Combinatorial Inquiries into Knowledge Federation and Journalism: Toward Improving Effectiveness of Collective Action

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Abstract. How can knowledge federation and journalism contribute to improving the effectiveness of collective actions? This is the core question framing an exploration that introduces a combinatorial approach toward developing systemic understandings of complex challenges. These understandings can only be guided by collectively seeking answers to questions we ask. The hopeful outcomes of such understandings are more effective collective actions by implementing more coherent strategies.

Keywords: Combinatorial Inquiry, Combinatorial Reduction, Combinatorial Reconstruction, Co-Operative Inquiry, collective action, decision-making, collective intelligence, knowledge federation, sensemaking, data quality, journalism.

1 Introduction

This paper explores the potential relationships between knowledge federation and journalism, through an emerging method of combinatorial inquiry. The method provides a systems approach for discovering relationships among multiple subjects of inquiry, by focusing on the direct relationship between any two subjects. This exploration begins with an attempt to determine the role of knowledge federation in raising collective intelligence, and the role of journalism in society. As one thread connecting their roles, both journalism and knowledge federation contribute toward an overarching goal of improving the effectiveness of collective action.

For framing the role of knowledge federation, it is initially conceptualized as the real-time joining together of disparate knowledge sources for the task-at-hand, with each source retaining its independence. Although knowledge federation may subsequently influence each source, this happens through mutual agreements from within the source. Integrally linked to knowledge federation and collective intelligence are collective sensemaking and data quality. Together, the overall goal is improved decision-making, resulting in more effective collective action.

As the point of reference for the role of journalism in society, this inquiry begins with the elements of journalism, as defined in the book of that name by Bill Kovach and Tom Rosenstiel [1]. In identifying nine core principles of journalism, Kovach and Rosenstiel intimately link journalism as the source for engaging and informing the citizenry of each nation, opening up the possibility for sustainable democracies, as "the primary purpose for journalism is to provide citizens with the information they need to be free and self-governing."[1].

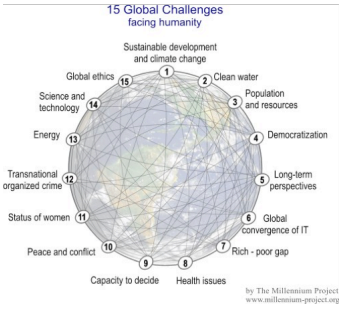
2 Combinatorial Inquiry

The mathematical foundations for combinatorial inquiry are four methods that enable a structured approach for developing a greater understanding of complex systems. These methods are combinatorial reduction, combinatorial reconstruction, qualitative combinatorial analysis, and qualitative combinatorial modeling.

The methodological foundations for combinatorial inquiry research at the component-pair level are the principles of co-operative inquiry, as developed by John Heron and Peter Reason. The core principle of co-operative inquiry is that research is conducted 'with people' rather than 'on people'. While these co-operative principles as conceived apply to people conducting research, they also provide profound insights for establishing and maintaining integrity of relationships among knowledge domains.

2.1 Combinatorial Reduction & Combinatorial Reconstruction

When modeling a system as a fully connected N-node network, the traditional reductionist approach focuses on each node separately as the base unit of consideration (this Millennium Project Global Challenges diagram depicts a fully connected 15-node network). While any system must initially be defined by conceptions of these individual nodes, the combinatorial approach presented here complements this traditional reduction process at two levels. First, the distinction made here is that combinatorial reduction makes the base unit for study a pair of nodes and the line connecting them, representing the one:one relationship between them, with this base unit referred to as a component-pair. Combinatorial reconstruction then builds upon these relationships by identifying subsystems where each subsystem has each node represented once and



only once, and all component-pairs are represented once and only once among all of the subsystems. This allows each subsystem to represent a perspective of the whole system, collectively informing a more robust understanding.

2.2 Qualitative Combinatorial Analysis and Modeling

In perceiving systems as fully-connected networks, the quantitative scale has been well established, the binomial coefficients more commonly known and understood by Pascal's Triangle, determining the number of possible combinations. To complement this understanding, the primary combinatorial inquiry being proposed here includes a conjecture that combinatorial theory also offers a way to quantify the strategic importance of these relationships, based on the corresponding power series of 2. This conception develops a system for applying weighting factors: a value of 1 to the sum of all components in the system, 2 to the sum of all pairs of components, 4 to all triples of components, generally 2^{i-1} to the subgroup of i components, so that overall sum is 2^N-1 for the N-node network (as with binomial coefficients, the 1 represents the external environment of the closed system). To all of these terms, the normalizing constant becomes $1/2^N$.

