

GROUP POLARIZATION, SOCIAL INFLUENCE AND THE ANALYTIC HIERARCHY PROCESS

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Keywords: Analytic Hierarchy Process (AHP), Group Polarization, Social Influence, Social Comparison Theory, Persuasive Arguments Theory, Structuration Theory.

Summary: *In this paper, we pay attention to a particular phenomenon of group decision-making. Following on from earlier work, reported at ISAHP2001, in which the issues of conformity and deviance, which concern group interaction, were discussed, we now focus on the process of Social Influence, which occurs when group interaction causes members to conform. Particular attention will be given to the Group Polarization Effect. The critical element of group decision-making is the process of aggregation in which the individual members' preferences are combined into a single group preference set. The question is how the use of the AHP influences the social processes involved. The empirical results reported in the earlier work are re-analyzed from this perspective demonstrating the effect while using the AHP. It will show that the 3-phase AHP approach is an excellent vehicle allowing full social influence while simultaneously eliminating domination.*

1. Introduction

As an introduction the question may be asked: How might Social Influence affect the decisions of a group? In group decision-making the group members can choose from among a number of options, and they may each know all these options and have an opinion as to which option is best. Under these circumstances, group members are likely to have differences of opinion, which will be stated during the meeting, examining the options and discussing the reasons for their preferences. At the end of the meeting the group must decide which option is best. Social scientists have come to believe that Social Influence is part of this transformational process. Social Influence, therefore, is the process by which group members influence one another's opinions and is part of the overall process a group uses to formulate a decision based on the members' opinions. The transformational process, moving a group from a set of individual opinions to one group decision, the process of choice aggregation, is essential for group decision-making and it is important to understand the role of Social Influence in this transformational process. Before addressing Social Influence *per se* we need to discuss briefly an interesting effect observed in the group interaction process.

2. The Group Polarization Effect

Research into decision-making of natural groups uncovered an overall phenomenon called the *Group Polarization Effect*. The research is based, to a great extent, on decision problems called *Choice Dilemmas*. A typical choice dilemma used would be in the form of a fictitious character, say Mr Jones, who is faced with a choice between two options. One option has an attractive outcome but only some probability of success, while the other option has a less attractive outcome but will definitely succeed. The choice dilemma, hence, involves an attractive, risky plan and a safe plan. When using such a choice dilemma in research, groups are instructed to advise Mr Jones of which option to choose. The group can make a *risky choice* by advising Mr Jones to choose the riskier option if the odds of success are low, say 2 in 10. In

contrast, the group can make a *cautious decision* if it advises Mr. Jones to choose the risky option only if the odds of success are high, say 8 in 10. In general, a group is *risky* if it recommends the more attractive but unsure option at odds of success that is less than 5 in 10, or *cautious* if it decides to recommend this more attractive but chancier option at odds of success that are more than 5 in 10. Group decision-making research on choice dilemmas often applied a particular experimental method, first used in a study of Choice Dilemmas by Wallach, et al [1962]. In their study method, a number of participants first worked alone and chose acceptable odds for each of a series of 12 choice dilemmas. Each participant's first decision was labeled the *pre-discussion opinion*. Next, the researchers placed the participants in groups, and each group made a decision about acceptable odds. Finally, each participant made one last individual decision about which odds would be acceptable, again working alone, this choice was labeled the *post-discussion opinion*.

