# Seeking Sustainable Solutions: Using an Attractor Simulation Platform for Teaching Multi-Stakeholder Negotiation in Complex Cases

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Abstract

We live and work in an increasingly complex and dynamic world. The demands of working in such environments require that negotiators come to understand situations of conflict and work with these situations in correspondingly complex and dynamic ways. This paper presents a new pedagogy based on a newly developed computer simulation, The Attractor Software®, that is intended to assist conflict-practitioners, policy-makers and conflict stakeholders in negotiating complex agreements without neglecting the dynamical properties and the complexity of the systems in which they work. This methodology is one component of a multidisciplinary research program concerning dynamical-systems and conflict. The program’s mission is to apply important insights and tools from dynamical-systems theory to enhancing the understanding of difficult social conflicts.

Key words: negotiation, complexity, dynamical systems, attractors, conflict resolution
Seeking Sustainable Solutions: Using an Attractor Simulation Platform for Teaching Multi-Stakeholder Negotiation in Complex Cases

We live and work in an increasingly complex and dynamic world. Due in large part to physical, biological, and human cultural evolution, negotiators today are being confronted with progressively more complex ecological, political, economic, and social problems. In addition, the situations they face are in a constant state of flux; changing from moment-to-moment, and over the days, weeks and months of the negotiation process. The demands of working in such environments require that negotiators come to understand situations of conflict and work with them in correspondingly complex and dynamic ways. Failing to do so typically results in a misreading of situations and in the generation of short-term solutions to problems that prove unsustainable, or that bring unintended negative consequences (see Dorner 1996; Peterson 2002).

Against this backdrop, we present a new pedagogy for teaching negotiations in a complex world. It was first conceptualized as a methodology for working with stakeholders attempting to comprehend and address chronic patterns of destructive conflict and violence in New York City public schools. It has since been developed as a platform for teaching multi-stakeholder negotiations in various situations of protracted social conflict. This methodology is one component of an extensive research project on dynamical-systems and conflict, which is working to apply the many important insights and tools from dynamical-systems theory to enhancing the understanding of difficult social conflicts (see Coleman 2006; Coleman, Bui-Wrzosinska, Nowak, and Vallacher 2006; Nowak, Vallacher, Bui-Wrozenska, and Coleman 2006; Coleman, Vallacher,
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Nowak and Bui-Wrozinska 2007; Coleman, Vallacher, Nowak, Bui-Wrzosinsak, and Bartoli in press; http://www.jsmf.org/grants/cs/essays/2006/coleman.htm). This research suggests that it is particularly useful to conceptualize ongoing, destructive conflicts as strong attractors: a particular form of self-organization of multiple elements comprising the mental and social systems associated with conflict. The centerpiece of the teaching platform presented in this paper is a computer simulation of conflict attractors that allows participants to visualize and work interactively with the dynamics of conflict as they unfold overtime.

This paper has five sections. It begins with a brief discussion of the dynamical-systems approach to conflict, and the utility of understanding conflict in terms of attractors. We then describe the development of the attractor simulation. This is followed by an outline of a negotiation workshop that employs the simulation to enhance participants’ understanding of complex, long-term dynamics in conflict, and the importance of understanding these dynamics for achieving sustainable solutions. We then present the findings of two outcome studies comparing the effectiveness of a workshop that employed the simulation with one that employed a traditional integrative problem-solving method. New directions for the development of this work will be discussed.

Dynamical Systems, Conflict, and Attractors

Conflict presents a paradox for traditional views of mental process and social relations. By its very nature, conflict is intensely dynamic, with an ever-changing field of forces impinging on the parties involved, evoking a wide variety of mental states and
action proclivities that undergo constant change. Because conflicts are associated with phenomenological and behavioral instability, one would expect to observe concerted efforts at conflict resolution that would restore quiescence to people’s mental, emotional, and behavioral experience. Yet, conflicts can endure over considerable periods of time without any appreciable diminution of each party’s respective mental and behavioral volatility. Indeed, some of the most intense and volatile conflicts are also the most protracted, taking on the semblance of intractability. How is it that a phenomenon so rich in dynamism can lend itself to such impressive continuity?

