes that endeavor to harmonize opinion through discussion and debate. In the latter case homogeneity is achieved, often, at the cost of decision quality due to phenomena such as Polarization, Pressures to Conform or Domination by powerful members. As Environmental Management, Sustainable Development and Corporate Social Responsibility become more and more important in corporate governance; the need for multi-stakeholder GDM will increase with the accompanying increase in input heterogeneity. In the light of these problems, all becoming more acute in the multi-stakeholder group environment, the homogeneity requirement has to be seriously reconsidered.

Before discussing homogeneous judgments it is necessary to point out that homogeneity will be used, in this paper, to denote the similarity between judgments (or priorities) of individual group members. It should not be confused with two other uses if the term. First, to denote the fact that elements (criteria, sub-criteria, alternatives) being compared should, ideally, not differ by more than one order of magnitude (eg not to compare a blueberry and a watermelon directly as to relative size [Saaty, 1999a: 142]). Second, the use regarding aggregation of individual judgments, the Homogeneity Condition (H). For ratio judgments this means that if all individuals judge one element to be u times as large as another element, the synthesized judgment should also be u times as large [Saaty, 1999b: 31].

2. AHP and Homogeneous Judgments

2.1 Homogeneous Judgments as AHP Fundamental

Although homogeneity of judgments between different judges is not included in the four axioms [Saaty, 1986] nor listed as one of the seven pillars of the AHP [Saaty, 1999b], the importance of homogeneity is argued by Mardle et al [2004], Zahir [1999] and Saaty & Vargas [2004]. Particularly, Basak [1988] is adamant that only homogeneous judgments can be aggregated. Peniwati [1999] argues both that one cannot, in practice, expect a small range of individual judgments and that this necessitates the use of debate to increase the level of coherence. She seems to implicitly agree with Basak [1988] that one cannot simply aggregate heterogeneous individual judgments. On the other hand, we find references that do not explicitly advocate homogeneous judgments as fundamental. It is not discussed in two of the fundamental books on AHP/ANP [Saaty, 1999a, 2001] neither is it mentioned in Forman & Selly's [2001] extensive discussion of the AHP. Peniwati [1996a: 72] argues that homogeneity, albeit preferable, cannot always be achieved in practice and that the most important element required for effective group decision–making is the consistency of the group outcome even if the individual results are incompatible. Dyer & Forman [1992] discuss several applications of the AHP in group decision situations over a wide range of group heterogeneity while Petkov & Mihova-Petkova [1997] advocate the use of AHP in problem contexts with a high degree of input divergence, presenting - as a particular strength of the AHP - the assistance AHP provides to GDM in pluralist situations.

2.2 AHP Axiom 4 and Arrowian Impossibility

AHP's Axiom 4 states that *all* elements, and judgments regarding these elements, should be included to ensure expectations, regarding the outcome, are properly satisfied [Saaty, 1986], [Harker & Vargas, 1987]. This axiom is not stated explicitly in terms of input homogeneity but it seems reasonable to assume that, if some group members' judgments were excluded solely on the basis that such judgments are different from that of other members' judgments, this axiom would be violated. The celebrated theorem of Social Choice Theory, Arrow's Impossibility Theorem [Arrow, 1951], relates to the ordinal aggregation of individual preferences into a group preference. One of the conditions stipulated for such an aggregating function (Social Choice Function) is that of Universal Domain (UD). The UD criterion requires that the choice function accept a considerable amount and diversity of information from group members about their preferences. Since Arrow [1951]analyzes whether and how members' preferences might be aggregated to reach a collective decision, and since there is no *a priori* reason to expect members' preferences to adhere to any pre-ordained pattern, it makes sense to require the method of aggregating preferences to work no matter what the members' preferences may be. The UD Stipulation thus, states that the choice function must accept from each group member *any* ranking of the alternatives. The AHP with its use of cardinal preferences in the form of ratio scales has removed the Arrowian impossibility [Peniwati, 1996b], [Saaty & Vargas, 1996]. This implies that all 5 the stipulations for a SCF can be simultaneously achieved unlike, in the ordinal case, where at least one has to be violated. By implication the stipulation of UD is also met and, hence, both homogenous as well as heterogeneous judgments are (in principle) included in the valid domain of the AHP's aggregation via the geometric mean of both judgments and priorities.