In the early 1960s the popular notion was that groups are more cautious and less daring than individuals, an idea entailing that group interaction moderates the extreme views in a group. It was hypothesized that the mathematical average of the pre-discussion opinions of the group members would indicate what they would eventually agree upon. The choice dilemma research findings, however, showed this idea to be false. In 10 out of the 12 choice dilemmas that the group examined, the eventual decision was riskier than the mathematical average would predict [Wallach, et al, 1962]. Researchers immediately called this phenomenon the *risky shift* and following its discovery, it spawned a mass of risky-shift studies during the 1960s. In addition, researchers found that the group meetings appeared to have a lasting influence on members. The participants' post-discussion opinions were riskier than their pre-discussion ideas. Further, these post-discussion opinions approximated the group decision. Researchers found this true both immediately after the group meeting and several weeks later when they again asked the participants for their post-discussion opinions. Such a result is evidence that members did not merely comply with their groups but instead, an actual opinion change took place. Some early explanations for the Risky Shift were advanced, inter alia the *Diffusion of Responsibility*, *Familiarization*, *Leadership* and *Value Theory* [Myers & Lamm, 1976]. Various research data has shown that these early explanations inadequately explain risky shifts, particularly as later research uncovered that not all decisions demonstrate a risky shift but that, in fact, cautious shifts also occur, when groups make more cautious decisions than individuals. These two results together were renamed the *Group Polarization Effect*. This effect takes place when groups have members who lean toward one direction, either risk or caution, but do not agree on the same odds. Such groups tend to make decisions in the direction that the members favor. Group decisions, however, are usually more extreme than the individual members' pre-discussion judgments. Groups with members who lean toward the risky direction make decisions that are more daring than the individual members would make. People who are initially cautious make extremely careful judgments when they are in groups.

Scientists have proposed many theories regarding the Group Polarization effect. Not only were several theories proposed to explain the Polarization phenomenon itself, but scholars also believe that Polarization go beyond choice dilemmas and relate to all types of group decisions. In fact, the Group Polarization Effect was noticed in several strands of research not based on choice dilemmas and Myers & Lamm [1976] list seven such areas; attitudes, jury decisions, ethical decisions, judgments, person perceptions, negotiation behavior and risk measures. The Group Polarization Effect was first discovered through choice dilemma research but now seems to be a general group phenomenon leading scholars to believe that Group Polarization is a window into the larger process of Social Influence. Hence, by looking at Group Polarization, we can discover more about how Social Influence affects all kinds of group decision-making tasks. Investigating Group Polarization scholars still use Choice Dilemmas as a basis for research and proposals. In essence, Choice Dilemmas help scholars examine and theorize about Group Polarization, and Group Polarization in turn helps them look at Social Influence.

3. Social Influence

The light that Group Polarization sheds on Social Influence can be grouped into five positions [Pavitt, 1993], varying from a view that Social Influence plays no role in group decision-making, to one advocating that Social Influence is critical to group decision-making.

3.1 Position 1: Group Decisions Without Social Influence

Position 1 assumes that Social Influence is *not* important in group decision-making. Position 1 claims that members come into a group with preformed opinions about the best option. Groups come to their decisions by combining these pre-discussion opinions. The theory sees social interaction as a *combinatorial* process transforming individual pre-discussion preferences into a group output [Davis, 1982]. Individuals may change their opinions during the discussion but this is not important, as individual changes do not influence the final group decision because it is based on member's original opinions. The only important role of communication in group decision-making is to share information about and acquaint each group member with the other members' pre-discussion opinions. Social Influence is not critical to the decision-making process and whether or not members change their opinions during group discussion has no impact on the final group decision. Social Decision Schemes [Davis, 1973] fall within the realm of Position 1. A Social Decision Scheme is a probabilistic rule that specifies the likelihood that a group will reach a particular decision given that it began discussion with a particular distribution of member opinion. Social Decision Schemes Theory predicts group decisions with two factors – members' initial preferences and a decision rule governing the combination of these preferences into a final group output. For example, an *averaging* Social Decision Scheme would predict that a group would certainly choose that alternative closest to the average of the members' initial preferences [Kerr, et al, 1979]. The predictions that these schemes make, therefore, are based solely on pre-discussion opinions and the particular Social Decision Scheme utilized and do not account for changes in opinion that result from group discussion. Social Decision Schemes do not make any claims about whether Social Influence has any effect on group members' opinions and does not deny that Social Influence may occur during group discussion [Davis, 1982]. How well does Position 1 account for polarization? As we have mentioned earlier, group members *do* change their opinions as a result of group discussion. This is not to say that Social Decision Schemes are invalid. These schemes are still often able to predict group decisions but what we do know, however, makes it unlikely that Position 1 is a good explanation of the process by which groups make decisions. We need to find something that will account for the changes that members make during discussion. A Social Decision Scheme of *majority rule*, for example, predicts shift toward the dominant pole when the majority favors that direction and when there is skewness in the distribution of initial choices. Perhaps when a majority-minority constellation exists, deviant minority persons in the tail of the skewed distribution are moving toward agreement with the majority opinion, thereby creating a shift in the group mean. A decision scheme such as this could potentially account for Group Polarization without recourse to postulating any real changes in individual preferences. Although one might consider polarization a statistical artifact of a majority rule decision scheme, another view is to assume that majority influence produces genuine change in the minority [Myers & Lamm, 1976]. Research by Poole, et al [1982] substantiates the assumptions that interaction is a crucial factor in group decision-making and that although input conditions may impact on decision outcomes, they are mediated by interaction processes.

