The Organizing Pattern of Interaction: A Knowledge Centric Approach

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Abstract

The organizing pattern of interaction moves from less to more understanding about the relationships that exist between concepts. The current view of organizing activities is primarily a data-centric view. Organizing is not an end in itself but is an enabler of follow-on activities. This paper espouses a knowledge-centric view of organizing that broadens the conceptual understanding of Organizing. Referent research disciplines in knowledge representation and knowledge management are used to examine the basic definition and role of conceptual organization from a philosophical and theoretical perspective. A case study of a collaborative research project to develop an ontological model of the social process and its use in a large scale collaborative engineering project is described. This research concludes that organizational schemas operate as both means and ends in collaboration engineering. Measures of efficiency are data-centric and examine organizing schemas as means. Measures of effectiveness are knowledge-centric and examine organizing schemas as ends.

1. Introduction

Collaboration engineering seeks to understand and design repeatable processes that enable sustained GSS use in organizations. Briggs, de Vreed, and Nunamaker[9] propose ThinkLets as discrete facilitation units that integrate tools, script and configuration options as a basis for building repeatable facilitation processes. These basic building blocks implement patterns of interaction that are combined to form mission critical collaboration tasks. Facilitators can use these patterns to design processes and train practitioners in their implementation. Several patterns of interaction have been identified including divergence, convergence, organizing, evaluating, and consensus building. The existing literature in GSS has primarily focused on divergence tasks with little emphasis placed on other patterns [9].

The organizing pattern of interaction in collaboration engineering is defined as moving from less to more understanding about the relationships that exist between concepts. Typically this pattern of interaction is seen as never an end in itself but is always used to enable follow-on activities such as more divergence and elaboration of concepts [8,9].

Current research is concerned with measuring the efficiency and effectiveness of organizing ThinkLets [8,9]. Researchers have identified several issues pertinent to the creation of appropriate metrics. The purpose of organizing, process of organizing, validity of organizing schema, structure of the results, and interaction with the other patterns of interaction potentially require different metrics to be devised. An exploration of these issues is needed as a prelude to devising organizing metrics [8].

These issues raise several questions about the organizing pattern that warrant investigation:

1. *Is the purpose of organizing activity primarily an intermediate step that always enables the next activity, or is it an end in itself?*
2. *What are the basic approaches to organizing?*
3. *Is there a broader relationship between the organizing pattern of interaction and group cognition processes?*
4. *How does the organizing pattern support or interact with other patterns of interaction such as divergence, convergence, consensus building, and evaluating?*
5. *What impact will more complex organizational schemes have on the cognitive load experienced by practitioners and participants?*
6. *What metrics can be used to evaluate the efficiency and effectiveness of organizing?*

Regarding question number one, this paper argues that the current concept of organizing is data centric. While necessary, this perspective is too restrictive, stresses the utilitarian aspect of organizing activities, and will lead primarily to measures of efficiency. Organizing in this view primarily categorizes divergent data from previous brainstorming steps and is seen only as an efficient enabler of the next step. A

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knowledge centric viewpoint, on the other-hand, sees organizing as an end in itself in terms of processing. This focuses attention on the cognitive aspects of organizing and allows for a different perspective in relation to the other patterns of interaction, cognitive load experienced by participants, and the overall effectiveness of the process of facilitation.

The perspective of Knowledge Representation is used to examine these questions. It suggests that conceptual organization is a critical dimension of organizational knowledge and collaborative action. Conceptual organization indeed facilitates further elaboration and divergence of ideas but is also an end in itself as the organizational schemes that are developed represent organizational knowledge. Organizational knowledge is shared knowledge that is a necessary element of organizational collaboration and action.

This paper explores these questions in the context of referent disciplines and provides a philosophical and conceptual foundation for this pattern of interaction using referent disciplines in knowledge representation, knowledge management, and philosophical inquiry. After that a case study in collaboration is presented in which a research project in knowledge engineering provides a key conceptual model for a large scale engineered collaboration event. The paper then discusses the implications of this case for collaboration engineering and concludes with future research directions.

2. Knowledge Representation and the Structure of Organizing

> Measurement of the organizing pattern is dependent on the structure of the results. The deliverable of an organizing-activity may have one of several structures:
> - List
> - Ordered list
> - Tree
> - Network [8]

Knowledge representation is a new field of research that explores the form and structure of representations of knowledge. It draws from a number of referent disciplines in knowledge engineering and artificial intelligence for its computational characteristics and has deep philosophical roots in logic, epistemology, and ontology. Several classical philosophical models in knowledge representation and knowledge management are foundational in understanding theory and application of the organizing pattern of interaction in collaboration engineering.

