

Studying Trajectories of Conflict Escalation

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Abstract The present chapter describes research in progress which is developing a simple, replicable methodology aimed at identifying the regularities and specificity of human behavior in conflict escalation and de-escalation processes. These research efforts will ultimately be used to study conflict dynamics across cultures. The experimental data collected through this methodology, together with case-studies, and aggregated, time-series macro data are key for identifying relevant parameters, systems' properties, and micro-mechanisms defining the behavior of naturally occurring conflict escalation and de-escalation dynamics. This, in turn, is critical for the development of realistic, empirically supported computational models. The article outlines the theoretical assumptions of *Dynamical Systems Theory* with regard to conflict dynamics, with an emphasis on the process of conflict escalation and de-escalation. Work on a methodology for the empirical study of escalation processes from a DST perspective is outlined. Specifically, the development of a progressive scenario methodology designed to map escalation sequences, together with an example of a preliminary study based on the proposed research paradigm, is presented. Implications of the approach for the study of culture are discussed.

Keywords Conflict escalation and de-escalation • Dynamical processes • Time • Cross-cultural differences

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1 Introduction

Understanding, predicting, and managing conflict are arguably among the most important challenges facing mankind. With increasing interdependence, the well-being of societies and their potential for growth and cooperation primarily depends on the way the global community is able to handle existing as well as emerging social conflicts. However, contemporary conflicts are constantly changing and evolving in a broad cultural context. In fact, conflict is a universal phenomenon, yet the way disputes are manifested can vary dramatically across cultures (Gelfand, Erez, & Aycan, 2007; Imai & Gelfand, 2010).

Nevertheless, cross-cultural research on conflict dynamics is in its infancy. While main effects of cultural dimensions, individual conflict styles, or utility functions on people's behavior are being widely investigated, and new, qualitative dimensions of culture are being explored, still little research has been studying the way culture impacts how people's behaviors evolve over time in conflict. However, in order to formulate accurate cross-cultural models and predictions on disputes dynamics in the interpersonal, organizational, social, or military context, we need to gather consistent data on the dynamic variance of conflict across cultures. In fact, some conflicts evolve in a gradual manner, while other rapidly burst into violence; a given behavior may be seen as mundane in one culture, while it may be understood as a major violation, and be a trigger leading to series of unexpectedly violent reactions in another culture. Conflict, from this perspective, presents a challenge to social sciences, as it requires new tools to help understand, predict, and manage the constantly evolving, dynamical character of the phenomenon.

Recently, a paradigm widely used in other areas of science – the dynamical systems approach (DST) – has been applied to the study of social conflict (Coleman, Bui-Wrzosinska, Vallacher, & Nowak, 2007; Coleman, Vallacher, Nowak, Bui-Wrzosinska, 2007; Vallacher, Coleman, Nowak, & Bui-Wrzosinska, 2010; Vallacher, Nowak, Bui-Wrzosinska, & Coleman, 2006). This theoretical advance has opened new avenues for the study of complex systems of conflict, bringing computational models, computer simulations and advanced conceptual tools to bear on studying conflict (see for examples, Guastello, Koopmans, & Pincus, 2008; Nowak & Vallacher, 1998; Vallacher & Nowak, 2007). Computational models and simulations hold the potential to advance not only the understanding of the dynamic interplay between culture and conflict, but also to have predictive value, which is critical for applications. However, empirical data is also crucial to ensure that computational models are based on realistic, tested assumptions and thus show predictive power. Such empirical data should utilize multiple methods of data collection, including case studies analysis, statistical, time-series data, fieldwork, and experimental psychological data allowing for causal inference.

The present chapter describes a work in progress on the latter effort – experimental psychological data. The main focus of the present project is the cultural context of conflict escalation and de-escalation dynamics. Specifically, we report our efforts toward the development of a simple, replicable methodology aimed at

identifying the regularities and specificity of conflict escalation and de-escalation patterns, which ultimately can be used to study conflict dynamics across cultures. We believe that experimental data collected through this kind of methodology can help identify relevant cultural parameters, and their effects on naturally occurring conflict escalation and de-escalation processes. This, in turn, can facilitate the development of realistic computational models built on empirically supported rules.

In what follows, we first outline the theoretical assumptions of DST with regard to conflict dynamics, with an emphasis on the process of conflict escalation and de-escalation. Next, the work in progress on a methodology for the empirical study of escalation processes from a DST perspective will be outlined. Specifically, the development of a progressive scenario methodology designed to track escalation sequences, together with an example of a preliminary study based on the proposed research paradigm, will be presented. Implications of the approach and methodological tools for the study of culture are then discussed.

