

Deep Analysis: Designing Complexity Into Our Understanding of Conflict

By: [Thomas G. Matyók](#), Hannah Rose Mendoza, [Cathryne Schmitz](#)

Matyók, T., Mendoza, H.R., & Schmitz, C. L. (Summer, 2014). Deep Analysis: Designing Complexity Into Our Understanding of Conflict. *InterAgency Journal*(5)2, 14-24.

Made available courtesy of the Simons Center for Interagency Cooperation:
<http://thesimonscenter.org/publications/interagency-journal/>

*****© Simons Center for Interagency Cooperation. Reprinted with permission. No further reproduction is authorized without written permission from the Simons Center for Interagency Cooperation. *****

Abstract:

Conflict is inherently messy, and today those analyzing conflicts are confronted with an incredible number of problems that resist resolution. Chaos, ambiguity, and contradiction are routine. The vast majority of today's social conflicts can be characterized as "wicked problems," meaning they are a combination of ill-defined questions and multiple possible responses.[1] Simple answers are rarely sufficient to address the dynamics of modern struggle.

Keywords: Conflict Analysis | Peacebuilding

*****Note: Full text of article below**

Deep Analysis: Designing Complexity Into Our Understanding of Conflict

**by Thomas G. Matyók, Hannah Rose Mendoza
and Cathryne Schmitz**

Conflict is inherently messy, and today those analyzing conflicts are confronted with an incredible number of problems that resist resolution. Chaos, ambiguity, and contradiction are routine. The vast majority of today's social conflicts can be characterized as "wicked problems," meaning they are a combination of ill-defined questions and multiple possible responses.¹ Simple answers are rarely sufficient to address the dynamics of modern struggle.

Recognizing that conflict analysis remains fundamentally anchored to the 1990s and is heavily influenced by greed and grievance thinking, conflict analysis searches for responses to today's wicked problems, often disregarding the mounting research that suggests existential concerns of culture, identity, and religion are playing increased roles in conflict.² As a result, we need enhanced ways of analyzing conflict and communicating knowledge that allow us to make sense of the chaos, ambiguity, and contradiction. Contrary to creating mental frames that work to simplify conflict into compartmentalized technical problems solvable in the same way as a mathematics equation, we suggest heading in the other direction—away from such reductionist tactics and toward complexity. Deep analysis is a textured study of conflict that identifies patterns of contradiction present in the struggle that can lead to detailed responses.

Current mental frames of conflict quite often appear antiquated or simply not helpful as tools

Thomas Matyók, Ph.D. is Associate Professor in the Department of Peace and Conflict Studies at The University of North Carolina Greensboro. Currently, he is a Visiting Research Professor at the Army's Peacekeeping and Stability Operations Institute and teaches classes at the Army War College on Religion and Violence, and Conflict Analysis.

Hannah Mendoza, M.F.A is Assistant Professor, Department of Interior Architecture at The University of North Carolina Greensboro. Her scholarship focuses on gender, identity, and the built environment; design education, research methods, theory and philosophy; and design for the disenfranchised.

Cathryne L. Schmitz, Ph.D. is Professor & Chair, Department of Peace and Conflict Studies, and Professor, Department of Social Work, at The University of North Carolina Greensboro. She teaches graduate classes on organizational development, leadership, and peacebuilding.

to understanding what we are seeing. Individual and group intellectual habits form the frame within which we construct and reassemble reality. When conflict analysis frames are outdated or insufficient, they can have serious unintended negative consequences.³ We need expanded ways of analyzing conflict that recognize and embrace complexity.

In addition, once we have conducted conflict analysis, we need a common language for communicating lessons learned across organizational or agency boundaries. Rarely is one agency analyzing a conflict. Often several are studying conflict, viewing it through different lenses with analysis tools appropriate to their organizations, and being influenced by desired outcomes. Prejudice and bias are built into these frameworks, and organizations' patterns of behavior influence actions.⁴

The desire to roll-up shirtsleeves and get down to work tackling conflict and violence is certainly laudable; however, the desire for action cannot be allowed to push analysis out of the peacebuilding process. Abraham Lincoln wisely noted that if he had six hours to chop down a tree, he would spend the first four sharpening his ax. So it is with conflict work. Given a conflict to transform, ongoing analysis provides an understanding of context as well as an opportunity to develop a holistic view of the situation for the long term.