One of the benchmark works in the field is Knowledge Representation: Logical, Philosophical, and Computational Foundations by John F. Sowa [27]. Sowa describes the philosophical antecedents of current knowledge engineering efforts in artificial intelligence research. This work is an important bridge between classical philosophical epistemology and current knowledge engineering tasks.

Logic forms the basis of much early work in AI. Logic has its foundations in the epistemology of Plato [23] and his student Aristotle [6]. Socratic reasoning through systematic dialectical inquiry of basic truths led to the development of a philosophical understanding of the nature of knowledge and then a practical vocabulary for representing knowledge. Terms we use today like *category, metaphor, hypothesis, quality, quantity, genus, species, noun, verb, subject, and predicate* are coined words borrowed from either Greek or Latin by Aristotle to describe elements of knowledge representation. Interestingly in collaboration engineering we mainly use *category* as a primary organizing schema. Aristotle developed logic as a mechanism for reasoning about knowledge. While logic and logic systems form much of the legacy work in AI, the rigor of symbolic logic and its computational forms is now only one of the tools used in knowledge management systems. Of more recent interest is Ontology [27].

Ontology as a field of philosophical inquiry has been concerned with describing "what is" Ontological categories are classically defined and comprise much of the work of ancient philosophy and the work of Heraclitus [16], Plato [23], and Aristotle [6]. Later work by Kant [21], Hegel [14], Peirce [22], Husserl [19], Whitehead [30], and Heidegger [15] built on the earlier work of the ancients to develop top-level categories that form the basis of modern ontological systems. This interest in top-level categories that start with everything that is and work downward with more specificity is the opposite of current knowledge engineering approaches that work from the bottom up. Knowledge systems are built from specific databases and are concerned with micro-worlds in which all the specifics are known and their relationships are explicitly stated. AI works best when problem domains are strictly defined and delimited [17]. Both top-down approaches from

classically defined categories, characterized as the Platonic approach, and bottom up approaches, characterized as Aristotelian, are used in building ontological knowledge structures. We will examine such a structure used in a large scale collaboration engineering project later in the paper.

The principles of knowledge representation Davis, Schrobe, and Szolovits [11] summarize its role in AI but also can serve as a guide to organization of concepts for collaboration. A knowledge representation is:

1. A surrogate. Model building as a basis of problem solving is a common task in both AI and collaborative work. Surrogate models enable computational support of decision making tasks.
2. A set of ontological commitments. Determining what exists in the problem domain provides a conceptual framework that helps organize and contextualize diverse ideas into coherent relationships. In the second part of this paper we will explore an ontological framework for the social process.
3. A fragmentary theory of intelligent reasoning. Organization of conceptual entities represents a *theory* of the problem domain. Such theoretical models are powerful predictors of behavioral dynamics and interactions. Theories are grounded in the problem domain and are summaries of analytical thinking and intelligent reasoning. Theoretical models can also be the basis of further computational modeling and simulation.
4. A medium for efficient computation. Collaboration engineering involves both facilitation practice and computational support. More powerful collaboration tools utilizing AI techniques based on organizational patterns and schemes which can be easily translated into computational models need to be developed.
5. A medium of human expression. Knowledge representation plays a bridging role between the reasoning done by domain experts and systems engineers who build computational versions for exploration of the problem domain and solution set. A critical outcome of engineered collaborations would be representations that can efficiently be converted into computational models that are realistically representational.

These principles provide an answer to the questions of what an organizing schema is and the potential role that it can play in collaboration beyond just enabling further elaboration and divergence. They also raise the possibility of a further role that AI processing can play in providing innovative support for collaboration support tools. New technological support and facilitation scripts can be developed to enable successful collaboration.

Current research in systems thinking[4,25] and cognitive modeling[13] is highly focused on model building techniques[3,18] especially for mission critical tasks such as strategic thinking[2], policy analysis[12] and long term planning[10]. These collaborative model building systems are GSS systems specifically adapted to ease the cognitive load in considering the complex dynamics of social situations [25]. This field of research is rich in organizing schemes and methods and researchers are highly cognizant of the importance of the role that tools, scripts, and configuration play in collaboration design [5].