2 The Dynamical Systems Approach to Conflict

Along with the dynamical systems approach to social psychology (Nowak & Lewenstein, 1994; Nowak & Vallacher, 1998; Vallacher & Nowak, 2007) social phenomena can be described with the use of some core Dynamical Systems Theory concepts. The term dynamical system is generally used to describe numbers of interconnected elements that change and evolve *over time*. From this perspective, for example, boiling water is viewed as the current state of a system of interacting molecules, the brain as a system of interacting neurons, or the society as a system of interacting individuals. A dynamical system can generally be conceptualized as the state of its elements at a given time. A system's behavior is a sequence of such states. To describe sequences of states, we need to identify key variables and parameters capturing the evolving characteristics of the system. Although key parameters such as temperature and density for instance, describing a system of interacting molecules in a state of steaming water, ice, or vapor seem relatively simple to measure and identify, specifying key parameters for the description of human systems undergoing different phases of conflict escalation still poses an important challenge to social sciences.

In existing DST methodology, the temporal evolution of a social interaction can be plotted on a state space, where the x axis represents one side of the interaction, and the y axis represents the other side. In their marital interactions studies, for example, Gottman, and colleagues (2002) have been analyzing and predicting the trajectory of marital interaction by tracking the state of the husband and the state of the wife, and computing the rules governing their state trajectories. For example, two people may be strongly coupled and the dynamics of the husband can be majorly predicted by the state of the wife, or conversely the states of the couple may be weakly linked, and evolve in a less predictable way. Additionally, if a given region of the state space is frequently visited, it can be predicted that it will stabilize over

time and govern the couple's dynamics. Developmental psychologists have likewise advanced a tool – *Gridware*, where the trajectory of parent/child interactions are mapped on a two dimensional grid (Granic & Lamey, 2002; Lewis, 2000; Lewis, Lamey, & Douglas, 1999). The state of the parent is observed, coded, and plotted on one axis and the state of the child on another axis. Such data allow us to identify the regions of such grid on which the states of the interaction tends to stabilize, and toward which the system will return after being perturbed.

Here, we propose that trajectories of conflict escalation and de-escalation cannot only be mapped on a grid, basing on observation data, but also experimentally tested as a sequence of one party's reaction to another party's conflict provoking behavior. Using this strategy, we can track the variance in whole patterns of responses for the same scenario of conflict provocation across different social, cultural, and psychological conditions: people can escalate gradually in response to gradual intensification of aggressive behaviors from the other party, but the same conditions can also lead to exaggerated response or, conversely, resistance to change and stabilization at a given level of intensity. Responses trajectories can also progress along some repeated cycles, or have unpredictable, irregular character.

One way to formally portray and systematize such results is to describe the dynamical properties of conflict escalation trajectories as attractor's dynamics. Generally, the dynamical systems approach to social psychology identifies and describes attractors in social systems as regions, toward which trajectories in a state space converge with time. It is common to distinguish among four classes of attractors (Eckmann & Ruelle, 1985; Schuster, 1984): *fixed-point*, *periodic*, *quasiperiodic*, and *chaotic*. Here, we discuss in particular fixed-point attractors. The method we use to assess attractor dynamics is to actively perturb the system through a sequence of conflict provocation stimuli. If a single, fixed-point attractor exists, the system will return to the same state after some time, thus one party's response will return to the same level of conflict intensity, regardless of the influence from the other party. In the case of multiple fixed-points, small perturbations will result in the system returning to its original state, but further changes of the control parameter may result in the system moving toward a different equilibrium: threshold effects are to be expected in the responses patterns. In dynamical social psychological terms similar dynamics have been understood as catastrophic scenarios of change (Tesser & Achee, 1994) and will be referred to as catastrophic (as opposed to gradual, incremental) escalation. Properties of such scenarios are of particular relevance for de-escalation and practical applications: the hysteresis effect described in catastrophe theory (Thom, 1975) for instance, explains how crossing certain thresholds in conflict escalation leads to irreversible changes, undermining the potential for further de-escalation.

Although theories of conflict, disputes, and especially conflict escalation generally address the dynamical character of conflict processes, empirical studies rarely follow the dynamical paradigm. Research has mainly been static, with emphasis on conflict styles, strategies, or stable, individual differences. Here, we propose that conflict escalation and de-escalation processes can be mapped, and analyzed with regard to their dynamical properties (rate of change, stabilization, trajectories).