Our experience suggests that many practitioners of conflict resolution spend little time performing or simply ignore analysis. As indicated by the popular phrase of “paralysis by analysis,” perhaps analysis has taken on a bad name. Certainly, many students of peace and conflict studies resist analysis and express an active hostility toward it, preferring instead to focus almost exclusively on interventions.

As a result, many take an approach that begins with answers and then looks for problems to apply them against. When asked to confront issues outside of those answers, they

either shoehorn the problem into their frame of understanding or imagine it as an irresolvable problem for the ages. In doing so, they reject their creativity and do not develop their abilities to design new responses to changing contexts.

Ongoing analysis is the *sine qua non* of successful conflict transformation. Context drives analysis, and analysis is action. Analysts interpose themselves between the conflict and the outcome, becoming an actor within the context. Equally important, analysis is what allows for the possibility of learning from the intervention techniques and outcomes of resolution. Unless we understand why we make certain decisions, we can never understand why those decisions fail or succeed, nor can we identify future situations in which particular aspects can be successfully applied or redesigned. The analyst is a constant learner.

The desire to roll-up shirtsleeves and get down to work tackling conflict and violence is certainly laudable; however, the desire for action cannot be allowed to push analysis out of the peacebuilding process.

The purpose of this article is to contribute to the emerging narrative that focuses on conflict analysis and the multiple ways it can contribute to understanding crises. We propose that analysis is layered and never completed. It leads to a more informed understanding of a conflict and generates a response that leads to another analysis of a new conflict state—an epistemic cycle. Like conflict itself, analysis is a never-ending process. There will be no moment in which all is on a trajectory of peace that requires no captain, no course adjustment, but simply travels eternally and without maintenance.

It is misleading to think of analysis as

linear—analysis leading to action, leading to an end state. Rather, analysis occurs along a spiral where conflict is re-examined as it manifests itself in new conditions. We suggest a critical realist philosophy that removes human beings as the center of the social universe and focuses on decision-making in context. The social structure restricts analysis through culture, cognitive dissonance, group-think, and conscious and unconscious psychological misperceptions.⁵ Using a spiral metaphor and model of transformative conflict work, we advance the idea that at each stage of a conflict's evolution, analysis and intervention are bound by a newly-created social structure. Thus, the social framework moves from being a rigid, angular structure to becoming a constantly reforming liquid mass.

Rather than replacing existing models of conflict, deep analysis offers a multi-dimensional mental-frame that can be applied to existing conflict analysis models to complement their approaches.

We introduce the idea of deep analysis as a framework for approaching complex and ambiguous conflict contexts. Rather than replacing existing models of conflict, deep analysis offers a multi-dimensional mental-frame that can be applied to existing conflict analysis models to complement their approaches. Deep analysis extends models used to understand conflict and provides analysts with a mental strategy for going beyond the artificial limits imposed by model parameters. Deep analysis also provides a common language that conflict workers can employ across organizational boundaries.

The absence of joint conflict analysis models suggests that organizations' institutional inertia resists being forced into a Procrustean bed, where a one-size-fits-all approach is imposed. Agency-specific analysis tools develop organically because they meet a need in addressing wicked problems.⁶ The answer we propose is to maintain organization-specific approaches to conflict analysis while introducing a universal translator that can facilitate joint understanding of the conflict environment: Social Cube 2.0.

Background

A quick Google search of the phrase "conflict analysis models," results in more than 235,000⁷ hits. The number of hits suggests the significance of analysis to conflict work. With this number of resources available, how do we know which one is best? Certainly this does not indicate that there are more than 235,000 unique models of conflict analysis, but a cursory scan of the results indicates that there are a wide variety of models and model variants discussed. How does a peace worker begin to choose one over another? How does an ambassador know which ones she will need? In order to prepare practitioners for the multitude of contexts, many of which will include elements we cannot currently predict, should we use one, two, a dozen? Further, it is not enough to be versed in the models available, but rather true fluency comes with an ability to reform them to unique requirements. With so many models available, how do we become sufficiently versed in their possibilities to meaningfully fuse the results of multiple analyses to inform an intervention strategy?