Knowledge representation gives insight into the structure of explicit knowledge and of its role in group cognition. Knowledge management (KM) explores the process of knowledge creation and has insight into the construction of explicit knowledge constructs or representations. The primary dichotomy employed in knowledge management is between knowledge that is tacit and knowledge that is explicit. One of the primary goals of knowledge management is to convert tacit knowledge into explicit knowledge so that it can be shared. Collaborative mechanisms and processes are frequently employed for this task of knowledge creation and sharing.

3. Knowledge Management and the Process of Organizing

The process of moving toward a better understanding of relationships among concepts has at least three parts:

- Creating an organizing scheme
- Sorting ideas into the organizing structure
- Validating the sort

There are different methods for devising organizing schemes. e.g.:

- Abstraction
- Cluster-and-name
- Decomposition

It may be that metrics for the merits of the organizing scheme will differ by the approach. [8]

The process of organizing is a key concern of knowledge management. One of the key philosophical bases that is used for KM theory is Michael Polanyi [24] and his book The Tacit Dimension. Polanyi's observation is that "we know more than we can tell." Much of what we know is tacit. We know it but it is not easily articulated. Even so, tacit knowledge has a structure. The structure of tacit knowing and the conversion of tacit to explicit knowledge is a process of divergence and organization of discrete elements of knowing into a comprehensive organizational scheme that Polanyi calls a *gestalt*.

Polanyi identifies two terms of tacit knowing: proximal and distal. The proximal term is the particulars of which we are tacitly aware for the purpose of attending to the distal term. The distal term is the whole on which we are focused. The relationship between the proximal and distal terms of tacit knowing has three aspects: functional, phenomenal, and semantic.

The *functional structure* of tacit knowing is an attending from the proximal term to the distal. For example, in analyzing strategic situations our focus is on the situation itself. It is what we are attending to, thus it is the distal term. The situation is composed of many strategic factors that are the features of the situation. This is analogous to a human physiognomy where the strategic situation is the face and the features of the face are the individual strategic factors. These features are the tacit assumptions that together comprise our understanding of the situation. These assumptions are not articulated and are tacit because we are attending from them to the strategic situation as a whole. The strategic assumptions are initially unarticulated and we know more than we can tell. We may say we understand the strategic situation intuitively without being able to articulate easily our intuition.

Polanyi[24] next discusses the *phenomenal structure* of tacit knowing. For example, when confronted with a strategic situation composed of a particular set of strategic factors we are aware of the proximal strategic factors, from which we are attending, to the strategic situation itself.

These two aspects are combined in a third relationship between the proximal and distal terms, the *semantic structure* of tacit knowing. This occurs when a certain combination of strategic factors is perceived; a characteristic strategic situation is anticipated. This is the intuitive sense or "gut feel" that a manager has for certain strategic situations. The manager is made aware of certain strategic factors, the proximal terms of the situation. She attends from these individual factors to their joint meaning. The manager may not be able to identify the individual factors that create the strategic apprehension; she only knows them in terms of their joint meaning. It is their meaning to which her attention is directed and toward which action is taken.

A fourth aspect is deduced from the other three, the *ontological*, which is the relationship to the reality we have tacit knowledge of. The threefold relationship between the two terms of tacit knowing jointly constitutes an understanding of a comprehensive entity. In our example, the strategic situation is understood as a comprehensive entity which is jointly constituted by the individual strategic factors and their perceived meaning in a composite whole. The manager perceives strategic factors that together constitute a characteristic strategic situation which is a reality perceived as a comprehensive whole. This perception represents the existential learning of the individual gained through interaction with the strategic environment.

Tacit knowledge is also an adaptive structure that incorporates new ontological facts into its internal representational structure through the process of indwelling. In indwelling, particulars are integrated into comprehensive entities through interiorization. Instead of focusing on external particulars as comprehensive entities in themselves, we make them function as the proximal terms of tacit knowing. The particulars are integrated and we dwell in them (attended from them) and attend to the comprehensive entity that they jointly represent. An awareness of a new strategic factor is thus appropriated and internalized in the perception of strategic situations. The new factor becomes part of our proximal assumptions and we perceive it only in terms of its relationship to the whole. These new particulars thus constitute information in that there is a change to the structure of our tacit knowledge.