Although emerging in the field of conflict studies, dynamical methodologies are effectively applied in different areas of psychological research (cf. Gottman, Swanson, & Swanson, 2002; Granic & Lamey, 2002; Levenson & Gottman, 1983; Lewis, 2000; Lewis et al., 1999). Dynamical methodologies involve observational data, where individuals, dyads or teams reaction patterns are tracked at different levels, from coded behavioral responses, through emotional states, to physiological or neural imaging.

Key in the formation of people's patterns of social interactions is the social and cultural context. Culture develops, limits, and expands people's behavioral repertoire, that is the range of the possible actions and reactions people consider in response to social situations. Below we discuss the initial development of a tool – the progressive scenario methodology – a work in progress toward experimental data collection aimed at testing the role of cultural parameters on changes of people's psychological repertoire in the course of conflict escalation and de-escalation.

2.1 Progressive Scenario Tool Development

The progressive scenario tool is mapping the scope of one party's behavioral options in response to another party's conflict provocation behavior. The manipulated parameter, representing the stimulus responsible for changes over time, is a linear progression of the other party's conflict provocation behavior. Through the use of this tool, numerous independent variables such as cultural factors or individual differences can be manipulated in order to track their effect on the course of escalation/de-escalation. Below, we describe the two components of the tool: (1) the stimuli and (2) the response scale.

The stimuli consist of a series of short descriptions (vignettes) of gradually escalating and de-escalating conflict behaviors displayed by a colleague at work in a situation of task interdependence ("you are working on a common project at work"). Fourteen subsequent vignettes are scaled according to the level of destructiveness and aggressiveness of the behavior they represent: the first seven scenes outline a scenario of progressive escalation of provocation by a colleague at work, from a relatively mild disagreement ("Your colleague criticizes your work") to open confrontation and humiliation ("During a company picnic, your colleague insults your partner/relative publicly"). The remaining seven scenes outline a progressive de-escalation scenario, with descriptions of conciliatory behaviors aimed at reversing each escalatory step ("Your colleague apologizes publicly for his inappropriate behavior toward your partner/relative").

The response scale includes a list of 30 behaviors, which maps a general behavioral repertoire available to people across different conflict situations, ranging from friendly dispute to extremely hostile and aggressive interactions. This repertoire was first scaled with regard to the level of destructiveness to the relationship between the parties each possible response represents, from relatively constructive ("talking it over") to extremely hostile and destructive behaviors ("hurting him/her as much as

possible"). However, further ongoing studies, including multidimensional scaling procedures across cultures reveal additional dimensions such as individual/social character of the responses, the honor dimension, as well as the verbal/physical dimension.

Items were generated via focus groups conducted with individuals working in organizations as well as discussions with subject matter experts (professional mediators, and scholars from the conflict resolution field). Respondents generated an extensive list (150 items) of all the possible reactions people can have in conflict situations. Items were then analyzed, and narrowed down to 30 items, with careful conservation of the wide spectrum (space) of possible behaviors.

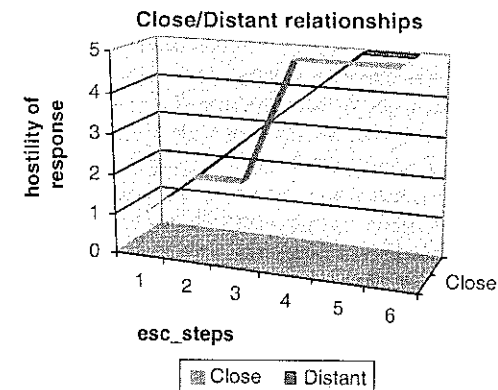
Large samples of individuals scaled items along conflict dimensions. These efforts were aimed at collecting qualitatively informed items (focus groups and subject matter experts), with the possibility to translate qualitative properties to quantitative data (scaling of the items along social psychological dimensions), and thus map a party's response trajectory on the defined phase space with some relative precision given the qualitative character of the data. Currently, a complete scale has been designed to measure changes in the destructiveness of the response behavior. However, other order parameters along which the behavioral repertoire can be described are currently been included, such as degree of honor violation, individual/social dimension or trust.