The apparent paradox of simultaneous volatility and stability can be resolved when conflict is examined in terms of basic principles of complexity theory and dynamical systems. The interplay of dynamism and equilibrium tendencies, in fact, is central to the dynamical perspective on mental and social processes (cf. Nowak and Vallacher 1998; Vallacher and Nowak 2007; Guastello, Koopmans, & Pincus, 2008). In this perspective, any phenomenon can be viewed as a set of interconnected elements that influence one another. The influence among elements has different manifestations, depending on the phenomenon in question. In brain function, for example, influence represents the signaling among neurons, while in social groups influence represents social interactions among group members. The mutual influences among elements promote the emergence of a coherent state that, in turn, provides order and stability for the system’s elements. Thus, neural interaction might give rise to a meaningful perceptual state and social interaction might give rise to a social norm or belief. Dynamism in this process reflects the mutual adjustment of the states of interacting elements so that they collectively support the coherent state. In a social group, for instance, individuals with
initially different opinions regarding a topic of interest attempt to influence each other to adopt a common opinion and thereby promote group consensus (Nowak, Szamrej, and Latané 1990). Because emergence of the system’s global state is due to the interactions among systems elements rather than to the intervention of outside agents, the process is referred to as self-organization.

Once a coherent state emerges, it functions as an attractor for the system. This means that new input to the system takes on values that are consistent with the values characterizing the elements associated with the attractor. In social judgment, for example, a strongly held view of an outgroup functions as an attractor by assimilating new information about the outgroup to that view. In self-perception, meanwhile, a stable self-concept functions as an attractor by reinterpreting contradictory information received in the course of everyday life. In a sense, an attractor provides an equilibrium for the system’s dynamics. New input to the system can be quite divergent in its potential interpretation and implications, but over time this diversity will be constrained in line with the interpretation associated with the system’s attractor. A person may encounter information that is inconsistent with his or her global assessment of an outgroup, for example, but this information will ultimately be reframed in a way that supports rather than contradicts the assessment. External influences or noise may perturb the system, but dynamic processes are engaged that return the system to its attractor.

The dynamical processes associated with the emergence and maintenance of attractors have direct relevance to the dynamism and stability associated with conflict. In a conflict setting, increases in tension, anxiety, and emotionality activate the press for coherence that promotes connections among the various thoughts, perceptions, and
memories associated with the conflict. The conflict progresses toward intractability as these elements self-organize into a structure, such that the elements no longer function independently, but rather are linked by positive feedback loops. A positive feedback loop means that the activation of each element increases the activation of other elements.

Each party to the conflict may encounter a wide range of ideas and experience a correspondingly wide range of feelings, but over time only those ideas and feelings that are consistent with a destructive orientation to conflict are embraced as relevant and credible. Indeed, the intensity with which parties to a conflict reinterpret or discount inconsistent information or events is a signal of the strength of the attractor characterizing the conflict. This means that attempts to change the state of conflict without changing the mechanisms that continually reinstate the conflict may result in short-term changes but are likely to be futile in the long run. To promote lasting change, it is necessary to change the attractor states of the system. This is easier said than done, since it is tantamount to changing the mechanisms responsible for the system’s dynamics.

Figure 1 portrays in metaphorical terms the essence of attractors and the relevance of attractors for conflict. Note that there are two valleys and a ball positioned in one of them (B). The ball represents the current state of the system. As the figure suggests, it will roll down the hill and come to rest at the bottom of valley B. In stabilizing the state of the system (i.e., the ball), the valley functions as an attractor for the system.

**INSERT FIGURE 1**

There are two attractors in Figure 1 and they differ with respect to two basic properties. First, each attractor is associated with a *basin of attraction*, reflecting the set of states that are “attracted” by (i.e., will evolve toward) the attractor. Because the basin
of attraction for Attractor A is wider than the basin of attraction for Attractor B, a wider range of states will evolve toward the former. Second, the two attractors differ in their respective depth, a feature that represents their relative strength. Attractor B is thus stronger than attractor A. This means that it would take a stronger force to dislodge the system from Attractor B than from Attractor A. Once a system is at attractor B, it is resistant to efforts aimed at dislodging it, even when there are strong forces perturbing the system.

These two properties of attractors have clear relevance for the intractability of conflict. A wide basin of attraction means that a large range of ideas and action possibilities will eventually evolve toward the dominant negative mental and behavioral pattern characterizing the parties to the conflict. Positive information may be encountered that contradicts the predominant negative view of another person or group, for example, but this information is likely to be transformed by a variety of cognitive mechanisms until it fits the predominant view. By the same token, a peaceful overture or gesture might initially be taken at face value, but over time it will be reframed until it provides evidence in support of, rather than in opposition to, the predominant response tendency of the person or group.