3.2 Position 2: Social Influence From Opinion Expression

The second type of theory that is relevant to how Social Influence processes affect group decision-making, Position 2, accepts the idea that Social Influence is important to the decision-making process and that Social Influence happens when group members listen to one another express opinions about the available options. As does Position 1, Position 2 claims that members come into a group with pre-discussion opinions. During their meeting, members share these opinions. Through this process, each person learns the other members' preferences. Position 2 then hypothesizes that members are likely to adopt the option of the majority. In essence, Social Influence occurs because people want to agree with the majority and this position thus assumes a *normative* process of social influence. An important aspect of Position 2 is that learning about other people's *opinions* is enough to bring about Social Influence. Group members need not hear arguments from one another about the strengths and weaknesses of the options. Social Influence occurs even when group members do not hear arguments for or against the options they are considering. Several studies, of which Asch's [1958] study of conformity is the classical example, found that participants agreed with the majority opinion even when that opinion was wrong. In the studies of Asch [1958] and other research of this tradition, participants heard only the judgments that other people made, not arguments about those judgments. The mere act of hearing the opinions influenced them, a finding consistent with the

normative thesis of Position 2. Social Comparison Theory, a view consistent with Position 2, has been applied to the study of Group Polarization [Myers, 1982]. Building on earlier work by Festinger [1954], Baron, et al, [1974] proposed a new version of Social Comparison Theory to explain the Group Polarization effect. They discarded Festinger's [1954] distinction between beliefs about abilities and opinions by giving a good/bad dimension to opinions also and stated that opinions, as well as beliefs about abilities, could be ranked on a scale running from good to bad. The view is that any situation involves opinions that people in a particular culture consider good and opinions that they consider bad, including opinions that have to do with risk and caution. In some situations they believe that being cautious is good; in others, that being risky is good. Researchers have found that how they write choice dilemmas influences whether risk or caution appears to be the 'good' opinion, this is an example of the Framing Effect [Tversky & Kahneman, 1981]. In both versions, the implied values serve as ideals or norms, which group members use to reach their pre-discussion opinions. They want to make the ideally 'good' choice when they consider whether Mr Jones should be daring or careful. During group discussion, members express their opinions to one another about the good option. For example, in a group of people all from the same culture, members have learned from their culture when being risky is good and when being cautious is good. For this reason, most people in this group will probably react to a choice dilemma in the same way. In other words, group members are likely to agree when risk or caution is the 'good' choice but are also likely to disagree on particulars. Members will probably require different actual odds for success before they will accept the more risky, but attractive, option. Some members will be more extreme in the 'good' direction than others, whether that direction is toward caution or risk. As they talk, members hear everyone's pre-discussion opinions. They all learn where they stand on the good/bad dimension in relation to others in the group. The theory hypothesizes that once members have this knowledge they can see if they are as far in the 'good' direction as other members. If they find they don't have as 'good' an opinion as other members do, they will shift their opinion so that it is closer to the extreme. They want to have as good an opinion as they can in the group, whether it is a risky opinion or a cautious one. At the end of the discussion, the group bases its decision on the members' more polarized post-discussion opinions resulting in the group decision being more extreme than the average of its members' pre-discussion preferences.