It is not possible to arrive at a qualitative decision on which analysis model is best; in fact, such a standard of measurement requires making a false choice. Models develop because they are appropriate for the organizations using them and in the contexts in which they

operate. They are not always the right choice for all organizations at all times and places. Additionally, the language employed is different among various groups (i.e., government, military, nongovernmental organizations, and academics). Organizations need a process that allows them to undertake analysis in a way that meets their unique needs, while allowing them to speak with other entities working on the same conflict from vastly differing perspectives in order to harmonize their responses.

Single descriptions of conflict provide limited information. Imagine learning about the American Civil War solely from the descriptions of Robert E. Lee. Even assuming that Lee presented a fact-based narrative and did not intentionally misrepresent the truth, his account would only provide a partial understanding of how the conflict developed, what occurred during the various phases from initial disagreements to all-out war, and the possibilities and consequences of the way it ended. Imagine pairing that insight, however, with descriptions from leaders of all sides, widows of Civil War soldiers, Matthew Brady's photos, slaves, children of the privileged, and so forth, and a much more complex image begins to emerge. Conflict analysis that is fused in this way can lead to insights of a higher logical type.⁸

Social cube analysis provides a ready-made analysis framework that practitioners can apply to existing conflict analysis models.⁹ Simultaneously employing the social cube with other models provides a common language that analysts can use to fuse multiple models and approaches. A social cube approach to analysis follows a design approach to peacebuilding and conflict transformation.¹⁰ Design approaches move beyond the artificial boundaries of academic disciplines to engage scholarship and practice, broadly integrating knowledge holistically. Employing a design approach to peacebuilding, practitioners abandon discrete

disciplines of academic study to assume a renaissance attitude toward knowing, an attitude that focuses on the whole as a complete entity, not simply the sum of its parts.

Complexity is free. In facing wicked problems, it is no longer enough to think outside-the-box, it is now absolutely necessary to get out of the box entirely. Conflict analysis should engage complexity and encourage complex thinking. Simple conflict analysis can lead to simplistic responses. However, inviting complexity into analysis should not result in a chaotic mess; rather, complexity should result in deep, nuanced, and textured analysis that can be articulated in a common language all can understand. When our models and metaphors betray us, we need to develop new models, despite the adage that the only thing more difficult than getting a new idea into an organization is getting an old idea out.

In facing wicked problems, it is no longer enough to think outside-the-box, it is now absolutely necessary to get out of the box entirely.

Deep Analysis

A primary rule of conflict analysis is that there is never enough. This is not to say that conflict analysis should lead to a state of "analysis paralysis," an inability to make a decision for want of ever more data. Rather, the point of deep analysis is that through an ongoing study of conflict, we can arrive at a more comprehensive approach to transformation. Deep analysis views conflict moving continuously upward along a spiral toward improved conditions and becoming a new conflict at each position. Systems adapt to transforming interventions and manifest new

