Evolution of the interpersonal conflict paradigm

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Abstract

Using Brunswik's (1952) lens model framework, Hammond (1965) proposed interpersonal conflict theory to explain the nature, source, and resolution of disagreement or "cognitive conflict" between parties performing judgment tasks. An early review by Brehmer (1976) highlighted the potential of this approach in, for example, understanding the structure of cognitive conflicts, and the effect of task and person variables on judgment policy change and conflict resolution. However, our bibliographic and content reviews from 1976 to the present day demonstrate that research on cognitive conflict using the lens model has declined sharply, while research on "task conflict" has grown dramatically. There has also been a shift to less theoretical precision and methodological rigor. We discuss possible reasons for these developments, and suggest ways in which lens model research on cognitive conflict can be revitalized by borrowing from recent theoretical and methodological advances in the field of judgment and decision making.

Keywords: interpersonal conflict theory, lens model, cognitive conflict, disagreement, task conflict, cognitive continuum theory, simple heuristics.

1 Introduction

It was during the cognitive revolution in psychology and the cold war period in political history when Hammond (1965) proposed that conflicts between parties performing judgment tasks could be viewed as purely cognitive, thus making it unnecessary to examine the motivations and values of conflicting parties as social psychologists might do. In interpersonal conflict (IPC) theory, Hammond (1965) outlined how this *cognitive* conflict could be construed within Brunswik's (1952) lens model framework, as well as the experimental methods that researchers could use to study the nature, source, and resolution of disagreement between parties performing judgment tasks. Briefly, cognitive conflict represents differences in how parties conceptualize the solution to a problem. For instance, different parties may have different policies for solving a judgment problem in terms of the information they rely on. Inconsistency in how parties apply their judgment policies can also lead to disagreement. Thus, according to IPC theory, parties striving to make a joint judgment on the same task could conflict because they disagree in principle (in that they have different policies for how to solve the problem) and/or in practice (in that they are inconsistent in the application of their policies). Importantly, while cognitive conflict is differ-

ent from conflict caused by motivational and value differences among parties, cognitive differences can evolve into motivational and value-laden conflicts. Under these circumstances, the underlying cognitive differences can be very difficult to detect and resolve.

An early review of research using IPC theory published in *Psychological Bulletin* by Brehmer (1976) highlighted the potential of this approach in advancing our understanding of cognitive conflict in both laboratory and real world settings. Despite this, since that time, IPC theory appears to have featured little in the growing field of judgment and decision making (JDM). For example, in a historical review of theories in the field, Goldstein and Hogarth (1997) provide only a passing mention of IPC theory when considering developments in judgment research. The need for conflict theories, including cognitive conflict, seems apparent in an era characterized by international terrorism where, amongst other things, parties disagree about the level of threat, and how to manage and minimize it (Mandel, 2005), and in an era characterized by a movement towards greater use of alternative dispute resolution. In fact, today, a theory of cognitive conflict could benefit from recent theoretical and methodological advances in the field of JDM. For instance, JDM researchers have shown that individuals are likely to use simple process models when performing judgment tasks (e.g., Dhami & Harries, 2001; Garcia-Retamero & Dhami, in press; Rieskamp & Hoffrage, 1999); and that non-cognitive factors such as emotions may affect how individuals make judgments (e.g., see Loewenstein & Lerner, 2003). In addition, researchers

have employed new tools such as virtual environments and computer simulations when studying judgment behavior (e.g., see Brehmer, 1992; Mosler, Schwarz, Ammann, & Gutscher, 2001).

Our goal is to evaluate the evolution of IPC theory from its inception to the present day. Specifically, we consider how research on cognitive conflict has developed in terms of its theoretical underpinnings and methodological stance, and we review the findings of empirical research on cognitive conflict. Our goal is modest in that we focus our efforts on cognitive conflict as it directly emerged from the IPC paradigm and related lens model framework. A review of conflict theories and research more generally are not within the scope of the present paper. The article is organized into three main parts. First, we consider the emergence of IPC theory from 1965 to 1976 by outlining its roots in Brunswikian psychology, the experimental methodology employed, and early research findings. Second, from 1976 to the present day, we trace the evolution of IPC theory and cognitive conflict research by conducting bibliographic and content reviews of publications that cite central articles by Hammond (1965) and Brehmer (1976). Finally, we discuss the future of IPC theory and cognitive conflict research by considering opportunities for theoretical advancement and methodological innovation offered currently in the field of JDM. We hope these will inspire future researchers.

2 Interpersonal conflict theory from Hammond, 1965 to Brehmer, 1976

In this section, we review the development of IPC theory from 1965 to 1976. We consider the roots of Hammond's (1965) IPC theory in Brunswik's (1952) lens model framework, the experimental methods proposed to study cognitive conflict, and the main findings of the early body of research on cognitive conflict as reviewed by Brehmer (1976).

2.1 Cognitive conflict and the lens model

Using Brunswik's (1952) lens model framework as a basis for theory and method, Hammond (1965) introduced IPC theory for understanding the nature, source, and resolution of cognitive conflict.[1] Figure 1 presents an adap-

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[1] Hammond (1965) applied the earlier developed multiple cue probability learning paradigm based on the lens model framework (Hammond & Summers, 1965) and the technique of cognitive feedback (Todd & Hammond, 1965) to judgment in social situations, namely conflict situations (see also Hammond, Wilkins, and Todd [1966b] for the related study of interpersonal learning). These historical antecedents of IPC theory differ from those noted by others. For instance, Brehmer (1976) claimed that IPC theory was guided by the conceptual framework of social judgment theory (Hammond, Stewart, Brehmer, & Steinmann,
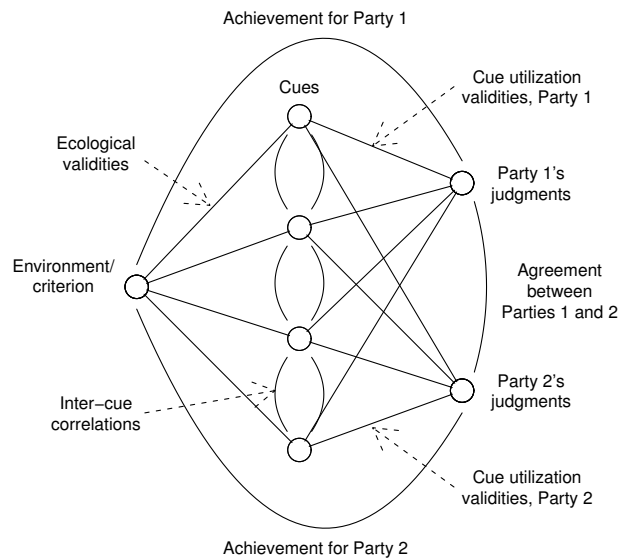

Figure 1: Lens model for study of interpersonal conflict and interpersonal learning (adapted from Hammond [1965] and Hammond et al., [1966b]).

tation of the lens model to the study of cognitive conflict (simplified for our purposes; see also Cooksey, 1996). For readers unfamiliar with this framework it is worth pointing out that the model shows a collection of cues diverging from a criterion in the environment, and these cues can be used by the different parties to predict the criterion. To the extent that a party's cue utilization validities match the ecological validities of the cues, the party will be able to achieve the criterion (i.e., make accurate decisions). Conflict can also occur in the absence of an outcome criterion, and to the extent that the cue utilization validities differ across the different parties they will be in conflict (i.e., disagree in their decisions). In the real world, the environment is often complex in that there are multiple, inter-correlated cues that are only probabilistically related to the criterion.

Analysis of cognitive conflict involves comparing the cognitive systems of the conflicting parties i.e., the right side of the lens model shown in Figure 1. In situations where there is no outcome criterion analysis would be restricted to the right side. There could of course be more than two parties in which case the model would include N-systems on the right side (Cooksey, 1996), and a party could also refer to a dyad or group of individuals (Rohrbaugh, 1988).