This has implications for collaboration engineering in that a data-centric focus on the particulars (divergence activities) can destroy our understanding of complex situations. For example, traditional strategic planning focuses on an understanding of the particulars through list making. The interactions that constitute the whole are lost unless explicitly reintegrated. Endless decomposition and analysis destroys the

meaning and understanding of the whole. This is the advantage of well constructed scenarios. They are an integration of separate factors into integrated patterns that put particulars into context. Polanyi calls the integration a ***gestalt***. This is a broader conception than the one used by Gestalt psychology where it is strictly related to perception which links the biological function of perceiving with higher forms of knowing.

Organizational learning can incorporate new insights gained from experience through rational learning processes that allow individuals to internalize new particulars through explicit reintegration. Explicit processes (like causal mapping [1,10]) that follow the structure of tacit knowledge are successful because they are consistent with the way humans gain knowledge and understanding. The design of ThinkLets must follow the tacit structure of knowledge for organizational effectiveness.

The power of a gestalt as an organizational schema is the power to communicate and create shared knowledge and understanding. Research in knowledge management supports the view that shared knowledge is a powerful factor in building consensus and the effectiveness of collaborative efforts.

Kenneth E. Boulding [7] in his seminal work: The Image: Knowledge in Life and Society describes a social knowledge transcript to which the individuals of the society contribute. Each individual has an image (Polanyi *gestalt*) that is a factual multidimensional view of the world. The image has the primary dimensions of space, time, and relationships: causal, personal, and emotional. In addition there are other dimensions of the image: relative certainty/uncertainty, reality/unreality, and the Jungian levels of consciousness, unconsciousness, and sub-consciousness.

While public or subculture images are not strictly images (only individuals truly have images), they have many of the same structures and elements. For example the process of blind reviews in the scientific publication process employs a value image that filters messages and therefore their impact on the public transcript. Even here, though, it is an individual reviewer's reading of the message. The message is processed through a personal value image and is accepted, rejected, or revised in some way. The value image of individual reviewers may or may not be shared with the values of the journal, the value image of the editor, or that of other reviewers. The interplay of values, the construction of the message, and the repetition of the message all have their affect on what shows up on the blackboard.

Knowledge representations are ontological statements about reality that are both individually retained and shared through sociological transcripts like Simon's scientific blackboard. Organizing schemas in collaboration are similar sociological transcripts that represent the grounded theory of the group at hand. They represent the tacit knowledge that the group process has made explicit. To be effectively communicated and shared, they must be seen as a holistic gestalt or image. The next section of the paper describes a case study of a large scale collaboration engineering project and the development and use of a collaboratively constructed gestalt.

5. A Collaborative Knowledge Gestalt: The Social Process

In the fall of 1970 a massive research project was initiated by the Institute of Cultural Affairs (ICA), an international not-for-profit organization concerned with the human factor in world development. Today the organization is based in a series of nationally incorporated organizations and an international umbrella organization: ICA-International. More than 1500 books representing foundational writings in social dynamics were analyzed by a global group of volunteers and staff from the ICA. This diversification or ideation stage represented a massive brainstorm that was then organized into a multidimensional model by a smaller group of researchers. The triangular fractal model, a Sierpinski [26] triangle fractal, systematically organizes the social process dynamic into six levels of increasing detail that organize 364 discrete categories into a single integrated model. In the process of construction, successive levels of detail enabled clarification of the immediate preceding level. This had a ripple effect during the creation of the model such that the elaboration of categories lower down in the model would clarify and stabilize top level categories. In practical terms only the top 3 levels are used as an organizing schema. Figure 1 only shows the first two levels of the schema.

Jon and Maureen Jenkins [20] in their book The Social Process Triangles describe the primarily anthropological basis of the analysis. The top level categories are Economic, Cultural, and Political. The model is

> a series of interlocking triangles which deal abstractly with the process of creating

commonness of social facts which goes on in any culture at any time…The cultural (social) process triangles operate out of a single abstract rational. The foundational, or lower left, pole of any triangle pertains to the drive for self-preservation. In the context of the whole cultural (social) process, this is the process of economic commonality. Within the economic process, this is common resources; within the political process it is order, and so on. The foundational pole of any triangle is that without which the other two processes do not go on….On the lower right hand pole of any triangle is the communal pole which pertains to the relationships of power and decision-making in the midst of any social group…The final dynamic of the cultural process in any triangle is the top pole, the rational dynamic. This is the dynamic which dramatizes the uniquely human in the triangle: it is the spirit which makes participation in the social process worthwhile (p. 13).