The Social Comparison approach assumes that all that is necessary for Social Influence to occur in a group is that members express their opinions. Group members need not hear arguments about the advantages or disadvantages of either risk or caution to change their opinions toward the 'good' extreme. All that they need to hear is the pre-discussion opinions of the other members to decide whether his or her opinion is 'good enough'. This implies that Group Polarization will still occur in groups in which the members cannot argue for a particular option. By artificially constraining group discussions so that members could voice only their pre-discussion opinions but could not discuss arguments for or against either risk or caution, Teger & Pruitt [1967] found that Group Polarization did occur under these circumstances the amount of polarization, however, was not as great as in unconstrained discussion groups, implying that social comparison may partly account for the Group Polarization effect but is not the entire reason. This result is confirmed in a review of several relevant studies [Isenberg, 1986] indicating that there must exist other explanations for the choice shift.

3.3 Position 3: Social Influence From New Information

As did Position 2, Position 3 also accepts the idea that Social Influence is important in the decision-making process. The main contention of Position 3, however, is that Social Influence occurs when group members learn *new information* about the available options. The *arguments* that members present, not their *opinions*, are the key factors. Position 3 claims, similarly to the previous positions, that members come into a group with pre-discussion opinions. Position 3, however, hypothesizes that the group members talk about their opinions during the meeting. Their discussion centers on the advantages and disadvantages of each option. Through this type of discussion, each member learns more about the options. This new information often causes members to change their opinions and the group can then use the members' new opinions to help it decide on the best option. Comparing Positions 2 and 3 helps to understand the latter. Position 2 assumed that Social Influence occurs when people learn the *opinions* of others and, as a result, change their minds to agree more with them. Proponents of Position 2 do not focus on what happens when a group discusses the strengths and weaknesses of options. They do not think this is significant in the Social Influence process.

Supporters of Position 3, on the other hand, look carefully at what happens when group members argue about the *strengths* and *weaknesses* of their options. They believe that this discussion is responsible for Social Influence and do not feel that group members will change their minds merely because they learn other members' preferences. They believe that group members need to have new information before Social Influence can occur and thus assume an *informational* process of social influence. Burnstein and his co-workers [Burnstein, 1982] propose the Persuasive Arguments Approach, which claims that, when group members must choose from among a number of options, they all know something about each option. Every person has bits of knowledge that can be viewed as arguments either for or against each option. Members base their pre-discussion opinions on these arguments. During group discussion, members talk over the familiar arguments. They support or criticize each option, hearing arguments they had not heard before. They learn new information that gives them reasons to polarize their opinions further. At the end of the discussion, the group bases its decision on the members' further-polarized opinions. Consequently, the group decision will be more polarized than an average of its members' pre-discussion opinions. The Persuasive Arguments approach to the Group Polarization effect is a Position 3 theory. It assumes that the single factor of members learning new information about the group's options can cause Social Influence. Burnstein [1982] does not see the mere sharing of opinions as part of the process that changes group members' opinions but rather that new and persuasive information is necessary and sufficient to cause Social Influence. He feels confident that social influence is essentially informational and can be explained in information processing terms alone [Burnstein, 1982].