2.3 Measuring Homogeneity

The term Consistency is sometimes used in the sense of stating that the preferences of two individuals are consistent, by which is meant that these judgments are *similar* or *homogeneous*. Homogeneity as defined here, however, cannot be measured using the AHPs *Consistency* Ratio (CR) as the CR measures *intra*-judge consistency and not *inter*-judge comparability. When measuring *inter*-judge comparability the Compatibility Index (SI) [Saaty, 1994] is appropriate. The CR and SI calculations and targets are discussed elsewhere [Saaty, 2001] and are repeated here, without discussion, for sake of continuity. Perfect consistency implies a CR = 0.0 with the target to maintain consistency to a CR [0.10. Perfect compatibility implies a SI = 1.00 with the target to maintain compatibility to a SI [1.10.

Two example situations illustrate the difference between the use of CR and SI. If 2 judges I and II judge 3 criteria A, B and C as follows:

Situation 1 Judge I: Prefers A to B=3; B to C=2 and A to C=6. Judge II: Prefers B to A=3; C to B=2 and C to A=6.
Situation 2 Both Judge I and II: Prefer A to B=3; B to C=2 and C to A=6.

TeamEC^{TM} gives for Situation 1 the CR of both judges and the Group as zero, although the judgments are diametrically opposite with the SI = 5.821, while for Situation 2 it gives a CR = 1.533 for both judges and the group. In this case SI = 1.00 indicating exact compatibility between the judges.

In sum, in Situation 1, the judges are internally transitive hence a CR of zero, although their respective judgments are exactly reversed, ie heterogeneous. In Situation 2, on the other hand, the judgments of the judges are identical (homogeneous) but both are internally intransitive, hence a CR = 1.533. The SI specifically measures the similarity between 2 judgment matrices. As demonstrated in the examples above, a SI of 1.00 indicates that the matrices are identical while a comparison between 2 differing matrices gives a SI-value > 1.10 - 5.821 in the case of Situation 1. So, CR correlates with intra-judge *consistency* (transitivity) irrespective of judgment heterogeneity while, on the other hand, SI correlates with inter-judge *homogeneity*.

Recently, Saaty & Vargas [2004] developed a new homogeneity measure, the Geometric Expected Value (GEV) Operator. They show that homogeneity can be measured on three levels: (i) For a single paired comparison (monogeneity); (ii) For an entire matrix of paired comparisons (multigeneity) and (iii) For a hierarchy or network (omnigeneity). The GEV Operator is a measure of monogeneity, ie the homogeneity of single paired comparisons. Saaty & Vargas [2004] argue that multigeneity should be measured using the Compatibility Index. This paper will focus on comparing pairwise judgment matrices and will, hence, use the Compatibility Index to measure homogeneity. At least two other measures of homogeneity are available. First, Basak [1988] suggests a statistical measure of homogeneity – the Likelihood-Ratio Test Criterion. This well-known statistical device is used to determine whether the judgments of a number of individuals can be seen as forming a homogeneous or a heterogeneous group as she is adamant that only judgments from homogenous groups may be aggregated. Second, Zahir [1999] proposes a Vector Space formulation of the AHP, and uses geometric closeness of vectors to identify homogeneous and heterogeneous sub-groups.