The lens model equation shown below (Tucker, 1964; see also Cooksey, 1996) details how a comparison of two

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1975), and Mumpower and Stewart (1996) stated that cognitive conflict research was rooted in cognitive continuum theory (Hammond, 1996a).

cognitive systems can be formally done:

$$r_A = GR_1R_2 + C\sqrt{(1 - R_1^2)}\sqrt{(1 - R_2^2)} \quad (1)$$

This equation points out that agreement between parties, r_A, is a function of two components, namely GR_1R_2, which is the linearly predictable component (when using multiple linear regression analysis) of each party's judgments contributing to overall agreement, and $C\sqrt{(1 - R_1^2)}\sqrt{(1 - R_2^2)}$, which is the unmodeled component of each party's judgments contributing to overall agreement. Equation 1 can be, and often is, reduced to the first component if one assumes that the unmodeled component of agreement is zero. Policy similarity is measured by G, while R_1 and R_2 are measures of each party's cognitive control over their judgment policies. The interpretation of C is more difficult as it could refer to several things such as the extent to which both party's policies are similar but unmodeled, the extent to which both party's policies are different and unmodeled, or a lack of unmodeled response variance in one or both parties.

Conflict may be due to systematic and non-systematic cognitive differences in the way parties solve the problem (Brehmer, 1976). Systematic differences refer to stable or predictable features of policies such as differences in relative cue weights, form of function relating cue values to judgments, organizing principles (i.e., how cues are combined), and policy consistency/cognitive control. Here, the lack of policy similarity means that parties may disagree both in principle and practice. Non-systematic differences introduce randomness or unreliability into the application of policies. Here, the lack of cognitive control means that parties may disagree in practice even though they agree in principle (false disagreement) or they may agree in practice even though they disagree in principle (false agreement; Hammond & Grassia, 1985).[2]

The nature and extent of the conflict may change as parties interact with each other and the task, thus highlighting the importance of studying interpersonal learning and task characteristics when understanding cognitive conflict. Indeed, an individual's ability to learn about another person's behavior is central to conflict resolution (Hammond et al., 1966b), as is his/her ability to learn about the characteristics of the task.[3]

According to Hammond (1965, and later Brehmer, 1976), in cognitive conflict research, the researcher's task is to measure the nature and extent of conflict between parties; document their efforts to agree; measure the nature and extent of compromise/resolution; measure the nature and extent of changes in the cognitive systems of conflicting parties; and document the effect of task- and person-related factors on conflict, compromise, and change. Such analyses are not only of theoretical import, but can also contribute to strategies for dispute resolution.

2.2 Methodology for cognitive conflict research in the lens model framework

From the perspective of IPC theory, the method used to study cognitive conflict involves experimentation (Brehmer, 1976; Cooksey, 1996; Hammond, 1965; 1973; see also Rohrbaugh, 1988, for group-based research methods). The standard experiment is divided into a training stage where parties are trained to think differently about a judgment task (i.e., develop a different set of cue-dependencies), and a conflict stage where the parties are brought together to attempt to arrive at a mutually agreeable solution to the problem.[4] More specifically, after each party has learned to solve the task alone they are brought together, unaware that they have different policies. The parties are then asked to co-operate on solving another set of problems which are actually different from the ones they each learned.[5] On every trial or judgment problem, they study the available information and make judgments of the criterion variable alone and then communicate these to one another (overt individual judgment). If they disagree, they must discuss the problem until they reach an acceptable joint response (joint judgment). They are then asked to reconsider their original decisions, and these revisions remain private (covert individual judgment). Finally, if there is an environmental criterion, they are presented with the correct solution. So, the parties must adapt to one another as well as adapt to the task in order to agree and achieve.

The researcher can precisely define and manipulate the quantity and quality of cognitive differences, and objectively measure cognitive conflict, compromise, and

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[2]Mumpower and Stewart (1996) point out that systematic differences in policies may be due to missing or poor feedback, missing or poor information, bias in subjective evaluations of one's own policy, and redundancy of information. Non-systematic differences may increase when the task is unpredictable or requires use of a large amount of information, especially in a nonlinear way, and when the party is learning to solve a novel task or a familiar task in a novel way. (See also Hammond's [1996a] cognitive continuum theory for how task characteristics may influence judgment).

[3]Research on interpersonal learning is also conducted within the lens model framework shown in Figure 1 (Earle, 1973; Hammond et al., 1966b; Hammond, 1972). Here, instead of making a joint deci-

sion, as would be done in a study on cognitive conflict, participants are asked to predict the other person's response. Comparison of the prediction with the other person's actual response provides a measure of interpersonal knowledge. Research on multiple-cue probability learning demonstrates how people learn about the task (Hammond & Summers, 1965). Characteristics of the task that individuals must learn include the cues, cue values, cue distributions, cue inter-correlations, and ecological validities (Dhami, Hertwig, & Hoffrage, 2004).

[4]Participants may also be selected because they have conflicting policies, and so the training stage is eliminated.

[5]Alternatively, the parties may be presented with a set of problems that only one party has learned, thereby requiring the other party to capitulate.

change. Furthermore, the researcher can add complexity to the experiment by, for example (as Brehmer, 1976, noted), introducing payoffs, manipulating feedback, and involving groups. Thus, although this paradigm may not fully represent all relevant features of what are typically complex problems, it can provide a reasonable analysis of some definable aspects. As such, Brehmer (1976) and Hammond (1965) both claimed IPC theory may be used to guide research into real world conflicts.

The basic data collected from a typical experiment includes the joint judgment, and the overt and covert individual judgments made by the parties before and after this (Hammond, 1965). As Hammond (1965) noted, these measures can be used to study the extent and nature of cognitive conflict, compromise, and change with respect to the task, and with respect to the other party. (There are overt and covert measures of compromise, conflict, and change). For instance, conflict can be measured by comparison of each party's overt individual judgments. A comparison of each party's overt and covert individual judgments and the joint judgments provides a measure of compromise at the overt and covert levels, respectively. Furthermore, a comparison of each party's (overt and covert) individual judgments and the criterion (where available) and the other party's judgments provides a measure of cognitive change with respect to the task and other party, respectively. Hammond (1965) also pointed out that the measures could be derived on both an inter- and intra-trial basis (i.e., comparison of each party's responses averaged across trials or comparison of each party's response on each trial, respectively), and that analyses could examine both external and internal dynamics such as the effect of interpersonal learning (Hammond et al., 1966b) and feedback (Todd, Hammond, & Wilkins, 1966). Indeed, the early research conducted by Hammond and colleagues focused on such topics (Hammond et al., 1966a).

2.3 Early findings of cognitive conflict research in the lens model tradition

After Hammond's initial research on cognitive conflict, Brehmer and colleagues conducted an intensive series of studies. In 1976 Brehmer reviewed the research that had been conducted on cognitive conflict using IPC theory. By then, research had examined issues concerning: (a) the structure of cognitive conflicts; (b) the relative importance of the task and the other party in affecting policy change and conflict resolution; (c) the effect of task characteristics on cognitive conflict; and (d) the effect of person characteristics on cognitive conflict. Research had also begun to study (e) how cognitive conflict could be resolved via supports/aids. We describe the main findings below.

First, conflict may persist due to non-systematic cognitive differences even when parties are motivated to agree, and actually do agree in principle. Indeed, while parties reduce the systematic differences in their policies (i.e., there is policy similarity), over time the inconsistency of their policies increases thus leading to little reduction in the amount of conflict although the structure of the conflict has altered (e.g., Brehmer, 1969). This is because parties tend to decrease their dependency on their old policies at a faster rate than they increase their application of a new policy that is compatible with each others' (e.g., Brehmer, 1972).

Second, policy change itself does not signify willingness to compromise but rather a desire to achieve, although compromise is sought when accuracy is not clearly observable/obtainable. When one party is initially trained in the optimal policy and the other is not, the latter will learn from the former if the task is highly predictable (e.g., Brehmer, 1973a). However, if task predictability is low, the parties start off by decreasing dependency on their initial policies. Here, based on feedback, the party with the optimal policy soon appropriately switches back to his/her original policy, and the other party also learns from feedback (e.g., Brehmer, 1974). When there is no feedback, parties may compromise: this reduces conflict without leading to observable inaccuracy (e.g., Brehmer, 1971).