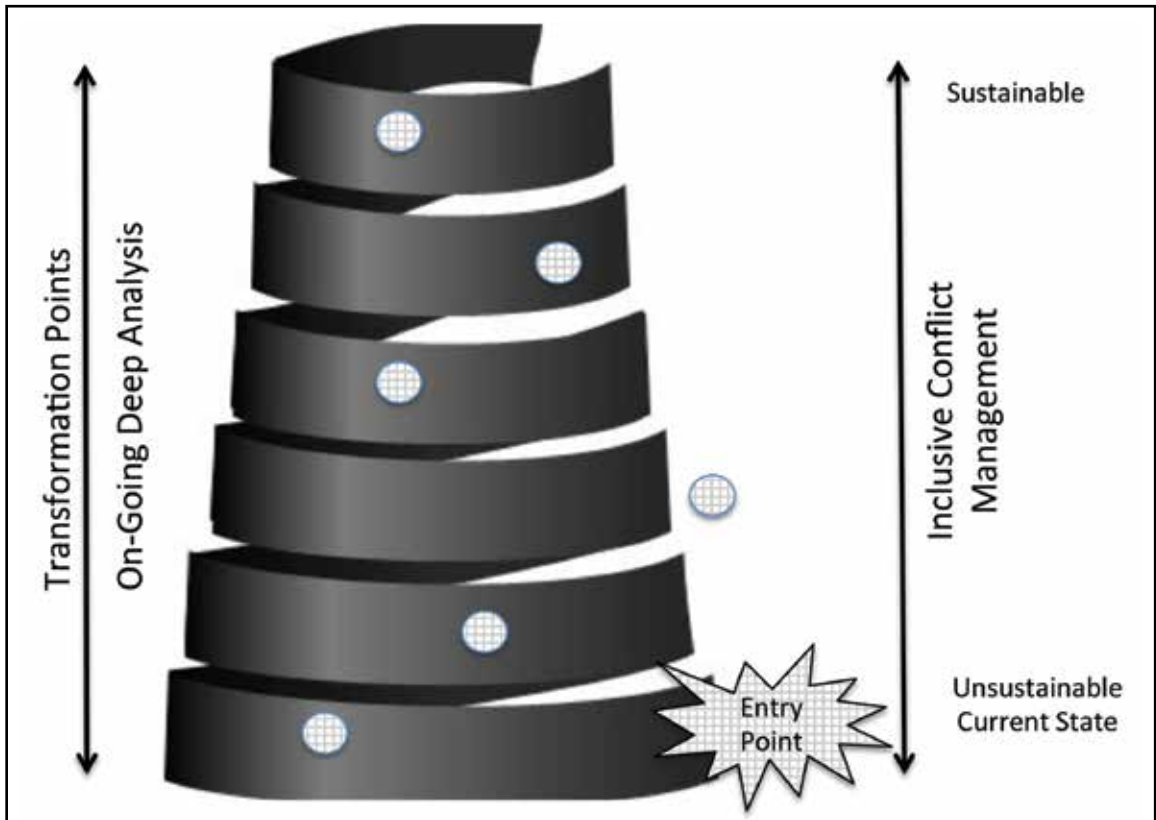


Figure 1. Spiral Model of Conflict Transformation

forms of old conflict. The use of the reflexive social cube results in an epistemic complex. An epistemology develops through use of the cube—knowledge is produced through analysis,¹¹ which leads to a transformational understanding of conflict. Every act of analysis creates new conflict; agent and structure interact in a creative and reinforcing activity. (See Figure 1.)

Deep analysis recognizes that conflict never ends, and because history never ends, conflict is rarely resolved. Boulding notes that if humankind's future relies on its ability to eliminate conflict, the future is bleak.¹² Conflict may be either latent or manifest; however, it is never absent. In deep analysis, the goal is conflict management and non-violent transformation. Conflict lives on in the collective unconscious and individual psyches.¹³

Deep analysis is based on three complementary components of conflict transformation; design, liquid knowing, and social cubism. Design suggests that sustainable peace processes are deliberate activities created in context to achieve deliberate goals. Liquid knowing advances the notion that conflict analysis eschews linear thinking in favor of thinking without boundaries in multi-dimensional space. The social cube offers a mental frame for multi-dimensional analysis of conflict, which allows analysts to develop an informed theory of change.

Design

Sciences can tell us what something is. Science informs us of a substance's physical properties and provides insights into the physical world. The humanities and social

sciences explain why something is. Humanities and social science disciplines contextualize what the sciences tell us exists. However, it is design disciplines that inform us about what something can be. Clearly, the sciences, humanities, and social sciences inform design thinking; however, they are viewed as restrictive. The design theorist and practitioner seek an integration of ideas. There are no design disciplinary boundaries to defend.