3. Empirical Evidence Regarding Homogeneity

When applying the SI-measure to both synthetic and real groups the magnitude of the dilemma is indicated. The question is: How divergent can judgments be before resulting in SI-values exceeding 1.10? Let us assume a hypothetical group of 6 individuals providing judgments on 4 criteria A, B, C and D and, if the judgments are as depicted in **Table 1**, this leads to the priorities displayed graphically in **Figure 1**. The SI values calculated for all combinations of matrices are shown in **Table 2**. It is clear from these results that even fairly close judgments often exceed the SI-target of 1.10. Although the judgments in this synthesized example differ marginally and the rankings are similar, the SI measure indicates some heterogeneity. The judgments used by Saaty & Vargas [2004] show similar evidence. In their Group 1 (Heterogeneous) all 5 individual matrices, compared to the geometric mean, give SI-values > 1.10 with an average SI = 1.263. The results of Group 2 (Homogeneous) are very (unnaturally) close but even here 2 out of the 5 individual matrices show SI-values > 1.10 as compared to the geometric mean. The average SI-value = 1.097 which is only marginally inside the 1.10 guideline. Real world groups, in the experience of the author, generally exceed these narrow judgment differences. Two examples will suffice. First, in a unique application of the AHP to environmental impact evaluation [von Solms, 1999], 18 managers, participated and provided judgments on the relative importance of 5 Environmental Risk criteria. The group is fairly representative of a senior management team in the South African manufacturing sector. The results, however, are disturbing from a homogeneity perspective. Compared to the group result (calculated using the geometric mean), 17 of the 18 individual matrixes (ie 94.5 %) show SI-values > 1.10. The average SI-value is 1.607, with 5 (27.8 %) of the SI-values > 1.50. Demographically the group must be regarded as homogeneous as all members were tertiary qualified, ranging between 30 and 50 years of age and employed by the same

company. In the second example, von Solms [2001] reports results from 37 engineering and operational managers (divided into 3 groups) providing judgments on the relative importance of 6 Sustainable Development elements. For this paper, the 10 individuals with the lowest CR-values (average CR = 0.1004) were selected and their matrices compared to the matrix formed by their geometric mean. All 10 SI-values exceed 1.10 with the average SI = 1.580. Like the first example, here too the group could be seen as demographically fairly homogeneous and it is the experience of the author that similar heterogeneity of input judgments are fairly generally found, and representative of, groups that could be deemed demographically homogeneous. It seems then that even fairly 'like-minded' individuals naturally provide judgments that are deemed heterogeneous by the SI-measure.

4. Homogeneity and Philosophy

A dominant view in sociology is that of Functionalism [Burrell & Morgan, 1979], [Goodman, 1992]. Built on a Positivist philosophy, Functionalism generally sees society as a system with many interacting elements. The view is that, like the elements of an organism, the elements of society perform different functions but that these functions are all directed toward maintaining the life and harmony of the whole organism (or society) [Pavitt, 1994]. Similarly, social interaction is seen as mainly for maintaining social harmony. Agreement and consensus are, consequently, emphasized over disagreement and conflict – which are seen as dysfunctional and disruptive. Under the influence of modem science with its Objectivist Epistemology, where an objective reality - functioning under influence of common laws - is believed to exist, social interaction is often viewed from a unitary perspective [Flood & Jackson, 1991]. One correct answer exists for any problem and a group of individuals tasked to make a decision regarding the problem is seen as attempting to find this one objectively correct solution [Rosenhead, 1996]. Any disagreement is only due either to individuals' misunderstanding the problem or to their not knowing all the facts. Any disagreement can, therefore, (easily) be removed via debate which will ensure a common (correct) understanding of the problem and enhance the knowledge of the ignorant individuals. Within such a philosophic environment a *consensus-theory-of-truth* view is often adopted and the belief that because people agree the resulting decision must be correct can become prevalent. Ironically, the *consensus-theory-of-truth* is also justified from the opposite end of the philosophic spectrum, ie from within Skepticism. Although Skepticism is a varied philosophical position, Skeptics generally agree that due to the subjective nature of knowledge, ultimate truth cannot be established and that the best we can do is to accept consensus as a substitute for truth. What the majority of experts agree on is possibly as close as we can ever get to achieving truth. Rescher [1993] argues that a view positing *agreement as a prerequisite for truth* is evident – in different forms – throughout philosophical history, from Aristotle, Rousseau, Kant and Mill to Pierce, Habermas and Rorty. In the light of such a long and widespread linking of consensus and truth or agreement and accuracy, it is not surprising that the view of consensus as being good and necessary is so deeply ingrained in GDM approaches. Either truth is objectively available in the world 'out-there' and groups will naturally coalesce on this truth through discussion or, because truth is subjective, group consensus represents this truth. Either way consensus is an admirable goal in GDM.