2.2 Conflict Trajectories

Results from the questionnaire (responses on the scale of possible behaviors for each level of the provocation) can be mapped on a two dimensional space. The space is defined by the level of conflict provocation displayed by the other party (control parameter), and by the level of response destructiveness and aggression (order parameter). Results can be mapped as (1) a state trajectory, where the averaged point of response destructiveness is plotted for each step of provocation. (2) The "map of possible behaviors" (the ensemble of behaviors considered as possible to display at a given time) in response to a given level of conflict provocation from the other party. The response is then not a point on the scale, but rather a space, where different regions are loaded with concrete values for groups or individuals. This allow for the identification of patterns of most chosen behaviors, but also latent clusters of possible behavior that remain stable across situations. Results from studies using the described questionnaire constitute a starting point for modeling, causal inference, as well as for the testing of the effect of various parameters on a laboratory simulation of escalation dynamics.

To illustrate the possibilities of the scenario tool, we conducted a preliminary study investigating the impact of relational closeness between two parties on conflict escalation and de-escalation trajectories. The most obvious difference between close and more distant relationships is the valence of the relation between parties, biased toward more positive for close relationships. Another difference, less trivial and

Fig. 1 Trajectories of escalation for close and distant relationships



critical from the point of view of this study, is that close relationships exert pressure on the relation toward consistency in attitudes, emotions, and in the overall patterns of interactions between the parties, thus restraining the scope of the behavioral repertoire to positive behaviors, while more distant relationships induce fewer constraints on the relation.

The study revealed that closeness is related to an initial narrow behavioral repertoire, involving a set of unequivocally positive possible behaviors. Results show, however, that in response to stronger perturbations manipulated through conflict provocations, such systems react abruptly, with qualitative shifts in the relationship, while more distant relationships are characterized by gradual escalation trajectories. In fact, close relationships lead to trajectories with a major shift after a series of responses, where, despite contentious behaviors from the other party (from situations, where your friend does not answer your phone calls or emails, to situations, where he criticizes your work in front of other people), the responses initially remained at a very low level of hostility (the behavioral repertoire initially comprised: "listening to him/her, turning it agreeably into humor, etc..."). However, when a threshold of provocation was crossed, the psychological repertoire underwent a qualitative shift, and in response to just a single perturbation step moved from a conciliatory repertoire straight to a sequence of responses characterized by extremely high levels of hostility and open aggression ("hurt him/her as much as possible"). Empirical results show a nonlinear progression of responses from one stable state of positive relations toward another stable state with extremely aggressive relationships. On the other hand, more distant relationships gave rise to more gradual escalation patterns, where mid-range levels of provocation triggered an intermediate responses repertoire. Figure 1 illustrates the general patterns of escalation for the close and distant relationship conditions.

Note that a single static measure at a given moment in time would not predict these paradoxical effects of closeness conditions on the system's dynamics: from a static point of view, close friends are expected to uphold a stable, positive relationship (Hardy, Bukowski, & Sippola, 2002; Cairns, Leung, Buchanan, &

Cairns, 1995). The DST perspective supports this, but only in the case of low levels of provocation, the control parameter in this study.

Additional results from further lines of research show that the trajectory of escalation is critical for later de-escalation: if intermediary states are omitted, and conflict moves from low to high levels of hostility abruptly, then the newly formed attractor for the relationship is less amenable to de-escalation attempts. Results from these studies are a direct validation of the *hysteresis* effect described in the catastrophe theory (Thom, 1994; Poston & Stewart, 1996), and support the catastrophic scenarios of change described by Tesser and Achee (1994). Escalation, from this perspective of the presented approach differs from former static approaches in a number of ways: First, escalation does not only occur at the level of observable behaviors, but also at the level of behaviors that start to be possible within a given interaction, and behaviors that vanish from the range of possibilities. Second, contrary to what the name itself would suggest, conflict escalation does not always occur in a step-by-step fashion, but can be non-linear, and move abruptly from low to high intensity without necessary going through intermediary steps. Third, the "reverse engineering" of escalation processes is not symmetric: the amount of energy needed to "undo" escalating steps is greater than the energy needed to escalate a conflict. Finally, moderate levels of conflict seem to be possible only if no strong pressure is exerted on the system, even if the pressure forces the system into exclusively positive states, so the dynamics of conflict may not stabilize at mid-range levels of intensity.