Design disciplines such as peace and conflict studies (PACS) are pointing to a new direction in scholarship. As fields of engaged-scholarship, design disciplines advocate for a transformative future unrestricted by disciplinary boundaries.¹⁴ We anchor our approach to analysis in design theory as articulated by Rittel, Webber,¹⁵ and Buchanan.¹⁶ PACS moves beyond multidisciplinary and interdisciplinary approaches to scholarship and practice, to conceptual ground that frames the disciplines as integrative. Integrative fields of study move out of silos where knowledge is stored for use by approved elite within discrete domains. Design disciplines focus on the study and practice of what can be, rather than engaging in continuous study of objectified past knowledge or the physical world. The focus of integrative design disciplines is “the conception and planning of the artificial.”¹⁷ Peace design is about the artificial.

Design focuses on the creation of artifacts.¹⁸ The existence and degree of peace within society is evaluated through the presence of artifacts. For instance, peace scholars ask, “What institutions of peace are present? How do they function? What peace symbols are in use?” The practice of building peace artifacts is what connects PACS to design and the practice of creating futures.

Design thinking is the scholarly practice of social construction that links theory and practice to create the field of design. Design thinking takes design out of its disciplinary

boundaries and places it in non-design fields. Design thinking is more than creative thinking.¹⁹ Creative thinking occurs inside the box using imaginative realignments of existing artifacts. Design thinking focuses on the not yet existing and how to make it real. It is not restricted by a finite number of existing artifacts.

Academia is dominated by disciplines that fall into one of two categories—sciences and humanities. Emerging to confront the wicked problems of our time are design disciplines engaged in substantive social change. Design disciplines challenge traditional ways of knowing and introduce ways of understanding not anchored to specific fields of study that possess their own unique logics. In vogue on college and university campuses today is the notion of interdisciplinary knowing. Interdisciplinary is another form of coordination or cross-talk among discrete academic disciplines. Interdisciplinary approaches to knowing fall short of the thinking required when addressing conflict issues using deep analysis. Interdisciplinary approaches keep academic disciplines intact. And, disciplines employ compartmentalized approaches to problems based on their limited views of reality. Design disciplines suggest that disciplinary approaches to scholarship and practice are outdated modes of thinking.

Liquid Knowing

Liquid knowing is a metaphor used in deep analysis to move beyond the notion of interdisciplinary bridging. Interdisciplinary thinking advocates for a form of enhanced communication among disciplines. At best, it suggests a “little of this and a little of that” approach to knowledge development, where disciplines accept into their canons only that which they find useful in supporting already established truths. These closed disciplinary systems can be thought of as boxes, outside of which designers are encouraged to think.