5. Homogeneity and Consensus

If the homogeneity of inputs cannot be guaranteed, debate may be used to harmonize divergent preferences. This, however, is not a panacea. At least four complications are evident. First, contrary to the notion of consensus as the ultimate touchstone of knowledge and truth, empirical evidence suggests that placing too high an emphasis on agreement can cause pathological conditions in GDM. Groupthink is a term coined by psychologist Irving Janis [1982] to describe one process by which a group can make bad or irrational decisions. In a groupthink situation, members of the group attempt to conform their opinions to what they believe to be the consensus of the group. This situation results in the group ultimately agreeing on an action, which individual members might normally have considered to be unwise. Janis' [1982: 9] original definition of the term was: "…a mode of thinking that people engage in when they are deeply involved in a cohesive in-group, when the members' strivings for unanimity override their motivation to realistically appraise alternative courses of action". Janis [1982] lists several symptoms that he sees as indicative of groupthink, two of which are relevant here: (1) *Illusion of unanimity* (the false consensus effect) and (2) *Direct pressure on dissenters to conform*. Groupthink and consensus decision-making are two phenomena that can occur in the same GDM environment. Members within a group cannot always distinguish between

them. Facilitators and leaders must consider and take appropriate actions to avoid Groupthink while striving toward a consensus decision. This is especially important if the group is homogenous and cohesive. A high emphasis on homogeneity of views, although not always the case, can unfortunately create the breeding ground of groupthink-like behavior. A second problem is the phenomenon of *Group Polarization*. Group polarization is among the most robust patterns found in deliberating bodies, and it has been found all over the world and in many diverse tasks [Myers & Lamm, 1976]. The result is that groups often make more extreme decisions than would the typical, or average, individual in the group, extreme being defined internally by reference to the group's initial dispositions. The term, *Group Polarization*, refers to a predictable shift *within* a group discussing a case or problem, as the shift occurs, group members move and coalesce, not toward the middle of antecedent dispositions, but toward a more extreme position in the direction indicated by those dispositions [Pavitt, 1993]. The effect of deliberation is both to decrease variance among group members, as individual differences diminish, and also to produce convergence on a relatively more extreme point among pre-deliberation judgments. If deliberation predictably pushes groups toward a more extreme point in the direction of their original tendency, whatever it may be, do we have any reason to think that deliberation is producing improvements? A sensible answer would emphasize the importance of paying far more attention to the circumstances and nature of deliberation, not merely to the fact that it is occurring. The implication of Group Polarization is that group dynamics have the potential of changing the group's final decision without necessarily changing any of the underlying facts that lead to the decision and as such has both potential benefits as well as detrimental effects in GDM [El-Shinnawy & Vinze, 1998]. Explicating the role of group polarization while using the AHP is, therefore, of great importance if we wish to utilize the AHP as an effective GDM methodology [von Solms, 2003]. A third problem-plaguing consensus is the phenomenon of *group dynamic pressures to conform*. The classical experiments performed by Asch [1958] and Hare [1952] demonstrate the tendency for group members to conform to majority views, even in cases where the majority is clearly wrong. The potential in small groups for extreme social pressures to conform cannot be overestimated [Fisher, 1974]. A fourth problem evident in consensus decision-making is the issue of *domination* by powerful group members [Pfeffer, 1981]. Group consensus can easily be distorted to reflect, not a genuine group view, but rather a view biased toward that of the forceful or dominant minority [Hildyard et al, 1998]. Both the latter problems have been discussed in more detail elsewhere [von Solms & Peniwati, 2001a, 2001b]