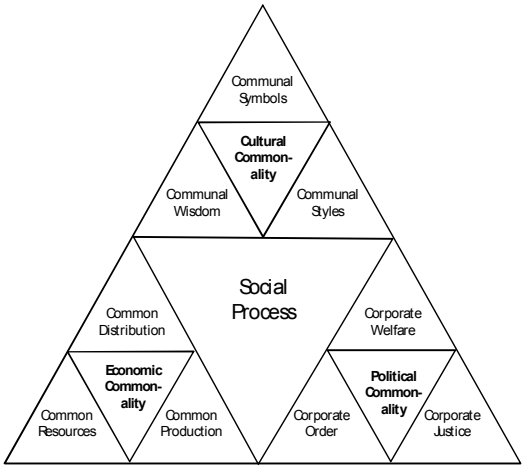

Figure 1

This underlying rational for each triangle is used to systematize the ontology through all six levels. The ontology is a true fractal in that each triangle is composed of three interlocking triangles which follow this self-similar abstract categorization at each successive level in the model, making it a richly dynamic analytical structure. This type of categorization has rich roots in knowledge representation as far back as Aristotle and can be found in other classical philosophical work.

Plato, on the other hand, uses pure abstract categorization. The changeable flow of everyday experience is determined by the unchanging mathematical form or idea that is the true reality. The "Social Process Triangles" thus are a pure form of Platonic modeling with an emphasis on unchangeable form that determines the observable changeable flow of observable social content. Aristotle, however, reversed the emphasis and focused on the observable content: form was an abstraction from the ultimate reality of the observable world. The interplay between these two perspectives describes the essential dialectic that was used to build the construct. As such it represents the interplay of both form and content.

From Aristotle to Peirce ontological categories have been a subject of study. The triadic form of ontology was first developed by Kant's interpretation of classical Greek categories. Kant [2] initially described the triadic pattern categories as dichotomies where the third category arose from the combination of the first two. This was next picked up by Hegel in his dialectic of thesis, antithesis and synthesis, and then by Peirce, Husserl, and finally Whitehead.

This classical approach to categorization is incorporated in a unique representation of sociological knowledge. The resulting model represents a collaborative research project in developing a systematic ontology of the social process which has been utilized as part of the organization's Technology of Participation (TOP) method of facilitation [28]. Since the initial construction of the ontology, the framework has been known as "The Social Process Triangles."

The example is interesting in that it demonstrates the power of an organizing schema to ease cognitive load when considering complex dynamics. This addresses question number five above, which asks: What impact will more complex organizational schemes have on the cognitive load experienced by practitioners and participants? During the United States Bicentennial in 1976, the model was a featured part of five thousand official "Town Meetings" that were held in each county of the United States. The model was a key organizing gestalt that enabled both the efficiency and effectiveness of the event.

6. Large Scale Collaboration Engineering: Town Meeting 76

During the United States Bicentennial in 1976, the ICA engineered a collaborative "Town Meeting" that was officially recognized by the American Revolution Bicentennial Administration [29]. The event was sponsored locally across the approximately 5000 counties that make up the United States. ICA consultants

and staff in 47 cities worked to train thousands of local practitioners to organize and facilitate the meetings following a prescribed facilitation model distributed in workbook form. The process was self documenting and more than 2500 documents remain in the ICA's archives in its Chicago headquarters. The social process triangles were a key part of the facilitation and were used to analyze and organize participant input into challenges facing the country at the community level in 1976.

The meetings were daylong facilitated events that followed a strategic planning format. Normally 100 - 200 people attended the day long meetings. Since the number of trained staff facilitators was too small for such a large scale collaboration activity, local practitioners were trained to lead the meetings following a predefined script that was published in a souvenir workbook. The day was broken into morning and afternoon sessions with a lunch interlude between the two sessions and a closing celebration and presentation of the documented results of the meeting.

The morning session focused on creating challenge statements that documented the present challenges facing the community. Preprinted workbooks with complete instructions were used as the technology in the meetings. They provided a script for facilitation that was common to all 5000 meetings.