Third, formal (surface and system) task characteristics can influence each party's policy development and the ease with which they can achieve, and such characteristics alone can explain cognitive conflict. Hammond and Brehmer (1973) did not find much evidence for substantive or content task characteristics influencing cognitive conflict. Surface characteristics refer to the number of cues, the metric level of cues, and the inter-cue correlations, while system characteristics refer to the distribution of cue validities, forms of functions relating cues to the criterion, organizing principles, and task predictability. For example, there is greater agreement despite less reduction of policy differences when the cues are inter-correlated than when they are orthogonal (Brehmer, 1975). This may be because cue inter-correlations enable the parties to achieve with little change of their original policies (Mumpower & Hammond, 1974). In addition, there is less agreement between parties when task predictability is low because each party's policies are less consistent rather because of any systematic differences in their policies (e.g., Brehmer, 1975). Similar findings have been observed for tasks that require policies with nonlinear function forms which tend to be more difficult to develop (e.g., Brehmer, 1973b).

Fourth, traditional individual difference variables such as gender do not affect measures of cognitive conflict (Hammond & Brehmer, 1973).

Finally, cognitive aids may be useful for reducing conflict. Hammond and Brehmer (1973) applied the technique of cognitive feedback (Todd & Hammond, 1965) and developed a cognitive aid to conflict resolution called POLICY.[6] This interactive computer program enables parties to express their policies, compare them, change them, and discover the effects of such changes on conflict (see Rohrbaugh, 1988, for group decision support systems). Cognitive feedback involves providing information about the task (i.e., ecological validities, inter-cue correlations, predictability, and cue-criterion function forms), the party's judgment policy (i.e., utilization validities, cognitive control/consistency, and cue-judgment function forms), and the match between them (i.e., achievement, and its linear and nonlinear components) (Balzer, Doherty, & O'Connor, 1989; Doherty & Balzer, 1988). Such feedback can help to speed conflict reduction (Balke, Hammond, & Meyer, 1973).

In 1969, Leon Rappoport warned that "if the cognitive conflict model is to serve as anything more than a laboratory analogue, it must be determined whether socially-induced (i.e., "natural") cognitive differences generate the same conflict phenomena as laboratory induced (i.e., "artificial") cognitive differences" (p. 143). In fact, as Brehmer (1976) noted, many of the findings that were observed in the laboratory on simulated tasks were also obtained in naturalistic environments or real tasks, particularly for use in policy development (e.g., Adelman, Stewart, & Hammond, 1975; Balke et al., 1973; Brown & Hammond, 1968; Steinmann, Smith, Jurdem, & Hammond, 1975). Brehmer (1976) concluded his review with avenues for future research including examining the antecedents and consequences of policy inconsistency, and further analysis of real world conflicts.

3 Interpersonal conflict theory and cognitive conflict research post 1976

Here, we trace the evolution of IPC theory after 1976 to the present day to determine what further contributions cognitive conflict research in the lens model tradition has made since Brehmer's 1976 review. For example, have researchers followed up on the suggestions initially made by Hammond (1965) that IPC theory can tell us something about real world political conflicts? Have researchers conducted research on the antecedents and consequences of policy inconsistency as suggested by Brehmer (1976)? Are there other ideas beyond those

of the lens model that are guiding cognitive conflict research today? To answer these questions, we used a combination of bibliographic and content reviews of publications since 1976 that cite the central articles by Hammond (1965) and Brehmer (1976). Thus, we focus on cognitive conflict research as it directly emerged from the IPC paradigm and related lens model framework. While the content review can shed light on the theoretical, empirical, and methodological contributions made since 1976, the bibliographic review indicates the "influence" or "importance" of the contributions. The bibliographic review also helps us to identify new research fronts in cognitive conflict research emerging from the work of Hammond (1965) and Brehmer (1976). The main limitation of this approach, however, is that it can exclude relevant publications by virtue of them not citing the central articles of interest. Later, we discuss how this limitation excluded potentially relevant work on negotiation.

We conducted a "cited reference" search on the ISI Web of Knowledge, Web of Sciences Databases (Science Citation Index Expanded, Social Sciences Citation Index, and Arts & Humanities Citation Index) to identify relevant journal publications in the period after 1976, to 2007 that cited Hammond (1965) or Brehmer (1976).[7] Publications before 1976 were also added in order to provide a full picture of the evolution of cognitive conflict research in the lens model tradition. Overall, our searches resulted in 192 hits, with 141 publications dating after 1976. After 1976, 39 publications cited Hammond (1965), 102 cited Brehmer (1976), and 15 cited both authors (i.e., were repeats). Thus, excluding the repeats there were a total of 177 publications (192 minus the 15 repeats) with 126 publications dated after 1976. (A list of the 177 publications is available from the second author.)

First, we conducted a bibliographic review of the 177 publications using CiteSpace II (Chen, 2004, 2006) which is a bibliometric tool that visualizes trends and turning points in scientific literatures based on citations. The input was bibliographic records from the publications and the outputs include illustrations of co-citation networks either in a cluster view or in a time zone view.[8] In CiteSpace II, the entire time interval is sliced into equal length segments in which citations and co-citations are calculated. In our analysis we used two year segments. In each time slice the co-citation network is determined by three thresholds, citation (c), co-citation (cc) and co-citation coefficient thresholds (ccc; this threshold determines the cosine coefficients in the normalization of the co-citation counts). The thresholds can be set for three

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[6]This was originally called COGNOGRAPH. The emphasis is on teaching consistent new policies. However, the effectiveness of this aid has not been empirically tested (Brehmer & Brehmer, 1988).

[7]Searches were as of October 27, 2007.

[8]Here, we provide only a brief overview of the steps involved in analyses using CiteSpace II, since only some of it's basic features were required for present purposes. The reader is referred to Chen (2006) for a detailed overview of CiteSpace II.

points in time with linear interpolation between them. The resulting networks in each time slice can then be pruned by using the Pathfinder algorithm or the minimum spanning tree algorithm. The networks in each time slice are then merged into a synthesized network. As our main objective was to illustrate the network of the most central publications, we present figures with pruned (using the Pathfinder algorithm) co-citation networks based on high thresholds. That is, the resulting merged network shows only the most important publications in terms of citations and co-citations during the time period. In the merged network, individual publications are represented as tree rings where the thickness of a ring is proportional to the number of citations in a given time slice. The size of the outermost ring and the size of the font of the publication label are proportional to the betweenness centrality of the publication. The betweenness centrality measure is a graph theoretical property that specifies the importance of a node's position in a network (Chen, 2006). The color of the connecting lines between the citation trees represents the year of the first co-citation of the publication.

Second, we conducted a content review of those publications since 1976 on cognitive conflict in the lens model tradition, and which had cited Hammond (1965) or Brehmer (1976). After examining the 126 publications, only 17 were deemed relevant to this review. As described below, the remainder (109) were either publications on cognitive conflict but not in the lens model tradition or on topics related to (but not directly on) cognitive conflict such as interpersonal learning, group decision making, and decision aids. Our content review summarizes the methods and main findings of the 17 relevant publications.

3.1 Bibliographic review

The main results of the bibliometric analysis are presented in Figure 2, which shows the cluster view of a co-citation analysis from 1965 to 2007. Brehmer (1976) and Hammond (1965) are the two most central articles as they were the basis of the selection procedure. The publications on IPC theory or cognitive conflict research in the lens model tradition can be found on the left. These are mostly from the 1960s and 70s. Indeed, there appears in recent years to be a decline in cognitive conflict research using the lens model tradition, and few central articles were published in the years after Brehmer (1976). Although 126 publications have cited Brehmer (1976) or Hammond (1965) over the past 30 years, few of these actually examine cognitive conflict in the lens model tradition. Of the 17 publications that we classified as relevant to the content review we report below, there were two highs of 3 publications in 1977 and 1979 and then a sharp decline to one or zero each year following that.

The upper left and the upper right of Figure 2 shows publications largely concerned with JDM, only some of which are related to cognitive conflict (but not directly on the topic itself). Here, for instance, researchers have examined how cognitive conflict may affect a third person's judgments. For example, Cosier (1978) studied the effect of different ways in which expert advice could conflict and the effect of their degree of accurate knowledge of the environment on subjects' predictions of the criterion (see also Schwenk & Cosier, 1980). Cosier, Ruble, and Aplin (1978, Study 1) examined perceived helpfulness of expert advice under high and low conflict. Researchers also investigated factors that may impact judgment policies which have implications for future research on cognitive conflict (Hagafors & Brehmer, 1983), and shown how judgment analysis can be used to study expert judgment (Adelman & Mumpower, 1979). However, most of the publications on the upper left and right of Figure 2 are unrelated to cognitive conflict. For instance, Dinkage and Ziller (1989) explored US and German children's conceptualizations of war and peace via photographs.