6. Homogeneity and Multi-Stakeholder Groups

The inclusion of stakeholders, other than management, in decision-making is a frequent issue in contemporary management literature [Freeman, 1984], [Halal, 2001], [McEwan, 2001], particularly in the environmental management and sustainable development fields. Many reasons for a multi-stakeholder approach are given including (1) *Ethics* – it is morally right to involve the stakeholders who are to be affected by the decision; (2) *Democracy* – the democratic ideal is decision-making *by* the stakeholders rather than decision-making *for* the stakeholders; and (3) an *Instrumental* argument that the involvement of different stakeholders increases the effectiveness of decision-making and the implementation of decisions [McEwan, 2001]. Environmental policy decisions are increasingly claimed to require wide participation of stakeholders, for example in Australia [Ananda & Herath, 2003], South Africa [DEAT, 2002], the UK [DETR, 1999], and the USA [Bryner, 2001] inter alia. The need for multi-stakeholder GDM has, thus, become an international imperative.

At the core of stakeholder decision-making is a controversial decision. Controversy typically arises, because those with a stake in the decision consequences disagree about the preferred decision alternative. Stakeholders can disagree because of differences in values or differences in beliefs about the decision consequences, or both. Multi-stakeholder groups are important to ensure fair, equitable and comprehensive decision-making in strategic decisions as these decisions affect a wide range of stakeholders. Multi-stakeholder groups will, by their very nature, represent major difficulties in debate and reaching consensual group choices which could be seen as just and balancing the aspirations of all stakeholders. The literature acknowledges the fact that involving stakeholders and balancing stakeholder interests are problematic [Polonsky, 1995] and that Stakeholder Theory is specifically about managing potential conflict stemming from divergent interests [Frooman, 1999]. Particularly problematic is the use of consensus as choice aggregation in multi-stakeholder groups. Consensus was shown to be less effective and desirable in *competitive social contexts* [Tjosvold & Field, 1983]. Multi-stakeholder groups represent social contexts