There has been a great deal of research examining the Persuasive Arguments Theory. In general, these results have been supportive, for example Isenberg [1986] reviews many of these studies and finds a strong relationship between the effects of persuasive arguments and Group Polarization. Most theorists now believe that a good theory about both Group Polarization, specifically, and Social Influence, generally, must include some aspects of persuasive arguments. However, Persuasive Arguments Theory has problems accounting for certain research data. These problems stem from two underlying assumptions of the Persuasive Arguments Approach. First, the approach presumes that the arguments that are voiced during discussion are representative of the arguments with which the members of the group are familiar. As a consequence, the proportion of arguments on either side of the issue that come up during discussion equal the proportion of arguments that members know on both sides. If, for example, sixty percent of the arguments that members are familiar with are in favor of risk and forty percent are for caution, the Persuasive Arguments Approach implies that sixty percent of the arguments that come up during the discussion will also be for risk, and forty percent of the arguments will favor caution. However, there is strong evidence suggesting that this assumption is wrong. If this assumption was correct, discussion should also include arguments new to each member on the *disfavored* side of the issue. As a result, group members will learn new arguments in favor of caution along with new arguments in favor of risk. These new arguments on either side of the issue will approximately cancel one another out, leaving the group's opinions unchanged and Group Polarization will *not* occur. In fact, Group Polarization could only occur if the assumption of equal proportions of arguments is *wrong* and arguments are *biased* in favor of the side that the members originally favor. There are studies suggesting that discussion is biased in this manner and in one such study, Pavitt [1994] used three choice dilemmas for which some of the participants were asked to write down the arguments they knew on both sides of the issue. Then they made a decision about each dilemma in three- or four-member groups. A content analysis was performed in order to determine the proportion of arguments on both sides of the issue in both the written lists and the discussion. The discussion was consistently more polarized than the written lists. When participants leaned toward risk, 57 percent of their written arguments but 86 percent of their voiced arguments favored risk. When participants leaned toward caution, 60 percent of their written arguments but 83 percent of their voiced arguments favored caution. This finding implies that the discussion is biased in favor of pre-discussion opinions. Why do group members seem to talk so much about ideas that favor the group opinion? Why don't they instead reveal more of their personal arguments on the disfavored side? The Persuasive Arguments Theory cannot answer these questions. It does not account for the disproportion between personal opinion arguments and group decision arguments. It does explain the effect of arguments during group discussion. It cannot reveal, however, why the group tends to verbalize only those arguments that favor the original group option. As such it is contrary to research on information sampling [Stasser & Titus, 1985] which suggests that group members are more likely to express shared perspectives during discussion than unique perspectives, a result recently replicated by Devine [1999]. Second, the Persuasive Arguments Theory

would predict that the arguments that persuaded each participant most during group discussion were the ones that were *new* to that participant. The hypothesis is that 'novel' arguments are persuasive. Meyers [1989a, 1989b] found this hypothesis false. Arguments tended to be slightly more persuasive if they were *less* novel, ie if they coincided with knowledge already shared by members, a result in line with Social Judgment Theory [Sherif, et al, 1965] arguing that arguments within a persons latitude of acceptance, ie a view that is *known* and *acceptable* to the recipient is likely to be more persuasive than one which is not.

3.4 Position 4: Social Influence From Both Opinion Expression and New Information

Position 4 combines parts of positions 2 and 3. In Position 2, theorists hypothesize that opinion expression is the key to Social Influence in groups, while in Position 3, scientists theorize that new information causes group members to change their minds. Now, in Position 4, researchers claim that *both* opinion expression and new information are important; both can affect the preferences of group members. Scientists variously combine Positions 2 and 3 to come up with theories consistent with Position 4. The main argument of Pavitt's [1994] version of Position 4 is that Social Influence is a result of two aspects of group interaction: (1) a social comparison process that leads to biased group discussion and (2) the new, but often biased, information that group members learn from one another when they discuss the options. As did Position 2, Position 4 claims that we can rank opinions on a good/bad scale (a version of Social Comparison Theory). Pavitt's proposal, however, does not strictly adhere to Social Comparison Theory. It does not assert that people use cultural beliefs to help them decide what is 'good' and 'bad' in a situation. Instead, people decide what is a 'good' opinion based on the arguments they can think of in favor of different options. The more arguments they can come up with in favor of an option, the 'better' that option becomes to them. As did Position 3, Position 4 argues that group discussion leads to members learning new arguments relevant to their decision. However, unlike Persuasive Arguments Theory, Pavitt [1994] does not presume that the arguments that come up during discussion are representative of all the arguments known to group members. Instead, members only bring up arguments that are consistent with what they think is the 'good' option. Therefore, group discussion is biased in favor of that option. As a result, group members only learn more about that option that the members originally favored and their opinions, thus, become more extreme, and Group Polarization occurs. There is good evidence in support of this proposal, demonstrated directly by Pavitt [1994] and indirectly by the evidence provided for *both* Social Comparison [Hogg, et al, 1990] and Persuasive Arguments [El-Shinnawy & Vinze, 1998] indicating the likelihood of an integrated explanation. Research shows that combining Social Comparison and Persuasive Arguments Theories can explain the Group Polarization effect [Myers, 1982] and this, in turn, means that we may be able to explain Social Influence in general using such an integrated formulation.