Most interestingly, the bottom right of Figure 2 shows that a new research front on group conflict appears to have emerged which also apparently examines cognitive conflict. It is in the mid-1990s, after the publication of Jehn's (1995) article on the benefits and detriments of intragroup conflict, and the earlier book by McGrath (1984) on the interaction and performance of groups, that we can observe this new research front. These new central articles and their offshoots are at the bottom right of Figure 2. As we will discuss later, this new research front is not grounded in the lens model tradition and, although they still occasionally cite Brehmer (1976; and, rarely, Hammond, 1965), these researchers use different theoretical frameworks and research tools than those used by researchers studying cognitive conflict in the lens model tradition. In fact, these researchers are not as interested in cognitive conflict as defined in the lens model tradition.

3.2 Content review

As mentioned above, we also conducted a content review of the 17 (out of 126) publications classified as being on cognitive conflict in the lens model tradition, which cited Hammond (1965) or Brehmer (1976). The Appendix presents a summary of the main aims, methods, and findings of these studies. (The main publications before 1976 were reviewed in Section 1).

All 17 publications reported studies that appeared to have moved beyond the theoretical issues reviewed by Brehmer in 1976 to investigate a new set of problems (except perhaps Rose et al., 1982). First, nine studies examined the effect of some form of intervention on cognitive conflict or judgment performance. Cosier and
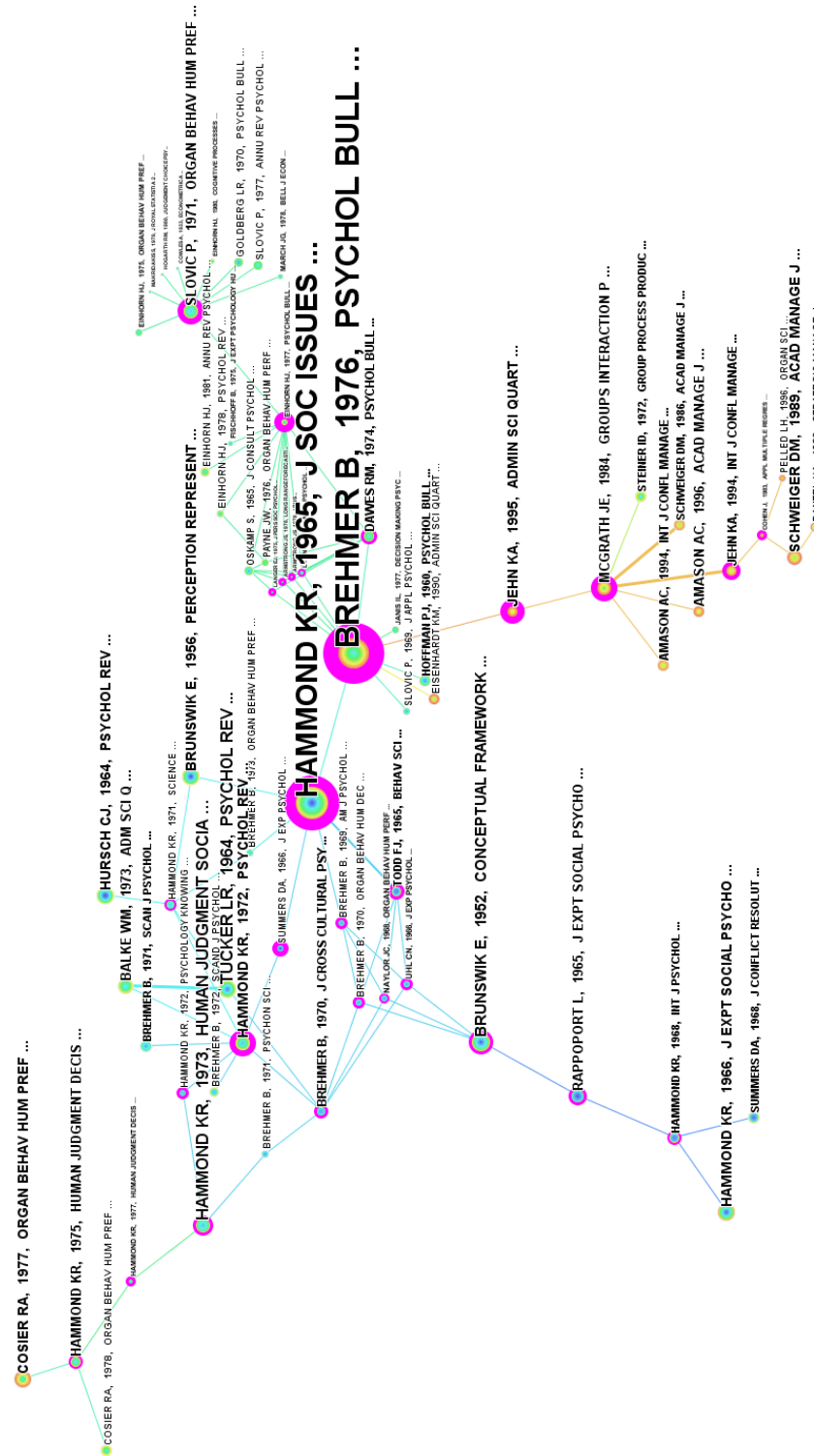
Figure 2: Co-citation network of publications 1965–2007 (2 years slice, parameters c, cc, ccv: 3, 2, 25; 3, 3, 25; 4, 4, 25)

Rose (1977) examined the effect of cognitive conflict and goal conflict on judgment performance, and found less prediction error under high (than low) cognitive conflict in earlier trials, and under no-goal conflict. Holzworth's (1983) study measured the impact of task predictability and mediation on conflict reduction, and reported that, while there was no significant effect of mediation, agreement was greater under more (than less) predictable tasks. Alexander (1979) measured the effect of communication technique on conflict reduction, and found that dyads trained in the "region of validity" technique showed greater conflict reduction than those not trained as such. Harmon (1998) studied the effect of decision making method and communication medium on group satisfaction and agreement, and found that audio-communication (as opposed to face-to-face communication) increased satisfaction while policy modeling decision methods improved agreement over conventional decision making methods. Harmon and Rohrbaugh (1990) and Sengupta and Te'eni (1993) studied the effect of cognitive feedback on group JDM. Whereas cognitive feedback increased group cognitive control, it did not increase agreement, and shared feedback did not improve group judgment accuracy over individual feedback/no feedback, but it did increase agreement. Reagan-Cirincione (1994) and Bose and Paradice (1999) measured the effectiveness of group decision aids or support systems on group performance, which revealed that such aids were effective. Andersson and Brehmer (1979) compared the effect of individual and interpersonal learning on policy change, and reported no significant differential effects of these types of learning.

Second, five studies investigated group conflict (Bose & Paradice, 1999; Reagan-Cirincione, 1994; Harmon, 1998; Harmon & Rohrbaugh, 1990; Sengupta & Te'eni, 1993). These reported on the effectiveness of cognitive feedback (i.e., availability of feedback and whether it is shared), and group decision aids (where group discussion was aided by a facilitator and computer analyst) or support systems (where there is computerized collection and communication of individual judgments, amongst other things), as well as decision making method (i.e., structured policy modeling or not) and communication medium (i.e., audio or face-to-face).

Third, two studies examined potential perceptual influences on cognitive conflict. Dhir and Markman (1984) studied marital conflict in task definition rather than judgment performance. They found that feedback of their spouses' perception of the task had a differential impact on husbands' and wives' ability to correctly predict their spouses' judgment policies. Qualls and Jaffe (1992) examined how husbands' and wives' pre-existing perceptions influenced conflict in joint purchase decisions. Here, similar perceptions led to less conflict and these

couples resolved conflict differently than couples with dissimilar perceptions.

Finally, some studies also included measures of interpersonal learning as well as interpersonal conflict (Alexander, 1979; Gillis, 1979b; Gillis & Moss, 1978; McCarthy, 1977).