The depth of an attractor signifies how difficult it is to transform the malignant tendencies of an intractable conflict. When there is a deep attractor for destructive conflict (as in attractor B), attempting to resolve the conflict is like trying to push the ball uphill from the bottom of the valley. When the pushing force is relaxed, the ball will reverse its trajectory and roll back to the attractor (the bottom of the valley). So, for example, pointing out the non-productive nature of a person’s hostile attitudes toward
someone else may succeed in achieving a few temporary concessions—in effect, pushing the ball up the side of the valley—but eventually this appeal to logic will prove counter-productive as the forces restoring the attitude overwhelm the persuasive appeal—much like gravity eventually proves too much for muscle power.

Note, however, that if there is sufficient force to dislodge the system from its attractor (e.g., A), the system will gravitate in short order to another attractor (e.g., B), provided there is one available. This implies that if a system is characterized by more than one attractor, the mental, affective, and behavioral states characterizing the system tend to sort themselves categorically. If a change in the system’s state occurs, it is likely to do so in a qualitative (nonlinear) rather than incremental (linear) fashion (cf. Latané and Nowak 1994).

In the dynamical model of conflict, in sum, intractability is due to the organization of elements rather than to the specific value or nature of individual elements. Multiple elements become linked through positive feedback loops to establish an equilibrium that pulls the respective parties into a state of conflict. This makes conflict resolution a daunting task. Establishing trust between mutually antagonistic groups, for example, is certainly a noble goal and may be a necessary step in the resolution of inter-group conflict. In light of the dynamical scenario, however, this step may prove unsuccessful. Even if trust is somehow established between the groups, the influence of other linked thoughts, memories, and expectations is destined to disrupt the trust and reinstate the conflict. With this in mind, successful intervention should not aim at pushing the person or group out of its equilibrium, but rather changing the social system in such a way that the equilibrium among forces is changed. This involves disassembling
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the malignant attractor and working to establish or bolster an alternative attractor for
more benign or positive relations, and then moving the system into the basin of the new
attractor (provided one can be established).

The Attractor Simulation

From the dynamical-systems perspective, enduring conflicts can be viewed as an
attractor of the social system, characterizing its long term tendencies. If the attractor for
destructive conflict is strong (wide and deep), the system will tend to be pulled toward a
state of conflict and to return to this state when perturbed by outside influences.

However, a full understanding of conflict dynamics in terms of attractor changes requires
more than a description of a conflict attractor’s energy landscape. What is also critical –
especially for conflict transformation strategies - is the strength of the alternative attractor
for peace and positive social interactions. A conflict system’s dynamics can be currently
captured by a destructive attractor, in which case the attractor’s tendencies are visible in
manifest conflict processes (such as overt hostilities and violence). However, an attractor
can exist as a potential structure for future interactions and remain latent, with the
possibility of capturing the state of the system at some point in the future. In sum, then, a
conflict system can be characterized on three dimensions: its current (manifest) state, its
potential for positive interactions, and its potential for negative interactions.

Characterizing conflict on these three dimensions is not straightforward for people
unfamiliar with the approach of dynamical systems and specifically with the concept of
attractors. Moreover, any factor influencing a social system characterized by conflict
Attractor Simulation Software may affect each of the three aspects in different ways, which makes systematic analyses of relationships between a conflict system’s elements practically impossible. For example, an increased police presence in an intergroup community conflict may decrease the momentary state of violence in the community, but it may also decrease the strength of the attractor for future positive interactions between the parties, and at the same time increase the strength of the attractor for future negative interactions. Thus, understanding the multiple consequences of an action can be a daunting task for any person involved in a dynamic conflict situation.

The development of the attractor simulation was inspired by our experiences working with teachers, students, administrators, and volunteers in urban schools with histories of chronic conflict and violence. We would typically begin these initiatives by interviewing stakeholders in these schools to generate a sense of the “essence of the problems” they faced. These interviews would typically elicit a host of interrelated problems and processes (see Figure 2) that left the stakeholders and our team feeling generally overwhelmed and depressed. These feelings stemmed from the multitude of factors influencing the situation, and the multitude of consequences of each factor on the whole system’s dynamics. This complexity presented extraordinary challenges to any clear analysis of these conflict situations, let alone the development of plausible scenarios for successful intervention. Almost every possible intervention targeted one factor or another in the conflict, but also appeared to either impede or fail to address other issues, or simply could not be undertaken given the conditions of the system-as-a-whole.