3.5 Position 5: Social Influence From Group Discussion

Position 5 gives group discussion itself a large role in the influence process and a bigger role than do any of the other four positions. Poole and associates [Poole et al, 1985] formulated this *interactional* position, which has become known as Structural Theory, a view built on the work of Giddens [1984]. As do the other four positions, Structural Theory hypothesizes that when people come to groups they already have opinions about what they like best. Positions 3 and 4 claim that people base these pre-discussion opinions on all the arguments they can think of before the group meeting. The arguments are both for and against all of the options. Position 5 hypothesizes this also. After this initial similarity, however, Position 5 starts to differ. Structural Theory claims that what happens during group discussion is of utmost importance. As members talk, the group *creates* a new base of information, as it were, which it uses to make its decision. The Structural Perspective is based on the premise that the factors determining social action exist only in the stream of interaction. External factors, including pre-discussion preferences, only have bearing on action insofar as they are produced and reproduced by group members using them in interaction [Poole, et al, 1982]. The opinions and arguments that members voice during discussion create a unique body of information for the group, which members use when they form their post-discussion opinions. As do the other theories, Structural Theory hypothesizes that a group's decision is based on the members' post-discussion opinions. Structural Theory, however, claims that these final opinions come directly from the new base of information that group discussion creates. Members cease to focus on

their own arguments and turn to the arguments that the group has discussed, thus, members' initial opinions may relate only slightly to their final opinions. Pre-discussion and post-discussion opinions may have no similarities, and the members' early ideas may have little in common with the final group decision.

How does the Structural Approach compare to previous Positions? In a direct comparison of Social Decision Schemes (Position 1) with Structural Theory, Poole, et al [1982] report that the empirical evidence substantiates the assumptions that interaction *per se* is a crucial factor in group decision-making and that Structuration (Position 5) is a much better explanation of group action than Social Decision Schemes (Position 1). To compare the Structural and Persuasive Arguments (Position 3) approaches, Meyers [1989a, 1989b] expressly designed research to examine these two approaches to Group Polarization. The results of her research imply that Persuasive Arguments Theory alone cannot account for the Group Polarization effect, however, neither do the Structural view, which can account for some of Meyers's findings, but not all. Thus, it is unclear whether we need a theory such as the Structural Approach, an explanation that gives group discussion such a large role in the Social Influence process, to explain the Group Polarization effect. What does emerge from this research is that a *cognitive-informational* view, such as Persuasive Arguments Theory, cannot by itself explain adequately the processes found in group decision-making and it seems warranted that it should be complimented with a *social-interactive* view, such as Structural Theory, leading to a model that takes into account both cognitive-informational and social-interactive commitments while positing interaction as an integrative and central force [Meyers, 1989b].