Methodologically, most researchers diverged from the experimental method proposed by Hammond (1965) in several ways. First, in seven studies there was no training stage where participants learned to perform the judgment task (Dhir & Markman, 1984; Harmon, 1998; Harmon & Rohrbaugh, 1990; McCarthy, 1977; Reagan-Cirincione, 1994; Summers et al., 1977; Qualls & Jaffe, 1992). Second, and relatedly, in over half of the studies parties were not trained to hold different judgment policies. Rather, in some studies parties were brought together based on their existing policy differences (Bose & Paradice, 1999; Harmon, 1998; Harmon & Rohrbaugh, 1990; McCarthy, 1977; Reagan-Cirincione, 1994). Gillis and colleagues paired participants according to the medication they were prescribed (Gillis, 1979a; 1979b; Gillis & Moss, 1978). Dhir and Markman (1984) and Qualls and Jaffe (1992) studied married couples. These methodological departures represent more than superficial deviations. Rather, they can reduce the researcher's control over the study of cognitive conflict by, for instance, introducing unwanted (and potentially unknown) variability in how different parties perform the task and in the degree of existing conflict between parties.

Finally, in seven studies parties did not interact at the conflict stage. Rather, participants were either given a simulated person's judgments in conflict to their own (Cosier & Rose, 1977; Rose et al., 1982) or participants' responses were paired (Summers et al., 1977). In McCarthy's (1977) study, joint judgments were optional, and Andersson and Brehmer (1979) examined how individual learning compared to interpersonal learning. Dhir and Markman (1984) and Qualls and Jaffe (1992) simply paired individuals' judgments. This elimination of the interpersonal communication between conflicting parties means that relevant issues such as interpersonal learning cannot be addressed in the study of cognitive conflict, compromise, and change.

Before summarizing the findings of this content review, it is worth pointing out that, since the bibliographic review technique used for initial selection of publications was limited to those that cited the articles by Hammond (1965) and Brehmer (1976), some potentially relevant work on negotiation was excluded (Darling, Mumpower, Rohrbaugh, & Vari, 1999; Milter, Darling, & Mumpower, 1996; Mumpower & Rohrbaugh, 1996). This work reiterates the importance of the task environment when understanding negotiation or conflict behavior (Mumpower, 1988; 1991). Negotiation tasks do not always have an

outcome criterion, or it may be irrelevant. Characteristics of negotiation tasks are often subjectively interpreted by the conflicting parties, and these characteristics (interpretations) may change as the parties interact. The task structure in turn affects the most appropriate negotiation strategy. Thus, in negotiation tasks parties must agree on what the task is and how to solve it. This work expands or redefines the terminology for discussing conflict resolution: for example, settlements may be efficient, have joint utility or equality, and strategies may involve compromise or logrolling/horsetrading (where parties make trade-offs so they each obtain a desirable outcome). Controlling for formal task characteristics, substantive task characteristics (i.e., cover story) can affect negotiators' ability to reach efficient settlements (Milter et al., 1996). This work has also described procedures to support conflict resolution in multi-party negotiations in real-world public policy settings (Darling et al., 1999).

In sum, although our bibliographic review indicates that after 1976 relatively few studies were published on cognitive conflict in the lens model tradition our content review suggests that several new contributions were made by this small body of literature. In fact, the literature went beyond the issues studied in the earlier work reviewed by Brehmer (1976) in several interesting ways. However, for unknown reasons, no-one followed up on the suggestions initially made by Hammond (1965) that IPC theory can tell us something about political conflicts, which nowadays may focus on identifying and managing threats to national and global security, although the work on group conflict and negotiation sometimes deals with public policy issues (e.g., Darling et al., 1999; see also Hammond and Grassia, 1985 for public policy examples). Similarly, few researchers directly examined the antecedents and consequences of policy inconsistency as suggested by Brehmer (1976). Karelaia and Hogarth (2008) recently examined the impact of several factors such as outcome feedback and cue redundancy on policy inconsistency, which may be worth exploring in the context of cognitive conflict research. Researchers also often departed from the experimental method described by Hammond (1965). Rather than representing useful innovations these departures appear to dilute the control that the researcher has over the experimental situation in, for instance, knowing the precise sources of conflict, and limit the study of important issues in cognitive conflict such as interpersonal learning.

3.3 Research on group conflict: A paradigm shift in cognitive conflict research

Beyond the small body of published literature on cognitive conflict in the lens model tradition conducted after 1976, the bottom right of Figure 2 revealed that in

the mid-1990s there was an emerging research front on group conflict that apparently examines cognitive conflict. The central publications were by McGrath (1984) and Jehn (1995). However, this new research front is not grounded in the lens model tradition and, although they still occasionally cite Brehmer (1976; and rarely Hammond, 1965), these researchers use different theoretical frameworks and research tools than those used by researchers studying cognitive conflict in the lens model tradition. It is worth briefly reviewing the new central publications in order to assess the degree to which this research front, which has attracted more researchers than the lens model tradition, marks a theoretical and methodological advance in cognitive conflict research.

McGrath's (1984) book reviews the theoretically grounded empirical literature on small groups, and summarizes the methods used to study small groups. He notes that when a group's task is to resolve conflicts, as is often the case, IPC theory (which he confusingly refers to as "social judgment theory" throughout) is relevant to understanding the negotiation process. IPC theory is thus reviewed in a chapter entitled "Cognitive conflict tasks: Resolving conflicts of viewpoint within the group." Here, a passing reference is made to Brunswik's (1955; whose name is misspelled throughout) lens model, and articles by Brehmer (1976) and Hammond et al. (1966a, 1975) are summarized. The experimental method associated with IPC theory is also summarized. In addition, with reference to a study by Rohrbaugh (1979), McGrath (1984) concludes that the cognitive feedback approach used by IPC theorists to improve group judgment is not very effective. Overall, McGrath (1984, p. 66, p. 89, p. 93) calls the work on IPC "limited," noting that much of the research has been conducted only on "two-person groups," and he calls the method used "very elaborate."

Thus, McGrath's (1984) book introduced IPC theory and its associated method to researchers interested in studying group JDM. However, this was just one of several approaches reviewed by McGrath, and he was somewhat critical of it. It is no surprise therefore, that few researchers interested in group JDM have studied conflict in the lens model tradition. In fact, later, Jehn's (1995) reference to Brehmer (1976) is merely to point out that he (and others) suggest that the relationship between conflict and performance is influenced by the type of task a group performs. Similarly, others refer to Brehmer (1976) simply as a means of suggesting that cognitive conflict may result in affective conflict (Amason, 1996). Generally, the research questions, theoretical insights, and experimental method of IPC theory were overlooked in the central articles by McGrath (1984) and Jehn (1995), and with the exception of work by Rohrbaugh and colleagues (Rohrbaugh, 1988, and Harmon & Rohrbaugh, 1990), abandoned in recent research on group conflict (e.g.,

Pelled, Eisenhardt, & Xin, 1999).

As the central article by Jehn (1995) demonstrates, cognitive conflict is often defined in terms of "task conflict." According to Jehn (1995, p. 258)

"Task conflict exists when there are disagreements among group members about the content of the tasks being performed, including differences in viewpoints, ideas, and opinions."

This concept was measured by Jehn (1995, p. 268) using a short scale that includes items such as "How often do people in your work unit disagree about opinions regarding the work being done?" "How frequently are there conflicts about ideas in your work unit?" And, "How much conflict about the work you do is there in your work unit?" Responses are provided on 5-point scales anchored by 1 = "none" and 5 = "a lot." Others have used similar measures (e.g., Pelled et al., 1999). Therefore, the new concept of task conflict is somewhat vague and ill-defined, and its measurement is not very precise. For instance, it is unclear how participants interpret concepts such as "conflict," "opinions," and "ideas," and there is no clear differentiation of different aspects of the phenomenon of task conflict. Finally, its measurement is on a short, subjectively interpreted scale. This approach clearly departs from the precise definition of cognitive conflict provided by IPC theory as the relation between cognitive systems which is measured quantitatively in terms of agreement (r_A), policy similarity (G), and cognitive control (R_1 and R_2), and which clearly differentiates between different aspects of the phenomenon (e.g., policy similarity versus cognitive control).