In the afternoon a *practical proposals workshop* used the same general approach as the earlier *present challenges workshop*. Participants were divided into four guilds. Three guilds worked on the political, cultural, and economic challenges from the morning sessions. The remaining guild was assigned to create the new community song, story, and logo. Individuals wrote practical responses to each of the challenges assigned to their guilds and evaluated their responses as to which were the most imaginative, practical, and effective suggestions.

In order to standardize the output of the meetings, the exact form of the challenge statements and practical proposals were prescribed with a template. The template elements were outcomes of the facilitation process and included in the final document as a series of challenge statements and practical proposals.

The workshops were highly scripted events. At first, participants were divided into groups of 20; termed guilds. Each guild briefly discussed the community's hopes and dreams for the future and noted them in the workbook. This constituted the community's operating vision. The next step was to individually brainstorm the social issues blocking the realization of the community's vision. Participants were asked to list three economic, three political, and three cultural issues. This follows the rational provided by the first level social process gestalt categories (see Figure 1).

An intermediate convergence ThinkLet was then used to individually star the three most important issues from the list of nine. A wall chart was used to publicly list individual's most important concerns and after starred concerns were listed any other critical concerns that had been missed were added. Issues were tallied by level 1 categories (economic, political, and cultural) and the workbook provided space for 20 issues per category for a total of 60 issues.

After the divergence activity, an organizing activity based on the social process triangle at the third level was used to cluster the issues. An initial convergence ThinkLet was used to reduce the issues list to the 20 most important issues. Individuals were asked to place a check beside the five issues that seemed most important. Then as a group the 20 most important issues were selected and recorded in the workbook again. Participants then were asked to plot these issues on the social process triangle at the lowest level (27 different triangles.) Once the issues were plotted, they were clustered into four to five clusters based on proximity of the issues. Each cluster was given a priority number based on the number of issues in the cluster.

Next the guild was divided into small teams with each team focused on one of the clusters. The cluster issues were copied into the workbook; the cluster number and social arena from the social process triangles were also noted. The team was then asked to list the reasons these issues were not being resolved. This elaboration would produce a new list of social blocks that was again converged to three most important blocks. Once three social blocks were selected, the team was asked to state the one objective social reality that confronted the community in dealing with all the issues. All team responses to this question were recorded in the workbook. This divergence step was converged to a single statement of the underlying contradiction in the next phase of the workshop. Team participants were then asked to list local illustrations of the underlying contradiction.

The final step used a collaborative writing approach to draft challenge statements according

to the formalized statement that would be printed in the community document. Each team was divided into three "units." Each unit was instructed to draft a sentence describing the social blocks, underlying contradiction, and local illustrations based on the team brainstorm of these items. The units then met as a team and selected or combined sentences to draft a single challenge statement and give a title to the challenge. These were recorded on a wall chart for a final plenary session and also produced on a document production form for publication at the end of the meeting.

The practical proposals workshop used the same general approach as the earlier present challenges workshop. Participants were divided into four guilds. Three guilds worked on the political, cultural, and economic challenges from the morning sessions. The remaining guild was assigned to create the new community song, story, and logo. Individuals wrote practical responses to each of the challenges assigned to their guilds and ranked their responses as to which were the most imaginative, practical, and effective suggestions.

In the cross-gestalt, the guild worked together to create groups of practical proposals using a cross-gestalt ThinkLet. In this ThinkLet the primary organizational tool was a matrix. The columns were labeled with the challenge titles and the responses to each challenge were listed in the cells under the title to which they were a response. Then the responses were grouped across the challenges without regard to column affiliation, thus the term cross-gestalt. These grouped responses became the basis for the proposal components that were then reported in the prescribed statement format.

At the end of the meeting, the challenges and proposals were reported out in a plenary session and the group who created the new community song, story, and logo would perform a drama to end the session as the newly published town meeting document was distributed to the participants. This little bit of ceremony at the end of the meeting allowed participants to take away an image (or *gestalt*) of the meeting and the accomplishments of their work.

Researchers have noted that with the organizing pattern there is simultaneity of patterns;

> Sometimes groups generate, evaluate, clarify, or reduce at the same time as they organize. Metrics for organizing-activities must allow for measurement of organizing-process and organizing-outcome even when other patterns also manifest during the activity [8].