Further exploration of responses items revealed that dimensions other than destructiveness, as well as triggers for nonlinear dynamics could have emerged as control parameters for the escalation process. For example, trust appeared to be critical in close relationships, and thus in a situation of rupture of trust, a shift has occurred in close relationships conditions, while this factor appeared irrelevant in the distant relationship condition. Such shifts between control parameters are being further investigated, and open an interesting line of research for the study of cultural differences. Further studies using this methodology have been comparing escalation and de-escalation trajectories using individual differences as splitting parameters, and are currently being investigating variance of escalation patterns in various cultural contexts. Additionally, the response scale and the vignettes are currently being adapted in Pakistan, Korea, and Eastern Europe, allowing for the development of more universal behavioral repertoires and provocation stimuli, as well as culture specific sets. Although still in its infancy, a dynamical line of research on changes at the level of behavioral possibilities in response to provocation may shed light on the paradoxical effects of culture on conflict dynamics.

2.3 Culture and Conflict Escalation

The expansion of the DST methodology to the study of cultural factors in conflict dynamics is a work-in-progress. Currently, through in-depth interviews in Egypt,

Iraq, Jordan, Lebanon, Pakistan, Turkey, and the UAE, we are extracting local conflict episodes to develop new stimuli and new behavioral repertoires that are generalizable to the Middle East. Additionally, multidimensional scaling techniques are used to identify main parameters accounting for differences and commonalities in the perception of various conflict behaviors, eventually showing dimensions of disputes across cultures.

Adapted versions of various DST tools, may verify how cultural factors that are relevant to the Middle East, the U.S., and Asia – and in particular – honor, dignity and face, respectively affect conflict dynamics (Leung & Cohen, 2011; Nisbett & Cohen, 1996). Cultural logics of honor, face, and dignity imply different trajectories of aggression. For example, people in honor cultures have a "keen sensitivity to the experience of humiliation and shame, sensitivity manifested by the desire to be envied by others and the propensity to envy the successes of others" (Miller, 1993, pp. 116). In such cultures, individuals are expected to go to great lengths to uphold the reputation of oneself and one's family and to avoid appearing vulnerable (Vandello & Cohen, 2003). Reputation is critical within cultures of honor, while payback serves as an organizing principle for individuals' interactions when they have been provoked (Delgado, Prieto, & Bond, 1997; Kamir, 2006; Leung & Cohen, 2011; Mosquera, Manstead, & Fisher, 2000; Vandello & Cohen, 2003). Individuals from cultures of honor are thereby expected to respond quickly and with high levels of destructiveness in order to show they are not vulnerable. Individuals are expected to have a quick reaction to even minor acts, due to the importance of reputation maintenance (the premium placed on having a 'tough' reputation necessitates a strong reaction to seemingly small breaches of respect). It is also predicted that individuals will continue to act aggressively towards the perpetrator even after time has passed since the initial transgression; that is, there will be little 'cooling off,' consistent with "hysteresis effects" described in DST (Nowak & Vallacher, 1998). Particular triggers such as damage to female honor, shame, and humiliation are expected to also be important control parameters affecting thresholds of escalation in honor cultures.

In contrast to honor, wherein self-worth can be taken away by other's actions, individuals in dignity cultures are theoretically born with equal worth and rights which cannot be taken away by others (Kamir, 2006; Leung & Cohen, 2011). In dignity cultures, external evaluations matter little, while internal valuations are of the utmost importance. Values such as autonomy, freedom, and standing up for one's beliefs play a crucial role in dignity cultures. Such cultures are also likely to endorse rationality, strong person-task separation, and an independent self-construal (Markus & Kitayama, 1991). We hypothesize that individuals from dignity cultures will generally react to increasingly aggressive acts in a linear fashion. Put differently, the escalation of aggression may be described as a rational, tit-for-tat strategy. In the same manner, individuals should react with decreasing levels of aggression as a perpetrator attempts to de-escalate the situation by apologizing or attempting to restore the relationship. However, particular triggers are expected to result in more severe reactions on the part of a victim from a culture of dignity, such as insults towards one's genuineness and challenges to one's freedom, rights,

and autonomy (Mosquera, Manstead, & Fisher, 2002) or status as an equal member of society (Kamir, 2006), and thus might be seen as critical control parameters of conflict trajectories in dignity cultures.

Finally, in face cultures, individuals place a large premium on external evaluation of the self, while lending little credence to internal evaluations. Face represents an individual's claimed sense of positive image in the context of social interaction (Oetzel & Ting-Toomey, 2003). Similar to honor cultures, upholding the reputation of both the individual and the family is critical. Face cultures tend to have strong norms for communal responsibility, person-task interdependence, and maintaining harmony. Compared to honor and dignity cultures, we expect that individuals from face cultures will be slow to react to initial aggressive acts and will react with less destructiveness. Over time, however, with continued provocation, we expect that conflict dynamics in face cultures can take on a "catastrophic escalation" pattern. Moreover, certain transgressions may trigger strong aggressive reactions in face cultures such as public criticism or embarrassment, communal shame, or violations of duties (Liao & Bond, 2011).