Furthermore, this group of researchers are largely interested in questions pertaining to the impact of task (cognitive) conflict on outcomes such as work satisfaction, liking of other group members, intentions to remain in the group, performance (Jehn, 1995), and emotional conflict (Pelled et al., 1999). They have typically used quantitative questionnaire and qualitative observational and interview methods as well as archival analysis to examine the nature and effects of existing conflict within work groups. For instance, Jehn (1995) measured individuals' performance via appraisal ratings, departmental records, and supervisors' ratings. The experimental method is rarely employed. This makes it difficult to advance causal theories, and their findings remain limited to description and prediction. Indeed, these researchers typically use multiple regression and other correlational techniques for data analysis, which is why the statistical textbook by Cohen and Cohen (1983) also appears in the bottom right of Figure 2.[9]

Therefore, while researchers working on group conflict

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[9]Although research in the lens model tradition has also traditionally employed correlational tools, these are used in conjunction with experimental techniques.

have focused on conflict in real world settings such as organizations which lends external validity to their findings, the main focus in this new research front on group conflict is not necessarily cognitive conflict, but task conflict. It could be argued that the methods employed do not represent an advance, and that the theories, as they currently stand, are limited. As such we believe the research front on group conflict revealed at the bottom right of Figure 2 does not really represent a constructive paradigm shift in cognitive conflict research.

4 The future of interpersonal conflict theory and cognitive conflict research

In this final part, we offer possible reasons for the sharp decline of cognitive conflict research in the lens model tradition, and we discuss the future of this research and IPC theory in the context of the growing field of JDM. Specifically, we consider some of the opportunities for theoretical advancement and methodological innovation in cognitive conflict research.

At a meeting in 2006 of the Brunswik Society, a small international group of scholars dedicated to Brunswikian psychology, researchers offered possible explanations for the historical decline of cognitive conflict research in the lens model tradition and the neglect of IPC theory. In particular, researchers recalled that they felt most of the important and interesting questions concerning cognitive conflict had already been sufficiently addressed in Hammond's and Brehmer's early work, thus leaving little scope for new insights. Researchers also reminisced that at the time there were several other areas of Brunswikian-related research available for exploration which were more appealing such as the study of clinical judgment (Hammond, 1955), multiple cue probability learning (Hammond & Summers, 1965), cognitive feedback (Todd & Hammond, 1965), interpersonal learning (Hammond, 1972; Hammond et al., 1966b), and social judgment theory (Hammond et al., 1975). From a more practical perspective, researchers noted that cognitive conflict research in the lens model tradition was challenging. For instance, echoing McGrath's (1984) criticism, researchers complained that the proposed experimental method was inefficient since it required many participants and much time. Furthermore, researchers noted that later generations of students were not always sufficiently trained to conduct the relatively complex statistical analysis required by the lens model equation.

It is however, premature to conclude that cognitive conflict research in the lens model tradition conducted to date has provided a complete picture of cognitive con-

flict, compromise, and change. None of the questions addressed in the early work have been fully explored. For instance, the effects of task characteristics on conflict, compromise, and change need to be examined more comprehensively, as do the role of person characteristics. And, much more research is needed on real world conflicts. In addition, there are other empirical questions that have yet to be addressed, which may contribute to a theoretical understanding of how conflict, compromise, and change are influenced by parties' subjective interpretations of events, and their opportunity to learn the task. For instance, what is the role of task definition in cognitive conflict? What are the antecedents and consequences of perceived rather than actual conflict? What is the effect of lack of feedback or delayed feedback on compromise and change? Is the nature of compromise and change different when parties conflict in a problem where there is no outcome criterion? Beyond this, conducting cognitive conflict research in the context of the fast expanding field of JDM lends several opportunities. By taking into account recent theoretical and empirical developments researchers can make theoretical advancements to IPC theory and integrate it with other approaches, as well as study emergent research questions. Moreover, by adopting new methodological innovations researchers can overcome some of the practical challenges to conducting cognitive conflict research in the lens model tradition.

4.1 Potential for theoretical advancement

Several developments in the field of JDM may be used to advance IPC theory. Two such inter-related developments, which were partly inspired by Brunswikian psychology, concern the nature of the cognitive models that are constructed when investigating JDM. Typically, researchers working in the lens model tradition have developed models of cognition using statistical regression techniques (Cooksey, 1996). These are static, structural models that describe how people weight and combine information but not how they search for it, and they suggest people use the same cues in the same way for deciding on different judgment problems in a task. Using these models, researchers have portrayed the judgment process as a linear, compensatory integration of multiple cues (Brehmer & Brehmer, 1988).

However, recently, it has been argued that regression models do not provide a psychologically plausible or flexible and adaptive description of human JDM (Dhami & Harries, 2001; Gigerenzer, Todd, & the ABC Research Group, 1999), even though they can capture simple processes (Hogarth & Karelaia, 2007). In fact, it has been demonstrated that people frequently use simple heuristics (e.g., Dhami, 2003; Dhami & Ayton, 2001), espe-

cially under certain circumstances (e.g., Garcia-Retamero & Dhami, in press; Rieskamp & Hoffrage, 1999). These are dynamic, process models that describe information search, stop, and decision making. They suggest that people may use different cues in different ways for deciding on different judgment problems in a task. Often, these "fast and frugal" heuristics, as they are called, portray the judgment process as non-compensatory, such that people base decisions on one cue alone.

Brunswik (1955, 1956) did not rule out the use of other models, neither did Hammond (1955; 1996b), and Brehmer (1979) recognized this. Thus, alternative visions of the lens model have recently been proposed (Dhami & Harries, 2001; Gigerenzer & Kurz, 2001), and simple heuristics have been adopted by some researchers in other areas of Brunswikian-related research such as social judgment theory research (e.g., Dhami & Ayton, 2001; Dhami & Harries, 2001; Kee et al., 2003). Similarly, it may be worth employing a simple heuristics approach to IPC theory, and examining how simple cognitive strategies fare in conflict situations. Researchers can examine the extent to which the findings of past cognitive conflict research generalize to situations where (one or both) conflicting parties use non-compensatory strategies. Indeed, advocates of the simple heuristics approach have argued for the superiority of these simple cognitive strategies relative to regression models in terms of, for example, achievement/accuracy (e.g., Czerlinski, Gigerenzer, & Goldstein, 1999; Gigerenzer & Goldstein, 1996), and so a simple heuristics approach to IPC theory and cognitive conflict research can indicate whether simple heuristics are also valuable in social (conflict) situations. Researchers can also investigate the pattern of information search and stop during conflict, compromise, and change. The fact that simple heuristics do not require the type of statistical analysis necessary for regression analysis also means that less numerically minded students may feel competent to study cognitive conflict.

Another development in the field of JDM that can be used to advance IPC theory concerns the nature of the factors that are used to explain cognitive conflict, compromise, and change. While working during the "cognitive revolution" in psychology, Hammond (1965) strived to show how cognition alone was relevant to conflict. In his vision of the future he saw that "conflict between men will be derived from their cognitive differences" (Hammond, 1965, p. 65). Similarly, Brehmer (1979, p. 1000) concluded that "cognitive factors may produce conflict and that cognitive factors alone may cause prolonged disagreement, even in the absence of differences in interest or emotional factors."

However, there has been a growing recognition in the field of JDM of the importance of non-cognitive factors such as emotions (Loewenstein & Lerner, 2003). Emo-

tions experienced at the point of JDM as well as emotions that an individual expects to experience from the outcome of his/her decision may impact the cognitive process and judgment behavior. For instance, in the context of risk, Loewenstein, Hsee, Weber, and Welch (2001) claim that anticipatory emotions can have a direct impact on judgment behavior. Furthermore, they state that both anticipated and anticipatory emotions can have an indirect impact on judgment behavior via influencing the cognitive process. Research using both a valence-based and an emotion-specific approach tends to support these claims (e.g., Clore, 1992; Johnson & Tversky, 1983; Lerner & Keltner, 2000; Zajonc, 1980). For example, experienced anger may lead people to be risk-seeking, while expected regret may lead them to be risk-averse. There is also evidence to suggest that emotions can have both benefits and drawbacks for JDM (e.g., Bechara, Damasio, Tranel, & Damasio, 1997; Frijda; 1986; Loewenstein, 1996; Slovic, 2001). For example, expected emotions can help the individual make decisions that take consequences into account, but forecasts need to be relevant and accurate. Immediate emotions can help him/her focus on important events, provide useful information and motivation, but can drive the individual to act contrary to long-term goals and can influence forecasts.