far more competitive than those found in the Tjosvold & Field [1983] study and can be placed in the Medium to High Pluralist – or even Coercive - contexts of the Flood & Jackson [1991] continuum. Consensus becomes less effective at High Pluralist/Low Coercive levels of disagreement [von Solms & Peniwati, 2001a]. The pluralistic objectives of the various stakeholders contribute to the complexity because these competing goals and perspectives can be difficult to resolve [Sonka et al, 2001]. Stirling & Mayer [2000] refer to similar problems concluding that the difficulties posed are of such a magnitude that aggregation of plural views cannot be achieved. They suggest that the different views and preferences be displayed on, what they call, a Multi-Criteria Map for inclusion in a broader deliberative process [Stirling & Mayer, 2000]. A somewhat similar view is found with Gregory [2000] when she argues for the use of stakeholder values with the goal of *decision insight*, not *consensus* due to the difficulty of achieving the latter. List [2000] argues that the great challenge of democracy is the resolution of conflict between divergent individual preferences and that the difficulties posed by aggregation depend crucially on *how divergent* the preferences, views and interests of individuals are. Elster [1986], in promoting deliberative democracy, says that debate will lead to a change (convergence) in preferences and there should not be any need for an aggregation mechanism since rational discussion would tend to produce unanimous preferences. Two criticisms of this deliberative ideal are relevant. First, Sunstein [2002] argues forcefully that the empirical evidence from group polarization studies show that deliberation leads to unanimous views over time but that these views become progressively more extreme, adversely affecting decision quality. He suggests that the only solution is a well-structured process in which group heterogeneity is promoted. Such diverse groups are less prone to extreme views if the divergent views are allowed to be adequately heard and to balance out [Sunstein, 2002]. Second, List [2000] points out that, although it may seem attractive, the ideal of preference harmonization may be unrealistic in most circumstances. Many examples and case studies in natural resource, environmental and development management demonstrate that increasingly situations are characterized by different types of organizations and groups who, although concerned about the same resources, are often acting independently and have different, sometimes conflicting, perspectives, values, objectives and knowledge systems. Further these differences seem to often defy traditional attempts at building consensus and agreement, whether based on 'improving' the knowledge and understanding of one group, on public participation and consultation or on other techniques [Anderson et al, 1997]. Values and objectives of different stakeholders appear, to be plural, conditional, incompatible and incommensurate [Daniels & Walker, 1997]. Edmunds & Wollenberg [2001] hold the view that an uncritical combination of elements of Habermasian Communicative Competence with Liberal Pluralism does *not* lead to adequate protection of disadvantaged groups because both Communicative Competence and Liberal Pluralism retain too much of the social order perspective and if applied uncritically easily leads to the acceptance of diversity along with the notion of an underlying *public intent* towards which diversity should and ultimately would converge [Edmunds & Wollenberg, 2001]. The critique of Edmunds & Wollenberg [2001], that a Habermasian deliberative approach is inadequate, can be addressed if methods for participative decision-making allow adequate protection of stakeholders against domination by other, powerful, stakeholders. Indeed, a participatory method that fails to deal with the distribution and operations of power within a multi-stakeholder situation is likely to offer little to marginalized stakeholder groups. The majority of participatory projects rest on the dubious assumption that simply getting different stakeholders around the table will lead to consensus being reached that is 'fair' to all. This only holds if it is assumed that the participants are equally powerful or if inequalities can be treated as a purely technical-procedural matter [Hildyard et al, 1998]. To equate the absence of conflict with the existence of genuine consensus is to rule out the possibility of a fake or manipulated (coerced) consensus [Knights & Willmott, 1985]. Facilitating participative debate and consensus may be important in multi-stakeholder negotiations but they are not enough to grant marginal groups the bargaining power they require to overcome the structural dominance enjoyed by more powerful groups [Boje & Winsor, 1993]. The deliberative approach must, therefore, be bolstered with some form of protective mechanism. A different choice aggregation method is required that would lead to a fair group outcome even under divergent value systems and inequalities of power while allowing fair trade-offs on salience and relative importance of decision aspects.

7. A Pessimistic View

Another view brings us full circle back to mathematical Choice *Aggregation* instead of Choice *Harmonization* via consensus. Risse [2003a] interprets the Rousseauian *General Will* as the decisions