4. Empirical Test for Polarization

4.1 An Opportunity to Apply the AHP

The opportunity to test the AHP in relation to Group Polarization and Social Influence presents itself. Several reasons make this an interesting exercise. First, the 3-phase application of the AHP [von Solms & Peniwati, 2001] utilizes the same three steps used in Choice Dilemma research, ie pre-discussion individual judgments (Phase 1); Group Consensus (Phase 2) and post-discussion individual judgments (Phase 3). This facilitates a direct comparison of how AHP influences group interaction to results obtained in Choice Dilemma research. Second, the AHP presents an excellent measure for measuring a 'risky/cautious' dichotomy, in the fundamental scale and pairwise comparisons. The pairwise comparison presents a clear 'dichotomy' when comparing Criterion A to Criterion B while the fundamental scale provides a perfect measurement opportunity of both the 'direction' and magnitude of opinion regarding the A/B dichotomy extending from a 9 for A over B to a 9 for B over A. Third, the predominance of Choice Dilemma research in Group Polarization studies can be extended fruitfully by the inclusion of decision situations in which AHP were used. Fourth, the evidence emanating from Choice Dilemma research on Group Polarization has been applied to examine Social Influence in groups. Likewise, we can examine the effect on Social Influence in groups when making group decisions using the AHP [Chen et al, 2002].

4.2 Experimental Design

An empirical study was earlier undertaken to test the feasibility of the 3-phase AHP approach [von Solms & Peniwati, 2001]. Thirty volunteers participated in 7 groups of 4 or 5 members each. Each group was asked to perform pairwise comparisons on 2 sets of items. In the first set, 7 geometric figures were displayed and the participants were asked to estimate the areas of the figures using pairwise comparisons. In the second set a hierarchy with 2 levels were used. 7 Criteria were suggested as necessary to determine the significance of a Safety, Health and Environmental (SHE) incident. The participants were asked to determine the relative importance of these 7 criteria in determining significance. The two sets were used to test group outcomes in both tangible (Figure Areas) as well as intangible (Risk Factors) rating areas. In both cases the 3-phase approach was used implying that members first rated the 7 elements individually, then the elements were discussed to obtain group consensus ratings. In the last phase each participant re-evaluated each element and again provided individual ratings. Each participant recorded his ratings by using a questionnaire-like form. Responses were subsequently processed using TeamECTM, the resulting

preferences exported to MS Excel™ worksheets and processed further. For the current case the results were re-analyzed to reveal the degree of Group Polarization found.

4.3 Calculations

When making pairwise comparisons of 7 items using the AHP, 21 separate judgments result. In the current research 3 such sets of 21 judgments were obtained for each of the 7 groups taking part. The first set was the Pre-discussion Judgments (Phase 1), calculated using the geometric mean of the group members' individual pre-discussion judgments. The second set was the Group Consensus judgments (Phase 2). The third set represented the Post-discussion Judgments (Phase 3) calculated, as for set 1, using the geometric mean of the individual group members' post-discussion judgments. Polarization Coefficients (p_j) were calculated by comparing all 3 sets of judgments in pairs, resulting in 3 sets of Polarization Coefficients for each group. First, comparing the Group Consensus with the Pre-discussion Judgments. Second, comparing Group Consensus with Post-discussion Judgments. Third, comparing Pre- to Post-discussion Judgments. When comparing two sets, say Set A, with separate judgments a_j , to Set B, with separate judgments b_j , this results in Polarization Coefficients p_j ($j = 1, \dots, 21$). The Polarization Coefficients were calculated by first taking the inverse of all judgments <1 and then; (i) If both a_j and b_j favored the same criterion: $p_j = a_j - b_j$ and (ii) If a_j and b_j favored different criteria: $p_j = -a_j - b_j$

The Polarization Coefficients measure the magnitude of polarization in that a positive Polarization Coefficient indicates Group Polarization on that pair of judgments, while a negative coefficient indicates that instead of polarization the reverse has occurred. With no polarization a Polarization Coefficient of zero is expected. The resulting 21 Polarization Coefficients for each of the 7 groups were subsequently combined and averaged to calculate an overall Polarization Coefficient. These 3 Overall Polarization Coefficients were tested for significance using the t-test against a hypothetical mean of zero. A mean of zero would be expected if no polarization occurred or if polarization and de-polarization were random. The process was performed separately for both the Geometric Figures and Risk Factors treatments.