Feeling challenged by the cases described by the stakeholders, we decided to work toward the development of a software platform that could help stakeholders unravel
the complexity inherent in these systems of progressively more complex conflicts. The main goal of the development of the attractor software was to help conflict stakeholders, negotiators, and third parties understand and systematically map the complexity of various factors influencing a given conflict system, in order to better visualize possible intervention strategies and consider the multiple consequences and potential impact of their actions.

INSERT FIGURE 2

The attractor software is essentially a visualization tool. It prompts the user to specify the key factors influencing the conflict, the actions that can be undertaken, and to estimate the consequences of these actions with respect to three types of outcomes: 1) their influence on the current state of the conflict, 2) their influence on the potential for future conflict or negative interactions, and 3) their influence on the potential for positive social interactions and, ultimately, sustainable peace. The user, by evaluating each factor, estimates the strength and the direction of the influence of each factor on the whole system. The software merely visualizes the understanding of the user, as a tool for encompassing and systematically describing what parties and interveners have identified, based on their own expertise and experience with a case. The software does not estimate the importance of each factor by itself, nor its influences. It is up to the user (1) to specify the case and the social relations to be analyzed (e.g., a marriage, an ethnic conflict), 2) to generate the list of factors that are likely to influence the nature of the current and future relationship\(^1\), and 3) to evaluate the importance and strength of each factor for the system, and the direction of its influence along the three dimensions considered (see Figure 3).
Attractor Simulation Software

INSERT FIGURE 3

The program provides a visual depiction of two attractors for the relationship: a positive attractor indicating stabilization of benign or favorable attitudes and positive actions, and a negative attractor indicating stabilization of malignant or unfavorable attitudes and negative or violent actions (See Figure 4). How the factors introduced by the user affect the overt thoughts and behaviors in the relationship will thus depend on the respective strength and basins of attraction for the positive and negative attractors. If the current state of the relationship (e.g., good vs. bad feelings) is within the basin of a strong attractor, this state is unlikely to change despite the introduction of factors relevant to change. Conversely, if the current state of the relationship is outside the basin of attraction for an attractor, the relationship may display a qualitative change (e.g., from positive to negative) with the addition of a single, seemingly unimportant factor.

INSERT FIGURE 4

Using the Program

The program relies on the user’s experience with the conflict or expertise in a particular area. Specifically, it assumes that the user is somewhat knowledgeable about the factors relevant to the thoughts, feelings, and behaviors characterizing the analyzed relationship, and that he or she can specify his or her sense of the relative importance of these factors. Someone who works with high school gangs, for example, may be in a position to identify the various conditions and triggers that affect each gang’s feelings, thoughts, and behaviors. However, such analyses gain considerable depth and validity if they involve directly various members of the concerned groups. The users then type in
the label for a factor and use a slider bar to specify its overall importance in affecting the relationships within the analyzed system.

Despite the user’s expertise and insight, though, the influence of specific factors introduced into the visualization software is not obvious. As noted earlier, a minor provocation can push two groups into open warfare, while a major change in conditions might have little effect at all on the relations between the two groups. Such non-linearity between influencing factors and the observable state of the relationship finds a logical explanation in terms of attractor dynamics. This can be portrayed when the attractors characterizing the relationship are described, and the resulting dynamics are visualized. This is because a momentary change in thought or behavior in response to a specific factor does not necessarily affect the long-term features of the relationship. However, strong potentials of systems (latent attractors) sometimes become manifest as qualitative shifts in the relationship (such as radical shifts form peaceful relations to conflict, or from violence to peace). If the state of a person or group is currently captured by an attractor, even strong forces that seem capable of changing thought and behavior may be countered by the attracting tendency of the prevailing thoughts and behaviors. But if a person or group’s state is currently outside the basin of one attractor, even a minor force might be sufficient to move the person or group’s thoughts and actions toward a completely different attractor.