made by a community with its deliberation subject to suitable constraints and argues that this ideal has implications for modern GDM theory and practice in that even *constrained* deliberation is not guaranteed to reach unanimity. Decisions must often be made under circumstances of radical and persistent disagreement - conflicts of values that cannot be fully eliminated - when deliberating bodies are required to make decisions in spite of such irresolvable disagreement. So we need an account of what to do when deliberation ends inconclusively. We might then still reach a general will, *provided* that for any set of circumstances under which a group might find itself in disagreement there is a uniquely reasonable rule which delivers that will. Risse [2003a] concludes that such a rule does not exist. First, Risse [2003a] sketches an argument against Uniqueness in Social Choice and shows – in line with Arrowian Impossibility - that there is no uniquely reasonable decision rule if *ordinal* rankings are aggregated. Second, he reviews Uniqueness in Bayesian aggregation. A Bayesian agent is an agent described by theories of Expected Utility that take probabilities to be subjective. Suppose we have a group of such agents, and suppose they would like for their group as such also to be a Bayesian agent. Moreover, they also would like for group decisions, and thus for group preferences, probabilities, and utilities, to be aggregated from the respective individual entities in such a way that at least unanimous agreements are preserved. This can be done in two ways, either *Ex Ante* or *Ex Post* [Risse, 2003b]. The first, *Ex Ante* mode aggregates the individuals' expected utilities. The second, *Ex Post* mode splits individual expected utilities into probabilities and utilities before aggregation takes place, ie aggregating probabilities and utilities *separately* [Risse, 2003b]. Mongin [1995], using the Savage framework, shows that Bayesian aggregation satisfying some reasonable condition is available only to fairly homogenous groups when using *Ex Ante* frameworks, with restrictions on group expected utilities formulated in terms of individual expected utilities. Mongin's [1995] result fails in the *Ex Post* framework, yet *Ex Post* models come with trouble of their own: They display a peculiar dependence on the level of detail used in describing the decision problem and preference reversals can occur with change in the detail of analysis [Risse, 2003a, 2003b]. Since we never know for sure whether a more fine-grained look at the same situation would reverse group preferences, decisions based on the *Ex Post* approach are ill-founded. So we must choose between two modes of aggregation each of which has its problems. Risse [2003a] claims that, neither the *Ex Ante* nor the *Ex Post* view has adequate resources to refute the other, and this establishes the falsity of Uniqueness of Bayesian aggregation. In sum: Risse [2003a] argues that there is no uniquely reasonable decision rule - neither if ordinal rankings are aggregated, nor if both utilities and subjective probability are aggregated in a Bayesian framework. Thus in many cases some individuals will be 'losers' in the decision process although they would not have been if had another, equally reasonable, rule been adopted. This, he claims, points to *inescapable* features of GDM – either rational decision making is unavailable to groups with little in common and available only to groups of like-minded persons, or groups are fragile decision makers with arbitrary outcomes dependent on the degree of detail involved [Risse, 2003a, 2003b]. The question is whether this same pessimistic result holds for GDM aggregation when using the AHP?

8. Conclusion

We are left with a dilemma. On one hand arguments are heard that choice aggregation (via the geometric mean) requires homogeneity of inputs. On the other hand we find that such homogeneity cannot, realistically, be expected in most real-world decision-making groups. The importance of multi-stakeholder groups and their characteristic heterogeneity make the dilemma even worse. We either accept the homogeneity limitation applying AHP only in the cases of very like-minded groups, or use debate and consensus building to harmonize views to within acceptable limits. Unfortunately, these two options do not solve the whole dilemma. Consensus is not a choice aggregation panacea and is prone to various group dynamic, sociological and psychological limitations, placing both the effectiveness and fairness of consensus decision-making at risk [von Solms & Peniwati, 2001a]. The challenge of this paper is to highlight the need for serious research effort aimed at solving this dilemma. Taket & White [1994] emphasize the importance of methods to aid multicultural (ie multi-stakeholder) groups in a GDM world under the hegemony of consensus and a singular rationality. They plead for methods that can work with difference, acknowledging diverse views and perspectives and allowing these different voices to be adequately heard in GDM. With the proper formulation the AHP can be just such a method.

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TABLE 1: JUDGMENTS PROVIDED ON CRITERIA A, B, C & D

	Criteria Pairs					
Group Members	**AB**	**AC**	**AD**	**BC**	**BD**	**CD**
Individual 1	1	3	4	1	3	2
Individual 2	2	3	5	2	3	2
Individual 3	3	3	6	1	2	2
Individual 4	3	7	7	2	2	1
Individual 5	4	8	8	2	2	1
Individual 6	5	9	9	1	1	1

TABLE 2: SI VALUES BETWEEN ALL MATRICES

	Ind 1	**Ind 2**	**Ind 3**	**Ind 4**	**Ind 5**	**Ind 6**
GM	**1.118**	1.048	1.031	1.025	1.045	**1.106**
Ind 1	**---**	1.066	**1.104**	**1.224**	**1.310**	**1.441**
Ind 2	**---**	**---**	1.054	**1.107**	**1.152**	**1.308**
Ind 3	**---**	**---**	**---**	**1.112**	**1.138**	**1.173**
Ind 4	**---**	**---**	**---**	---	1.007	1.087
Ind 5	**---**	**---**	**---**	**---**	---	1.067

FIGURE 1: PRIORITIES OF CRITERIA A, B, C & D