4.4 Results

The t-test results obtained were:

TASK	TREATMENT	AVERAGE	SD	T-VALUE	SIGNIFICANCE
Figure Areas	Consensus vs Pre-discussion	0.343	1.939	2.1436	$p = 0.02$
	Consensus vs Post-discussion	0.249	1.394	2.1679	$p = 0.02$
	Pre- vs Post-discussion	0.011	1.396	0.0920	$p > 0.25$
SHE Risk Factors	Consensus vs Pre-discussion	1.164	2.849	4.9518	$p = 0.0005$
	Consensus vs Post-discussion	0.276	1.439	2.3276	$p = 0.02$
	Pre- vs Post-discussion	0.814	2.523	3.9091	$p = 0.0005$

4.5 Discussion

Both sets of results show significant polarization from the Pre-discussion individual judgments to the Group Consensus. For the Figure Areas the mean difference of 0.343 is significant with $p = 0.02$ while the Risk Factors gave a mean difference of 1.164 with a significant level of $p = 0.0005$ clearly, the degree of Polarization is much greater for the SHE Risk Factors than for the Figure Areas. This is in line with the findings of Asch [1958] that people are more likely to accept group views in situations where judgments are more subjective. It agrees with the general Group Polarization findings, but presents us with additional information as compared to the Choice Dilemma research. Due to the fact that all Choice Dilemmas are of similar 'subjectivity' the differences found here are not seen in Choice Dilemma research and can, therefore, not be compared to the latter research tradition directly. The study also did not provide the opportunity to distinguish between social comparison and persuasive argument explanations for

polarization, but it can be hypothesized that in cases similar to the SHE Risk Factors where judgments are more subjective and members feel less sure of their initial judgments, both social comparison as well as persuasive arguments are more likely to exert a greater influence. In cases where more objective issues are judged, the judges would most probably feel more confident in their initial ratings and not subject to the same degree of group influence as in the subjective case.

The differences between Group Consensus and the individual post-discussion judgments are both significant at $p = 0.02$ level, with a mean difference of 0.249 for Figure Areas and 0.276 for the SHE Risk Factors. This is an aspect of Choice Dilemma research not discussed at length in the literature. Here, the trend is that the groups' post-discussion views were significantly different from the Group Consensus but represent a de-polarization in the sense that the post-polarization judgments are less extreme than the group consensus judgments.

Comparing the pre- and post-discussion judgments in the Figure Area's case show no significant differences implying that members 'returned' to their original judgments. This finding is in contradiction with the polarization literature claiming the persistence of polarized views over time [Wallach, et al, 1962]. The SHE Risk Factors show very significant ($p = 0.0005$) differences with the mean difference 0.814 indicating persistence of polarization as expected. The difference between the Figure Areas and SHE Risk Factors is not obvious to explain. If the social influence process causing polarization is also responsible for the persistence of the changed attitudes, the contradictory results require further investigation.

The AHP application displays the group polarization effect. While this study is intended to be exploratory rather than hypothesis testing and was originally designed to compare consensus and geometric mean results it is not robust enough to present adequate evidence on which to base any real conclusions regarding the *magnitude of* and *reasons for* polarization and the *social influence processes* responsible for it. What is clear, however, is that the 3-phase AHP allows social influence to occur, proving that the AHP is more than a social decision scheme and providing additional evidence for the value of this approach over and above the evidence found in the original study [von Solms & Peniwati, 2001]. The partial de-polarization evident in the Phase 3 geometric means (Post-discussion judgments) is further encouraging evidence that, although social influence occurs during discussion, group members can express a degree of autonomy in their 3rd Phase responses.

5. Conclusion

This paper discussed the phenomenon of Group Polarization and the different Social Influence Theories proposed to explain it. The most promising explanation includes both the *normative* influence through social comparison and the *informational* influence through persuasive arguments mediated through an *interactional* process such as Structuration. We used the results from an earlier study involving judgments via the AHP to investigate whether this effect is also seen when using the AHP in group decision-making. The presence of Group Polarization and consequently Social Influence was demonstrated. The study was not designed to test for polarization specifically and it is suggested that the relationship between using the AHP and polarization in group interaction is researched in more detail. 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 group decision-making [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 group decision-making methodology.

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