It may be worth expanding IPC theory to include noncognitive factors, and in particular, examining the role of emotions in conflict situations. Researchers could examine the direct and indirect impact that specific expected and experienced emotions (e.g., anger, regret, sadness, and happiness) have on the willingness to compromise and agree (or capitulate), ability to change, and on consistency. While negative emotions may lead conflict to continue and make agreement difficult to reach, positive emotions may facilitate compromise and change. In fact, emotions may also alter the conflict resolution strategies that parties use, and how they perceive and interact with one another (e.g., Forgas, 1998; van Kleef, de Dreu, & Manstead, 2006). Emotions may also impact the party's perception of the outcome. Finally, inclusion of emotional factors in IPC theory and cognitive conflict research can indicate further potential sources of expected and experienced emotions (i.e., from aspects of the conflict situation), which may be useful to those specializing in emotion research.

The potential for IPC theory and cognitive conflict research to employ process models that describe conflicting parties as using simple heuristics and being influenced by emotions is compatible with Hammond's (1996a, 2000) cognitive continuum theory (CCT). CCT is a recent Brunswikian-related development which highlights the interplay between characteristics of the task and modes of cognition. Cognition can be placed on a continuum from the intuitive to the analytic, although the most common type incorporates elements of both and is called quasirationality. Intuitive cognition is characterized by, for example, low cognitive control and awareness of cognitive activity but high speed of processing; whereas analytic cognition involves for example, high cognitive control and awareness of cognitive activity but slow speed of processing. Tasks can induce certain modes of cognition, and successful performance on a task inhibits movement along the continuum while failure may stimulate transition to other modes of cognition. Importantly, performance is contingent on the correspondence between the task properties and the individual's cognitive mode. It has been suggested that certain task characteristics such as having more than five cues, inter-cue correlations, pictorial presentation of information, many decision alternatives, no outcome feedback, familiarity with the task, and time pressure all induce an intuitive mode of cognition. The reverse of these induces an analytic mode of cognition, whereas a combination of the two types of task characteristics will induce quasirationality. Simple heuristics and emotions imply an intuitive mode of cognition, and it may be worthwhile studying how this mode relative to others may impact conflict resolution.

4.2   Potential for methodological innovation

Technological advances mean that researchers in the field of JDM have a wider variety of methodological tools available to them to develop and test their theories. As Dhami et al. (2004) point out, although experimentation is important, it has been supplemented by other methods such as virtual environments and computer simulations. Computer generated "microworlds" can simulate the conditions of naturalistic environments that participants repeatedly interact with. As with research on naturalistic decision making (Zsambok & Klein, 1997), virtual environments can be characterized by time pressure, limited information, uncertainty, limited resources, imprecise goals, high stakes, and dynamic conditions. Expert or professional JDM (individual or group) such as fire commanders and military leaders can be examined, as well as that of novices. However, instead of relying on descriptive accounts via observations, interviews, case studies, and "cognitive task analysis" as is the case in the subfield of naturalistic decision making, researchers using microworlds can manipulate and control aspects of the task and conflict situation, as well as obtain repeated measurements. Microworlds have been used in JDM to, for example, study dynamic decision making and judgment biases (e.g., Brehmer, 1992; Brehmer & Dörner, 1993; Fiedler, Walther, Freytag, & Plessner, 2002). Researchers can use microworlds to test their understanding of cognitive conflict, compromise, and change in naturalistic settings.

Computer simulation has been shown to be a particularly useful method of theory development since it allows precise and transparent specification of a theory, and rigorous and efficient testing of its implications (Mosler et al., 2001). Simulation models can be validated by comparison with past research findings, and the models can be used to design further research studies. Simulations have practical advantages: For instance, they can model dynamic processes, involve repeated trials, allow within-subjects analysis, and allow examination of individual or group behavior. Computer simulations have been used in JDM to, for example, model the overconfidence effect and hindsight bias (e.g., Hertwig, Fanselow, & Hoffrage, 2003; Pohl, Einsenhauer, & Hardt, 2003), as well as the outcomes of using different negotiation strategies (e.g., Darling & Mumpower, 1992). Similarly, computer simulations can be employed by researchers to develop and test the above suggested advancements of IPC theory, namely by including simple heuristics and emotions.

5   Concluding remarks

As our review shows, Hammond's (1965) IPC theory and his vision of cognitive conflict research have, since Brehmer's (1976) review, been "lost in translation" and neglected altogether. This is regrettable since there is a need for conflict theories, including cognitive conflict, in the current socio-political era characterized by international terrorism where parties disagree about the level of threat, and how to manage and minimize it, and where there is a growing movement towards use of alternative dispute resolution techniques. Already equipped with a precise theory and rigorous method, researchers studying cognitive conflict in the lens model tradition can make the most of opportunities offered in the growing field of JDM to consider conflicts where parties may use more or less simple strategies and where they may be influenced by emotions in natural environments. We hope the present paper inspires future researchers of cognitive conflict.

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Appendix

Content review of cognitive conflict research in the lens model tradition. (Only relevant changes to the standard method involving a training and conflict stage described in Section 1 of the paper are noted here.)

Study and Main Aims	Methodology	Main Findings

Cosier and Rose (1977): Effects of cognitive conflict and goal conflict on judgment performance.	• Training stage.
	
	• Conflict stage:
	
	  – Introduced goal conflict (differential payoffs for predictions by each S in a pair v. equal payoff).
	
	  – No interpersonal discussion (Ss given simulated others' judgments more or less in conflict with own).
		• Less prediction error under high (than low) cognitive conflict in earlier trials.
		
		• Prediction error greater under goal (than no-goal) conflict.
		
		• Prediction error reduced over trials.

McCarthy (1977): Analysis of cognitive conflict reduction and interpersonal understanding under no outcome feedback.	• Lens model with no criterion (outcome feedback or accuracy measure). • Ss had existing policy differences. • No training stage. • Conflict stage: – Joint judgments optional.	• No gender differences at conflict stage. • Policy consistency and similarity increased in later trials; agreement increased over trials. • Initial consistency determines agreement more than similarity does, but over trials similarity increases so becoming equal determinant of agreement. • Discussion duration decreases over trials. • Dyads' decision to reach joint judgment similar over trials. • Ss assume initial policy similarity. • If no discussion permitted males show reduced agreement than females. • Ss good at predicting others' judgments.
Summers, Ashworth, and Feldman-Summers (1977): Analysis of interpersonal conflict in context of societal problem solutions.	• No training stage. • Conflict stage: – No interpersonal discussion (Ss' responses randomly paired).	• Policy similarity high, but consistency lower, so level of agreement limited. • Nonlinear/unmodeled component of Ss' policies negligible.

Alexander (1979): Effects of communication technique on reducing cognitive conflict and interpersonal learning.	• Training stage:
	
	   – Instructed Ss in communication techniques ('region of validity' and supportive) or not.
	• Conflict stage:
	
	   – Included interpersonal learning phase.
		• Trained dyads had greater conflict reduction than untrained dyads.
		
		• Conflict reduction increased over trials.
		
		• Cognitive consistency and similarity increased over trials.
		
		• Dyads with greater conflict reduction communicated differently than dyads with less conflict reduction.
		
		• No difference in interpersonal understanding of trained and untrained dyads.

Gillis and Moss (1978): Effect of antipsychotic and antidepressant medication on conflict resolution and interpersonal learning.	• Ss receiving medication (Amitriptyline-perphenazine, AP, or amitriptyline-haloperidol, AH).
	
	• Training stage.
	
	• Conflict stage:
	
	   – Ss in medication conditions paired.
	
	   – Included interpersonal learning phase.
		• AH group had higher agreement than AP.
		
		• AH had more policy similarity than AP.
		
		• No difference in policy consistency between groups.
		
		• No difference between groups in accuracy of predicting other's judgments in a pair.

Andersson and Brehmer (1979): Effects of interpersonal learning on policy change.	• Training stage.
	