This case demonstrates the simultaneity of patterns where there is an interlacing of divergence, evaluation, convergence, organizing and consensus. The overall objective was consensus building between very diverse elements in the community. This was accomplished primarily through the organizing gestalts employed in the facilitation model that integrated diverse ideas into unified gestalts. Convergence and evaluation were used only as intermediate steps to enable organization. Here the measure of effectiveness was the extent to which consensus was built and the proposals were implemented by the community following the meeting. The Social Process Triangle, despite its complexity, was an efficient and effective organizing tool.

7. Conclusions and Further Research

At the beginning of this paper a series of questions was raised about the organizing pattern of interaction:

1. *Is the purpose of organizing activity primarily an intermediate step that always enables the next activity or is it an end in itself?*

This paper has articulated a philosophical foundation for research in this area that is grounded in knowledge representation, epistemology, and knowledge management. It posits that a knowledge centric approach will benefit researchers in understanding the role that organizing schemes play in cognition and in easing cognitive load. The data centric approach is useful for devising metrics of process efficiency, while a knowledge centric approach is useful for devising metrics of effectiveness. The purpose of organizing is both a means and an end.

2. *What are the basic approaches to organizing?*

Conceptual organization in collaboration is about building grounded theory that becomes an ontological statement representative of a group's tacit knowledge. The process of conceptual organization is the construction of explicit images or gestalts that are social constructions from individual perspectives. These perspectives are swept into a larger construct that can become the basis for further elaboration and divergence but must ultimately be reconstituted into a new gestalt or the group knowledge is effectively destroyed. This group knowledge is contained in

a social transcript or blackboard that is an explicit social knowledge construct.

3. *Is there a broader relationship between the organizing pattern of interaction and group cognition processes?*

The field of knowledge management can help provide insight into question three and also be a source of metrics for gauging the effectiveness of organizing techniques. Further research is needed to identify metrics that relate organizational learning objectives to organizing approaches.

4. *How does the organizing pattern support or interact with other patterns of interaction such as divergence, convergence, consensus building, and evaluating?*

From a knowledge centric view, organizing provides context and purpose to divergence and evaluating activities. When it is effective, it enables consensus by integrating diverse points of view into a common cognitive framework. Convergence can be enabled through organizing gestalts that comprehensively integrate diverse ideas into organizing frameworks.

5. *What impact will more complex organizational schemes have on the cognitive load experienced by practitioners and participants?*

An example was given of a collaborative research project that focused on the creation of an explicit ontology of the social process. The ontology was a gestalt of a massive literature review accomplished through a collaborative research effort. This ontology was used as a primary organizing framework and image in a series of meetings that were held in every county in the United States. Roughly half of the meetings (2500) produced documents that were later preserved in the institutional archives.

Anecdotally some of the 5000 meetings were too small to produce adequate documentation, documentation was never forwarded to the institution, or documents were lost. Still the remaining documents provide evidence of the efficacy of an engineered collaboration on a large scale. The social arena information plotted by participants of the meetings allowed for a systematic cluster analysis of challenges listed by communities. Challenges and proposals from the documents were used to validate findings of a research assembly in the summer of 1971 that identified specific social arenas within the social process triangles that were critical change points in society at the time. This data has never been statistically analyzed and can provide answers to current questions on measurement in the organizing pattern of interaction. The author is currently working with the ICA to preserve and digitize the archive to provide better accessibility for research in collaboration engineering.

6. *What metrics can be used to evaluate the efficiency and effectiveness of organizing?*

This paper gives a basis for looking at metrics of both the efficiency and the effectiveness of the organizing pattern. Researchers [8] have identified the following potential methods of measurement. They can be organized into measures of effectiveness and measures of efficiency:

Measures of effectiveness

- Internal consistency of the organized-deliverable
- Degree of understanding of the organized deliverable by people who use it for the follow-on step
- Producing an organized deliverable
- Consensus on goodness-of-deliverable
- Thoroughness of deliverable (breadth, depth)
- Perceived value/utility
- Degree to which concepts fit the categories in which they are placed

Measures of efficiency

- Time on task
  - To build the organized deliverable
  - To understand the organized deliverable after the fact.
- Degree to which organized-deliverable makes the next step better, faster, easier

The identified measures are primarily measures of effectiveness and deal with cognition. This paper makes the case that a knowledge centric approach utilizing referent fields of knowledge representation, knowledge management, systems thinking, and cognitive mapping can provide useful metrics for measuring the effectiveness of organizing schemes. This provides researchers with a rich source of established measures and instrumentation for devising organizing metrics.

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