In addition to allowing the user to utilize his or her knowledge and insight to specify relevant factors and their respective importance, the program allows the user to specify the nature of their impact. Sometimes a factor can have both a positive and negative impact. In a marital relationship, for example, raising children can strengthen
the bonds between the partners, but it can also produce considerable stress and thus challenge the relationship. To capture a factor’s potential for both positive and negative effects, the user employs separate slider bars to indicate 1) how much the factor in question promotes positive thoughts and behaviors, and 2) how much the factor promotes negative thoughts and behaviors in the relationship.

It is worth emphasizing that these two characteristics of relationships do not always act in opposition; in fact, they often prove to be orthogonal. This means that the potential for positive interactions can grow or decrease somewhat independently from the potential for negative interactions. For example, fostering social contact between conflicted groups can increase the potential for both positive and negative interactions in the future. The program also allows the user to specify, on a slider bar, the degree to which the factor in question contributes to momentary states of violence. Again, the user’s expertise and insights are critical here. In ethnic relations, for example, income disparity may be a very important factor in the long run, but it is unlikely to directly spark an episode of violence on a particular day. An act of humiliation, in contrast, may well provide the catalyst for momentary violence in such a relationship. A separate slider bar is provided to allow the user to specify the impact of each factor on the immediate versus long-term reactions of the system.

Finally, the program allows the user to reconfigure the attractor landscape directly. The pre-set configuration of positive and negative attractors may not capture the knowledge and insight of the user. It may be, for example, that the user feels that the positive attractor is relatively weak (i.e., a shallow valley) but has a wide basin of attraction (i.e., a wide valley), whereas the negative attractor is quite strong but has a
narrow basin of attraction (i.e., a deep but narrow valley). By changing the attractor landscape, the user can observe whether the relevant factors and their specific effects (i.e., on positivity, negativity, and momentary violence) begin to play a larger or smaller role in defining the overall quality of the relationship. The software can thus be employed in different ways to achieve different ends.

Potential Applications

The Attractor Software can be applied in different settings and can be useful in different ways. The benefits of the program include managing complexity, untangling the long-term and short-term consequences of conditions and actions, and understanding that the same action can have conflicting effects on the positive and negative aspects of the interaction. In more general terms, the software provides direct experience with dynamical concepts and tools, and thus fosters a way of understanding of conflicts. Below we outline some of the possible uses and benefits of using the software:

(1) The interactive nature of the program enables students, negotiators, and third parties to tap into their knowledge and insight regarding conflict, and to see how these factors impact both the momentary and long-term state of the relationship among the conflicting parties. With the addition of each new factor, the momentary state of the relationship is changed, but whether this change affects the long-term relationship will depend on the attractor landscape. This should sensitize users to the distinction between interventions that have immediate but not long-lasting effects and interventions whose effects may not be immediately
apparent but that change the attractor landscape and create new possibilities for relationships.

(2) Social science theory and data can be used to identify relevant factors in particular situations, specify the overall importance of these factors, and define the impact of these factors on positivity, negativity, and momentary violence. In this way, the program can be used both to test the assumptions of existing social science data and to identify which factors should receive attention in real-world contexts. Conversely, if the role of these factors has been unequivocally established in research and real-world contexts, one can modify the attractor landscape to make the results of the program come into line with such findings. This “reverse engineering” would help researchers and practitioners identify the manifest and latent attractors in interpersonal and inter-group relations. The identification of latent attractors is particularly important because they represent possible states for a relationship that may not be recognized by the parties involved but which could provide a focus of intervention.

(3) Users can interact with the software in small groups. This would allow them to share insights and together identify relevant factors, specify the effects of these factors, and observe how the relationship responds in the short term (i.e., momentary state) and in the long term (i.e., attractor tendencies). Rather than arguing about the likely effects of different interventions, for example, the users can test their respective assumptions and intuitions, and in this way perhaps reach a common understanding with agreed-upon strategies for conflict resolution.
(4) The software can also be used as a platform for resolving conflicts among representatives of conflicting parties. The parties to a conflict often see the world in different terms, and this lack of a shared reality can contribute to a conflict’s intractability. By working with this software in a collaborative venture, the representatives of the conflicting parties might discover what factors are most relevant to the maintenance of the conflict. More importantly, an initiative of this kind might promote an agreed-upon mode of intervention for resolving the conflict.