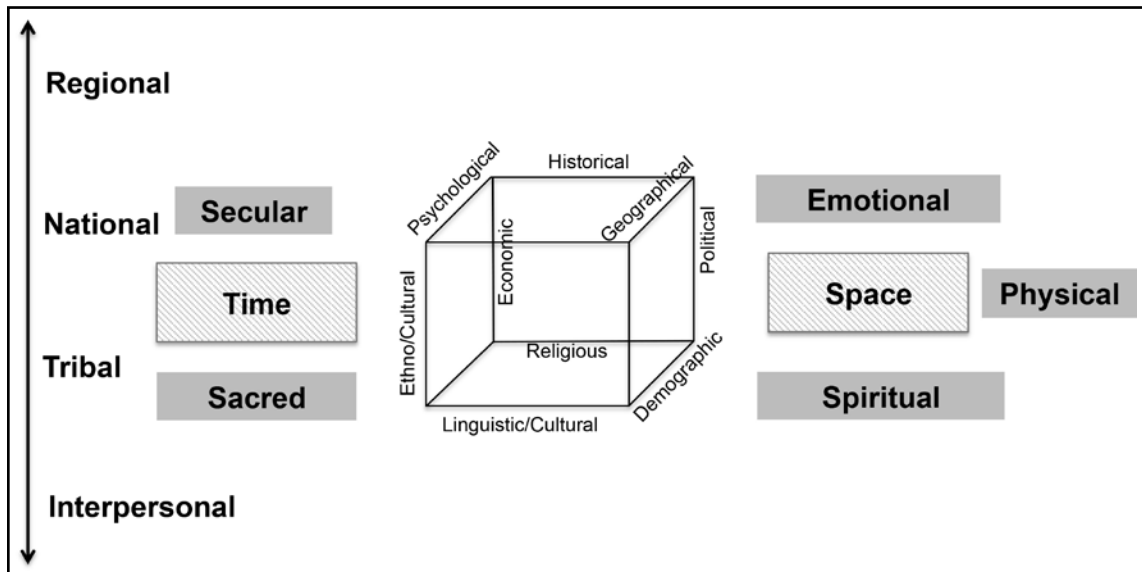


Figure 2. Social Cube Analysis 2.0 – Based on the work of Sean Byrne

What is needed is thinking that encourages contamination, not purity, of thought.

Analysis is not neutral, and it is influenced by the level at which it occurs.²⁰ At higher levels of analysis, responses are general, while at lower levels, they are specific.²¹ The box, or structure itself, influences and modifies thinking. It creates the borders outside of which people are discouraged from wandering. We need people who are intellectually capable of stepping out-of-the-box and think in new spaces.

The opposite of linear thinking that moves along a plane, conflict analysis is a form of intellectual scaffolding that continuously builds on itself. It is thinking spatially.

Social Cube 2.0

As an outcome of their structures, all social conflict models are inherently flawed. Possibly, the best we can do is construct models that view a specific conflict as a human system and advance our knowledge of it while being aware that we can only know a limited amount of all that can be known. Corraling human behavior is not an easy job. Complexity theory and chaos theory suggest that in non-linear systems—

such as social conflict—we are restricted to predictions based on probabilities influenced by constraints imposed on a system.²² The best we can hope for in understanding human behavior is to recognize possible patterns, because a particular stimulus does not always lead to the desired response.

The social cube outlined by Byrne et al. is a multi-dimensional mental frame that is used to analyze social conflict. (See Figure 2.) As an analysis tool, the social cube allows for the construction of a three-dimensional model of the social context within which conflict manifests itself. Two-dimensional, linear thinking can lead to an analysis that fails to recognize the holistic nature of conflict, and the social cube corrects the limitations of these approaches. A model of social conflict must be sufficiently complex to make sense of the chaos. Conflict analysis looks at the patterns involved, which develop in multi-dimensional space. The social cube serves as a foundational piece of deep analysis. Organization specific analysis, social cube analysis, and the addition of time and space form the architecture of deep analysis.

By adding time and space as elements of

analysis to the social cube and placing it in a hierarchical holographic position, we can develop a deeper understanding of conflict at all levels: micro, meso, macro, and mega. Analysts cannot fully understand conflicts outside the time and space in which they are analyzed. Time and space will always be the ether in which the social cube moves, and they allow analysts to think deeply, holistically, and expansively. We suggest expanding Byrne's model and employing an enhanced model, Social Cube Analysis 2.0, which incorporates time and space.

Byrne et al., outline the social aspects of conflict that construct a mental model for analysts. A limitation of the social cube is that it follows a Euclidean geometry with distinct lines and angles. In contrast, deep analysis using Social Cube 2.0 adds in a respect for hyperbolic geometry recognizing conflict's non-linear nature. We recognize this limitation and do our best to adjust to compensate for angular thinking. Very often, conflict manifests itself as ill-defined patterns in multi-dimensional space. Metaphorically, conflict has a fractal nature replicating itself at each level of analysis.²³ Conflict fractals function independently at each level of analysis in pursuit of specific goals, and they simultaneously influence fractals above them impacting their goal pursuit.²⁴ Conflict can be viewed as holographic,²⁵ the entire conflict present in each autonomous fractal manifestation. Social Cube 2.0 exists in three-dimensional space and time and moves freely within each level of analysis.

Though space and time are considerations within social cube analysis, they are treated independently of the cube, forming the context within which the cube is suspended and conflict is understood. Conflict requires space and time to provide context.

Outside conflict moves into the social cube and is acted upon through analysis that results in an epistemic complex moving conflict

continually along the mental spiral. As each conflict becomes new following each analysis and intervention, it is transformed through the social cube's mechanisms.²⁶

Interagency coordination is challenging for multiple reasons: competing goals and priorities, cultural differences, resource and power disparities, competition for resource turf, different assumptions and expectations, and lack of line authority.²⁷ Added to these challenges is the recognition that no uniform language exists that facilitates clear interagency communication regarding conflict analysis.