	• Conflict stage:
	
	   – Same or different task Ss were trained in.
	
	   – Involved individual learning (as in the training phase) or interpersonal learning.
		• No effect of learning type on policy change under same or different task at conflict stage.
		
		• Ss adapted slower to task at conflict stage if it is different from training phase than if the same.

Gillis (1979a): Effects of antipsychotic medication on conflict resolution.	• Ss receiving medication (thioridazine only, T-only, thioridazine in combination, TC, trifluoperazine, T, haloperidol, H). • Training stage. • Conflict stage: – Ss receiving same medication paired.	• No difference in agreement and policy similarity across the four groups. • Policy consistency differed for Ss taught linear versus nonlinear policy. • Ss less consistent over trials. • H group most resistant to reducing weight of trained cue, T-only most difficultly in learning new cue, and T best at reducing weight on old cue and using new cue.

Gillis (1979b): Effects of antipsychotic medication on conflict resolution and interpersonal learning.	• Ss receiving medication (fluphenazine or trifluoperazine) or not.
	
	• Training stage.
	
	• Conflict stage:
	
	  – Ss in three conditions paired with Ss receiving no/other medication (whose data are unanalyzed).
	
	  – Included interpersonal learning phase.
		• No difference in agreement, policy similarity, and consistency across the three groups.
		
		• Over trials, Ss in no medication group had greater increases in policy similarity and consistency than other two groups, who decreased in consistency and similarity.
		
		• Agreement did not improve over trials.
		
		• No difference between groups in accuracy of predicting other's judgments in a pair, or on other measures of interpersonal learning.

Rose, Menasco, and Curry (1982): Effects of form of cognitive conflict, information environment, and cognitive complexity on judgment performance.	• Training stage.
	
	• Conflict stage:
	
	  – Task at conflict stage required equal or different cue weights.
	
	  – Ss told task different at conflict stage.
	
	  – No interpersonal discussion (Ss given simulated others' judgments in inverted or simple conflict to own).
		• Task cue weights and conflict type interacted so achievement higher under different weights-simple conflict and equal weights-inverted conflict, but lower under equal weights-simple conflict and different weights-inverted conflict.
		
		• Achievement increased over trials, especially under different weights-inverted conflict
		
		• Achievement not higher under equal than different weights.
		
		• No difference in achievement between more or less cognitive complexity/information processing Ss.

Holzworth (1983): Effects of task predictability and mediation on conflict reduction.	• Training stage.
	
	• Conflict stage:
	
	  – Task at conflict stage more or less predictable.
	
	  – Introduced third-party 'mediators' (with congruent or incongruent knowledge) or not at second phase of conflict stage.
		• Greater agreement in more (than less) predictable task.
		
		• No effect of task predictability on policy similarity.
		
		• Agreement but not similarity increased over trials.
		
		• No effect of mediation on agreement or similarity, or joint judgments.
		
		• Over trials, judges' knowledge and achievement increased but policy consistency did not, but for mediators no change on any measures.
		
		• Judges' and mediators' achievement and consistency greater in more (than less) predictable task.

Dhir and Markman (1984): Analysis of marital conflict.	• Case study of married couple. • No training stage. • Couple generated cues that made cases. • Each S provided a priori subjective cue weights and function forms, and those of their partner, before making judgments. • Each S given cognitive feedback of own and partner's policy, then asked to revise own cue weights, before making judgments on new task. • No conflict stage.	• Wife's ability to predict husband's policy decreased after cognitive feedback, but husband's ability to predict his wife's policy increased.

Harmon and Rohrbaugh (1990): Effects of level of cognitive feedback on judgment accuracy and agreement.	• Ss had existing policy differences.
	
	• No training stage.
	
	• Conflict stage:
	
	  – Ss' individual judgment policies captured.
	  – Ss in 3/4/5/6-person groups (cognitive feedback shared among all members, cognitive feedback given individually, no cognitive feedback).
	  – Groups arrived at consensual policies.
	  – Ss made individual judgments.
		• No differences between individual level and no feedback conditions (combined and called "reduced" feedback).
		
		• No difference in accuracy of group judgments between reduced feedback and shared feedback conditions.
		
		• Individual judgments more accurate in shared than reduced feedback condition.
		
		• Greater agreement in shared than reduced feedback condition.
		
		• Ss' support for group policy similar for both conditions.
		
		• No differences between conditions in Ss' ratings of satisfaction, difficulty, and enjoyableness of method for dealing with conflict.

Qualls and Jaffe (1992): Analysis of conflict in husbands' and wives' joint purchase decisions.	• Used married couples. • Collected data on husbands' and wives' perceptions. • No training stage. • Made individual judgments. • No conflict stage.	• Couples with similar (than dissimilar) perceptions showed less conflict. • Conflict in perceptions of household influence and individual preferences increased as decision importance increased and joint decisions occurred. • Couples with similar perceptions resolved conflict via bargaining more when decision was more important. • Couples with dissimilar perceptions used capitulation and avoidance-withdrawal.

Sengupta and Te'eni (1993): Effects of cognitive feedback on group judgment convergence.	• Training stage.
	
	• Conflict stage:
	
	  – Ss in 3-person groups based on heterogeneity of individual judgments.
	
	  – Individuals in groups given feedback of others' judgments (and cognitive feedback for those in this condition).
	
	  – Ss made individual judgments.
	
	  – Groups given feedback of group members' judgments (and cognitive feedback for one condition)
	
	  – Groups make joint judgments.
		• Cognitive feedback increased cognitive control (including across time) at both the individual and group level.
		
		• Cognitive feedback did not increase strategy convergence, which occurred regardless over time.

Reagan-Cirincione (1994): Effect of group decision aids on group judgment accuracy.	• No training stage.
	
	• Ss provided cue weights and function forms, and made judgments.
	
	• Ss given cognitive feedback and they provided revised weights and forms.
	
	• Conflict stage:
	
	  – Ss in 4/5-person groups based on heterogeneity of revised weights and forms.
	
	  – Group discussion aided by facilitator and computer analyst.
	
	  – Groups shown individuals' revised weights and forms, groups agreed on weights and forms, made judgments, judgments also made using groups' policy, groups given cognitive feedback, allowed to revise weights and forms, made judgments again, and agreed on final policy.
		• Statisticized groups (policy of group using averaged revised individual weights and function forms) less accurate than best member, and aided group.
		
		• Aided groups more accurate than best member.
		
		• No difference between groups' and best member's accuracy before feedback.
		
		• Ss' accuracy not improved after feedback.
		
		• Groups' accuracy not improved over task phases, but groups performed better at last phase compared to first.

Harmon (1998): Effects of decision making method and communication medium on group satisfaction and agreement.	• Ss had existing policy differences.
	
	• No training stage.
	
	• Conflict stage:
	
	  – Ss' individual judgment policies captured.
	
	  – Ss in 3/4/5-person groups (conventional decision method with face-to-face communication, conventional with audio, policy modeling decision method with face-to-face, policy modeling with audio).
	
	  – Groups arrived at consensual policies.
	
	  – Ss made individual judgments.
		• No effect of decision making method on satisfaction.
		
		• Audio-communication perceived as more satisfying than face-to-face communication.
		
		• No effect of communication medium on agreement.
		
		• Policy modeling method (via imposing structure on interaction rather than computer-generated cognitive feedback) led to more agreement than conventional decision method.
		
		• No interaction effect of decision method and communication medium.

Bose and Paradice (1999): Effects of group decision support systems on group judgment performance.	• Training stage:
	
	  – Trained to use decision aid.
	
	  – Ss made individual judgments.
	• Conflict stage:
	
	  – Ss in 3-person groups based on heterogeneity of individual judgments.
	
	  – Introduced group decision support system (Level 1 aid, Level 2 aid, none).
	
	  – Ss made individual judgments with aids.
	
	  – Ss completed survey on attitudes and perceptions of support systems.
		• No difference between Level 1 aid and no aid in group agreement, post-decisional confidence, or individual and group consistency.
		
		• Group agreement, post-decisional confidence, and consistency higher under Level 2 than Level 1 aids.
		
		• Ss' attitudes and perceptions for group judgment and process more positive under Level 2 than Level 1 aids.