A Workshop on Negotiation and the Dynamics of Complex Conflicts

We have conducted a series of workshops aimed at presenting the relevance of Dynamical Systems Theory for the understanding of complexity and change in conflicts and negotiations. An important part of these training sessions has been devoted to exercises using the attractor software. The aim of the exercises was first to integrate and solidify participants’ understanding of conflict dynamics from a DST perspective, and second, to provide practical experience in using this perspective to deal with real cases of complex conflict systems. One important element of these workshops was a preparatory tutorial designed to introduce the notions of dynamical systems, attractors and conflict dynamics to the audience.

Below, we present the exercises developed specifically for use with the attractor software. It is worth emphasizing, however, that they constitute an integral part of a whole pedagogy introducing the DST approach to conflict dynamics. First, the visual
interface of the software is presented, with explicit links to the theory and to specific properties of attractors in conflict. Next, participants take part in a warm-up exercise aimed at familiarizing them with the software and its various options. The main objective of this exercise is to translate into dynamical terms participants’ understanding of a given conflict case using the options and visualization strategies offered by the software interface. Instructors used the recurring youth riots in France in 2005, 2006, and 2007 (based on press reports, short films, and pictures) as an illustration of a case to be analyzed through the attractor software tool.

Initially the group is divided into small subgroups of approximately five members each. Each group discusses and lists factors they feel might be relevant to the case. Next, each group estimates how these factors may influence three aspects of the conflict, through the evaluation of: 1) their potential for positive interactions (strengths of positive attractor), their potential for negative interactions (the negative attractor), and the current state of momentary violence. Subsequently, the user interface is displayed on a computer screen and multimedia projector, and the instructor demonstrates how to input all the factors generated in the group into the software. As the software output is explained, the three types of effects of each factor are depicted on the screen. Group discussion is facilitated around the estimation of each factor’s effects on the system’s dynamics, as well as how each attractor and momentary state change after the introduction of new factors. Specific practical issues related to the software are then addressed, as well as participants’ technical questions.

After the introductory session, participants are divided again into five or six person subgroups. Each group gets a generic description of a complex conflict case, in
which the short-term and the long-term consequences of different factors and actions may
go in the opposite directions (i.e., factors having good consequences in the short run have
bad consequences in the long run and vice versa). The scenario employed in our basic
workshop concerns an environmental conflict around Riverbank State Park in West
Harlem, New York, which was constructed above a sewage treatment plant in New York
City (Holloway 1992). A short term, integrative solution that seemed to satisfy the needs
of both the local city administration and the advocates for the local community was to
build the sewage treatment plant, and to compensate the community by constructing an
area on the roof of the sewage treatment plant that could be used by the community. This
rooftop area was essentially a large park (28 acres) with a football field, softball
diamonds, basketball courts, indoor and outdoor swimming pools, picnic areas, and
restaurants. Although the solution seems integrative and satisfying in the short term, it
becomes increasingly questionable when one considers the long-term consequences and
meanings, such as potential health issues (children playing on the roof top of a building
that processes 170 million gallons of raw sewage a day), odor, and at the macro level,
discrimination issues (why in Harlem, not around the Upper West Side area, where it was
initially planned?), micro-violence, and racism. In different instances of the workshop,
we asked the groups to process cases of complex conflicts from their experience as
practitioners of conflict resolution, as stakeholders, or as observers. The groups work
together using the software for approximately half an hour. During this time, they list the
factors affecting the conflict, and observe the positive, negative, long- and short-term
consequences as different factors are introduced.
In the next phase, participants move from the description of the status quo of the case to generating possible transformation scenarios, introducing hypothetical factors that can potentially change the course of the situation. Participants are encouraged to work on the whole system, and to try strategies aimed at: 1) minimizing the negative attractor, 2) maximizing the positive attractor, 3) moving the current state from the negative toward the positive attractor. Through this process, participants assimilate very complex features of DST, and apply them directly to practical problems. The intervention scenarios generated during this phase of the project prove remarkably mature, as they consider both short-term and long-term consequences of the proposed changes. Their potential impact on social relations is considered both with regard to conflict resolution strategies and to the creation of conditions for sustainable, active positive relations. Latent problems, potentially critical in the near or distant future, constitute an important indicator of a solution’s effectiveness, as well as how much the solution allows for the stabilization on the positive attractor (active, positive social relations) in the future.