Social Cube 2.0 translates analysis into a common language that can facilitate interagency communication.

Social Cube 2.0 translates analysis (conducted by agencies that view specific conflicts from different perspectives) into a common language that can facilitate interagency communication. Agents and agencies view conflict through unique lenses. These lenses bend the conflict "light" to create a focused picture meaningful to the individuals involved. Agencies view conflict with a goal of connecting it to their "distinct data bases, decision variables, decision makers, and affected constituencies."²⁸ A common Social Cube 2.0 language assists in developing an operational narrative.

What does the common language provided by the social cube look like? What does each dimension of analysis contribute to the narrative?

- **Historical.** All conflict has historical components. Deep analysis focuses on a specific manifestation of a historically-situated conflict. Since history does not end, it will always be a component of conflict.

- **Demographic.** Consideration of majority/minority demographics is necessary, as is the control and distribution of resources within communities and the society at-large.
- **Geographical.** Physical and social geography play crucial roles in understanding conflict. Geography influences conflict-resolution schemes. Specifically, what do lines of communication look like?
- **Psychological.** Conflict is existential, and to varying degrees, people's identities are linked to the conflict. The psycho-cultural dimension of analysis addresses the psychological and subjective characteristics of conflict. The psycho-cultural creates the narrative that describes what it all means. This psycho-cultural narrative is the domain of fear and anger.
- **Ethno/Cultural.** What in and out groups are present? How do they interact?
- **Religious.** What is the role of religious institutions within the conflict? Do religious actors and institutions follow the same scripts, or is there a difference between the formal and informal narratives? Are religious institutions and actors available to participate in conflict reconciliation?
- **Linguistic/Cultural.** Language and culture are interconnected. What symbols are used to legitimize the conflict?
- **Political.** Is the government legitimate? What is the accessibility to governance structures? What institutions of peace are present? How do they function? Is there trust in the political system?
- **Economic.** What economic resources are present, and are they equitably distributed throughout the social groups?

Space, an under-researched dimension of conflict, is assumed and rarely considered. Space is not another word for geography. Space is multi-dimensional and can be further viewed as having physical, emotional, and spiritual characteristics. Space and time are additions to the social cube. Conflict analysis is best accomplished in context with particular attention to the geographic, social, and emotional space within which it occurs. Woven into space is the dimension of time. These two additional dimensions of analysis place conflict in a unique contextual time-space. Conflict can only make sense within its designated space and time.

Secular and sacred time exist simultaneously.

Conclusion

The Social Cube 2.0 model presented in this paper offers a language that can facilitate interagency communication regarding conflict assessment. By acting as the framework for deep analysis, Social Cube 2.0 provides a common tool for multi-dimensional, on-going analyses that enhances and does not detract from agency-specific processes that have developed over time to meet specific needs. It is not about seeking homogeneity or removing complexity, it is about building in complexity and diversity of analyses.

Mental models grow from the metaphors in use to communicate the reality we know. The wicked problems we face today are too complex for the limitations of two-dimensional models. Conflict

workers are challenged to think in intellectual regions not yet explored, nor even discovered. Social Cube 2.0 multi-dimensional thinking is a step toward engaging in that intellectual terrain, and a model that encourages others to build upon it. We design our way forward. **IAJ**