2.4 Discussion

The dynamical-systems approach to the study of culture, negotiation, and collaboration offers the potential to enhance our understanding of the culture and conflict in three distinct ways: metaphorically, mathematically, and empirically. First, dynamical-systems theory offers a rich array of new metaphors, constructs, and principles that might be fruitfully applied to the culture and conflict literature. Dynamic system constructs such as attractors, emergence, and self-organization can serve as useful metaphors to help the researcher understand the dynamic nature of conflict and culture. Second, the dynamical systems approach provides the social scientists tools facilitating the mathematical description of the hypothesized mechanisms underlying specific culture and conflict dynamics. Thus, although social science theory is typically expressed verbally, the dynamical systems tools translate these theories into computer simulations. This will allow identification of assumptions inherent in our theories, but difficult to identify when theories are maintained in their verbal form. Finally, the dynamical-systems approach has implications for the types of empirical methodologies developed and employed in research. Typically, traditional social sciences focus on the central tendency of variables and ignore important dynamics reflected in variables' variances. Further, dynamical-systems models and methods push the social sciences to focus on events as they unfold overtime to understand the general pattern of interactions of the conflict parties overtime.

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A Game-Theoretic Approach to Modeling Cross-Cultural Negotiation

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Abstract Faithful models of negotiation should capture aspects such as subjective incentives, imperfect information, and sequential interaction, while providing explanation for behaviors such as bluffing, trust building, and information revelation. All of these objectives are elegantly addressed by theory of sequential games, and some of these phenomena have no convincing explanation without game theory's key assumption, namely, that of the rationality (or approximate rationality) of the negotiators. In this paper we discuss a game-theoretic approach to modeling negotiation. In addition to accounting for a range of behavior and reasoning styles we also address several aspects specific to cross-cultural negotiation. We argue that the existence of culture-specific beliefs and strategies can be explained by the existence of multiple game-theoretic equilibria. Within a culture, repeated interaction and learning lead to an equilibrium. On the other hand, across cultures, infrequent interaction leads with high probability to disparate (and often incompatible) equilibria. We hypothesize that inefficiency in cross-cultural negotiation can be attributed to this incompatibility. We discuss recently-developed algorithms that can be used to fit models of culture-specific behavior from data while incorporating rationality constraints. We anticipate that the additional structure imposed by rationality constraints will yield both statistical advantages and game theoretic insights.

Keywords Game theory • Communication • Negotiation • Models of cultural differences • Multi-agent influence diagrams (MAIDs) • Extensive form correlated equilibrium

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Foreword

Over the last five decades the corporate world has increasingly seen the value in expanding their reach across international borders. Organizations have worked to enter new markets overseas, gain access to cheaper labor pools, and take advantage of potential synergies and new ideas through merging with similar organizations in other nations. In doing so, they have encountered, and worked to solve, the variety of problems that stem from interacting and working across national and cultural boundaries. In the last decade, the military community has similarly encountered and begun work to solve many of these problems. In 2008 the Department of the Army requested that a consortium of universities led by Dr. Michele Gelfand at the University of Maryland and Dr. Katia Sycara at Carnegie Mellon University, undertake a line of research examining critical social processes across cultural boundaries. This research has focused on understanding collaboration and negotiation in cross-cultural contexts. The consortium is composed of two research teams led respectively by Drs. Gelfand and Sycara, with each team approaching these research problems from two complementary perspectives. One team has begun from a psychological perspective building grounded theory to explain observed behavior in negotiation and collaboration activity. A separate team has worked from a computational modeling perspective to model the observed computationally and thus inform theory on negotiation and collaboration. These complementary approaches, combining a psychologically-grounded approach with computational modeling, hold great promise for making significant strides forward in our understanding of these critical social processes in cross-cultural contexts.

As the reader makes their way through this volume, they will note the tension between the reductionism necessary for computational models to capture behavior with some measure of accuracy and the contextualization necessary for fully understanding behavior in the real world. Balancing this tension is both intentional in the design of the research effort and necessary to achieving the knowledge desired. The research teams represented in these chapters have provided an excellent example of how these two fields can cooperatively – indeed collaboratively – work together to achieve more than either could in isolation.