The final phase of the exercise is dedicated to group discussion. Participants discuss in a large group forum the cases analyzed, the factors they have considered, the possible solutions generated, and the effectiveness of these solutions as indicated by the attractor software. They also discuss their experiences with the software, including both their discoveries and their difficulties. This phase of the project may prove central in groups where different perspectives on the same problem are confronted. Thus, participants can compare and contrast their results with the outcomes of different attractor software simulations on the same problem. Participants are provided with tools that allow for a debate around concrete factors, including long versus short term interests and
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potential changes resulting from proposed solutions. The tools also facilitate discussion concerning participants’ different worldviews, as represented by complex systems of interconnected elements. Beyond enabling the sharing of different perspectives, the visualization of a concrete problem provides a space for each solution to be systematically considered.

Research Comparing Two Models of Negotiation Training

We conducted two studies investigating the effects of the attractor software training on the sustainability of agreements generated by participants in two negotiation courses at University of Warsaw in Warsaw, Poland. Participants in both courses were trained in both integrative negotiation (Fisher, Ury, and Patton 1991) and conflict attractor dynamics. Participants worked on a negotiation case concerning a union postal strike against a governmental postal system. Each class was divided into two subgroups, with one subgroup learning to negotiate with help of the attractor software and the integrative negotiation model, and the other subgroup trained only in integrative negotiation (although the attractor software training but was subsequently provided for educational purposes). Thus, we were able to compare the results of the negotiations achieved with or without the help of the attractor software training.

During the first day of training, participants received instruction in the conceptual foundations, strategies, and tactics of integrative bargaining (Fisher, Ury and Patton 1991). The theoretical discussion sessions were intertwined with negotiation games, during which participants could apply and practice the acquired knowledge. We began
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with basic principles of integrative bargaining (Separate people and issues; Focus on interests, not positions; Generate options; Use objective criteria) and next focused on tools and techniques for bargaining with difficult partners (Ury 1991).

On the second day, we started the experimental procedure. First we randomly divided the classes (n=32, 25 female and 5 male) into two equal subgroups and then separated the groups so that they had no further contact with each other. The first group negotiated the postal strike conflict in dyads, while the second group (at the same time) received instruction in the dynamical approach to conflict and the attractor software. The latter group worked with the conflict at Riverbank Park in Harlem in New York during the attractor training. Then, they were divided into dyads and were instructed to negotiate the postal strike conflict. At this time, the first group started their instruction in the dynamical approach to conflict. At the end of these sessions, we brought the two groups together again and discussed the negotiations, their experiences of the dynamical approach, and the attractor software. Then the participants were debriefed and thanked for their time.

The negotiated case concerned a conflict between a postal labor union and the management of the postal service in an imaginary country called “Ubu”. Participants received private scenarios that described the conflict situation from the point of view of either the union or the management. The objective conditions of the situation were as follows. The postal service in this country is state-owned but new delivery companies have emerged in the city and have started to take over both the clients and employees of the postal service. In response, the postal workers demand better wages. However, the postal service must increase its competitiveness in order to avoid losing its market share.
The postal union organizes and conducts a general strike. They demand a pay raise, additional income for marketing efforts, improvement of their conditions, and payment of unpaid overtime, among other demands. The goal of negotiator is to try to determine conditions for ending the strike.

After completing the negotiations, participants were instructed to fill out a Likert-type questionnaire (1- very bad, 6- very good) about their perceptions of the software usefulness (the attractor group only), satisfaction with the process and the outcome of the negotiation, the power of both participants in the negotiation, and their subjective perceptions of the durability of their negotiated agreement. In addition, they provided information about their gender, age, major field of study, and the nature of the contract signed in the negotiation.

The results supported the utility of the additional training with the attractor software. Participants who employed the attractor software found it much easier to communicate with their negotiation partners. The U Mann-Whitney test revealed marginally significant differences between groups according to mid-negotiation ease of communication with a negotiation partner (U=66.5; p<.053), and revealed significant differences during to the final phase of the negotiation process (U=60.5, p<.05). The data are presented on Figure 5.

INSERT FIGURE 5

The participants in the attractor software group also reported a better understanding of the negotiation process than did participants in the control group (U=54; p<.05). There were no significant differences in understanding at the early phase of the negotiation process (U=90, p<.34). However, participants in the attractor condition
Attractor Simulation Software reported better understanding of the process in the middle phase (U=51; p<.01) and the final phase (U=48.5; p<.01) of the negotiation.