NOTES

- 1 Richard Buchanan, “Wicked Problems in Design Thinking,” *Design Issues*, Vol. 8, Issue 2, pp. 5–21.
- 2 Sultan Barakat and Thomas Waldman, “Conflict Analysis for the Twenty-First Century,” *Conflict, Security & Development*, Vol.13, Issue 3, pp. 259–283.
- 3 Hannah Rose Mendoza and Thomas Matyók, “We Are Not Alone: When the Number of Exceptions to a Rule Exceeds its Usefulness as a Construct, It is Time for a Change,” in Tiiu Vaikla-Poldma (ed.), *Meanings of Designed Spaces*, Fairchild, New York, 2012, p. 47–58
- 4 David Litaker, et al., “Using Complexity Theory to Build Interventions that Improve Health Care Delivery in Primary Care,” *Journal of General Internal Medicine*, Vol. 21, Supplement 2, 2006, pp. 30–34.
- 5 Touko Piiparinen, “Reclaiming the Human Stratum, Acknowledging the Complexity of Social Behaviour: From the Linguistic Turn to the Social Cube in Theory of Decision-making,” *Journal for the Theory of Social Behaviour*, Vol. 36, Issue 4, December 2006, pp. 425–452.
- 6 Horst W.J. Rittel and Melvin M. Webber, “Dilemmas in a General Theory of Planning,” *Policy Sciences*, Vol. 4, 1973, pp. 155–169.
- 7 The term was searched in quotes in order to only return results for this specific concept. A search for the term without quotes returned over 42 million results, indicating that there is even greater public conversation spreading outward from this specific idea.
- 8 Y.Y. Haimes and A.Weiner, “Hierarchical Holographic Modeling for Conflict Resolution,” *Philosophy of Science*, Vol. 53, No. 2, 1986, pp. 200–222.
- 9 Sean Byrne and Neal Carter, “Social Cubism: Six Social Forces of Ethnopolitical Conflict in Northern Ireland and Québec,” *ILSA Journal of International & Comparative Law*, Vol. 8, No. 3, Summer 2002, pp. 741–769; Sean Byrne et al., “Social Cubism and Social Conflict: Analysis and Resolution,” *ILSA Journal of International & Comparative Law*, Vol. 8, No. 3, Summer 2002, 725–740; and Sean Byrne and Loreleigh Keashly, “Working with Ethno-Political Conflict: A Multi-Modal Approach,” *International Peacekeeping*, Vol. 7, No. 1, Spring, 2000, pp. 97–120.
- 10 Mendoza and Matyók, 2012, pp. 47–58.
- 11 Piiparinen, pp. 425–452.
- 12 Kenneth E. Boulding, *The Meaning of the 20th Century*, Harper & Row, New York, 1964, p. 14.
- 13 Vamik Volkan, *Blood Lines: From Ethnic Pride to Ethnic Terrorism*, Basic Books, New York, 1998, pp. 48–49.
- 14 Hannah Rose Mendoza and Thomas Matyók, “Designing Student Citizenship: International Education in Transformative Disciplines,” *International Journal of Art and Design*, Vol. 32, Issue 2, June 2013, pp. 215–225.
- 15 Rittel and Webber, pp. 155–169.

- 16 Buchanan, pp. 5–21.
- 17 Ibid., p. 14.
- 18 Ulla Johansson-Sköldberg, et al., “Design Thinking: Past, Present and Possible Futures,” *Creativity and Innovative Management*, Vol. 22, Issue 2, June 2013, p. 124.
- 19 Ibid., p.131.
- 20 Barakat and Waldman, pp. 259–283.
- 21 Rittel and Webber, pp. 155–169.
- 22 James Gleick, *Chaos: Making a New Science*, Penguin Books, New York, 2008, pp. 41–45 and David Litaker et al., pp. 30–34.
- 23 Benoit B. Mandelbrot, *Fractals: Form, Chance, and Dimension*, W.H. Freeman, New York, 1977, pp. 1–25 and Benoit B. Mandelbrot, *The Fractal Geometry of Nature*, W.H. Freeman & Company, San Francisco, 1982, pp. 1–24.
- 24 Moonsoo Shin et al., “Conflict Detection and Resolution for Goal Formation in the Fractal Manufacturing System,” *International Journal of Production Research*,” Vol. 44, Issue 3, 2006, pp. 447–465.
- 25 Haimes and Weiner, pp. 200–222.
- 26 Piiparinen, pp. 425–452.
- 27 Andrea Strimling Yodsampa, “Coordinating for Results: Lessons from a Case Study of Interagency Coordination in Afghanistan,” IBM Center for the Business of Government, Washington, DC, 2013, p. 9.
- 28 Haimes and Weiner, p. 204.