The findings related to differences in the outcomes of the negotiations between the two groups were the most interesting (see Figure 6). Our analyses revealed no significant differences between the groups in their experiences of satisfaction with the outcomes (U=90.5, p<35), satisfaction with the negotiation process (U=86.5, p<26), or perceptions of fairness of the outcomes (U=74, p<11). There were also no significant differences between the groups in the number of positive solutions generated for the postal union (t=1.62, 20.4, p<12), nor were there significant differences between groups in the number of positive solutions generated for postal management (t=1.33, 28, p<19). However, analyses of variance (ANOVA) revealed statistically significant differences between the group in the long-term stability of the agreement (F=5.92, 1,30, p<.05). This was assessed by calculating the overall costs of the agreements achieved and comparing these to the feasibility of managing these costs and their adverse impact on the financial viability and stability of the postal company. Similarly, t-tests revealed significant differences between these groups (t=3.18, 10.1, p<.01) on these same criteria. In fact, each pair that negotiated with help of the attractor software achieved durable long-term solutions, whereas the majority of the other pairs failed to achieve such results (five out of eight).

**INSERT FIGURE 6**

Taken together, the results reveal an interesting schism between the participants’ perceptions of the outcomes of the negotiations and the bottom-line implications of their agreements. These implications are directly relevant to the sustainability of the solutions.
Attractor Simulation Software generated for conflicts. These results suggest that the use of the attractor software in the negotiation promotes the attainment of better results. They also speaks to the fact that even a highly satisfying outcome may be not be durable and that this fact may go unnoticed to the parties until the consequences of their actions come back to haunt them. The attractor software, in sum, can serve as a non-trivial, but simple tool that potentially increases the durability of agreements.

Conclusion

The dynamical-systems approach to conflict analysis, research, intervention, and training is in a very early stage of development. However, this approach holds great promise for conceptualizing, comprehending, and working with conflict dynamics in all types of social relations. The attractor software tool and negotiation training pedagogy described in this paper is just one of the many practical initiatives that we believe will emerge from working with this new perspective. Our experiences thus far with the attractor software have been uniformly positive. However, we must stress again that we have observed that use of the software delivers its best results when it follows a careful introduction to the dynamical perspective on conflict. Clearly, the attractor software is not a self-contained tool, but rather represents an important component of the dynamical approach.

References


Figure 1. A dynamical system with two attractors (A and B)
Figure 2: The Ecology of Urban School Conflict and Violence

Macro:
- Poverty: poor housing, transportation, environmental toxins, unemployment
- Insufficient access to decent healthcare & nutrition
- Legacies of direct & institutionalized racism, militarization, associated trauma
- Drug trafficking, unsafe recreational facilities, alienation, crime
- Insufficient external control: safety, security, surveillance

Mesoscale:
- Legacies of hostile divisions: ethnic, racial, class, gang
- Poor school climate: discipline system, classroom management, governance
- Poor physical plant: building, noise, insects, temperature, # of students
- Family problems: drug and alcohol abuse, domestic abuse, divorce, crime
- Destructive modeling: media, music parents, siblings, leaders, peers
- School competition: for status, grades, leadership, sports, turf

Micro:
- Adolescent development: hostile attributions, oppositional identities, increased aggression
- Chronic feelings of humiliation, rage, helplessness, loyalty, injustice, hopelessness, loss, deprivation, low self-efficacy
- Individual differences: poor impulse control, deviance, birth trauma, immoral reasoning, short life expectancy
- Ecology of School Conflict & Violence

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Figure 3: Input (list of factors on the top) and output (visualization of the attractor landscape and the momentary state represented by the moving ball toward the valley).
Figure 4: A conflict attractor landscape with two attractors, one for destructive interactions (left) and one for constructive interactions (right).
The perceived easiness of communication during the consecutive parts of the negotiation process

Figure 5. Relative ease of communication during three phases of the negotiation process.
Differences in stability of agreement

Figure 6. The differences between groups according to the stability of reached agreements.
In thinking about a marital relationship, for example, the user might consider finances, children, and sex to be critical factors in determining how the marital partners will relate to one another, whereas in thinking about ethnic conflict they may feel that such factors as discrepancies in wealth, religiosity, and the history between the groups are the critical factors dictating how the groups feel about and act toward one another.