This conjecture can serve as the basis for a combinatorial modeling process, where factors or activities can be assigned these weighting factors. The baseline assumption for this modeling approach would be that all factors (nodes) are given equal importance, as the means for an objective reference point for evaluating results. This model can then be adjusted through any of our traditional approaches, such as statistical analysis, fuzzy neural networks, and subjective rankings of voting or Likert scale surveys.

2.3 Co-Operative Inquiry

In essence, combinatorial inquiry provides the means for organizing and integrating co-operative inquiries. Co-operative inquiry is conducted in a cycle alternating between reflection and action: each person is co-subject in the action phases and co-researcher in the reflective phases. The initial reflection phase is comprised of the entire group as it forms and collectively defines the nodes of the complex system that is their subject of inquiry. In the first action phase, subgroups focus on a component-pair, to further co-develop their initial understanding and co-determine their course of action, through direct dialogue. This informs the second action phase, in which each subgroup fully engages in the inquiry at individual and/or collaborative levels. At an appropriate interval specified by the group in phase 1, the whole group gathers to share their experiences, their courses of action, and reconsider the inquiry.

Subsequent cycles are structured by combinatorial reconstruction, enabling remaining component-pairs to be the subject of an inquiry during each cycle, until each component-pair has been a subject of inquiry, once and only once. This construct is shown in the table below for a system of six components, where rows represent subsystems. For fully implementing the co-operative inquiry method, a system of six components is the minimal level of inquiry, as there need to be five to eight cycles.

In guiding these cycles, co-operative inquiry serves as a comprehensive multi-dimensional framework that provides context for understanding and conducting participatory research, and has profound implications for knowledge federation and journalism. Of the many dimensions, one most pertinent to combinatorial inquiry is a distinction Heron makes between Apollonian or Dionysian inquiries. The application of combinatorial principles to co-operative inquiry can be seen from one perspective as a pure Apollonian inquiry, although another perspective is that combinatorial reconstruction could provide an infrastructure (the framework of the cathedral), while each inquiry of a component-pair could be Dionysian in nature (a bazaar within the cathedral). As defined by Heron: "The Apollonian inquiry takes a more rational, linear, systematic, controlling and explicit approach to the process between reflection and action."[1] In contrast, "The Dionysian inquiry takes a more imaginal, expressive, spiraling, diffuse, impromptu and tacit approach to the interplay between making sense and action."[1]

3 Our First Combinatorial Inquiries

The comprehensiveness of the foundational co-operative inquiry almost requires a bootstrapping approach, where prospective co-operative inquirers employ the method to learn about how to employ the method. Heron himself identifies this possibility, "A group may exist, or form, that chooses to be entirely self-initiating, and pull itself up by its own bootstraps into the practice of co-operative inquiry". [1]

As just noted, the primary combinatorial inquiry needed is an introspective inquiry to define the method itself, informed by co-operative inquiry and the bootstrapping strategy developed and implemented by Douglas Engelbart. This bootstrapping strategy, combined with other aspects of Engelbart's work, forms a foundation for an inquiry into collective intelligence. This second proposed inquiry identifies collective intelligence and knowledge federation within a Collective Action system. While the scope of the second inquiry is on the intellectual foundations for conducting more effective collective action, this Collective Action system also requires participatory foundations, of which journalism plays a central role.

3.1 What is the first Combinatorial Inquiry to Conduct?

A core conclusion Douglas Engelbart make in Augmenting Human Intellect, stems from asking the similar question, 'Whom to augment first?' [2]. His conclusion: the computer scientists who are developing the tools and methods for developing augmentation tools and methods. This conclusion serves as the practical implementation of bootstrapping, and applying this to our question leads to the conclusion that a combinatorial inquiry of combinatorial inquiry is in order.

3.2 What are the Foundations for Collective Action?

This proposed inquiry identifies six components for a Collective Action framework: in addition to *collective intelligence* and *knowledge federation*, two more components are *collective sensemaking* and *data quality*. Together, these four serve a purpose for more informed *decision-making*, which hopefully result in more effective collective action. As all collective action can be considered political in the larger sense, the sixth component is *journalism*, whose principles shape the nature of political discourse. As Kovach and Rosenstiel identify in their book on the elements of journalism, "people have an intrinsic need – an instinct – to know what is occurring beyond their direct experience" [2] Furthermore, "the function that news plays in the lives of people… [defines that] the primary purpose of journalism is to provide citizens with the information they need to be free and self-governing [2]

This overall framework cultivates a mindset to being open and receptive to new ideas, while respecting processes for verification and validation. This mindset is embodied in the principles of co-operative inquiry.

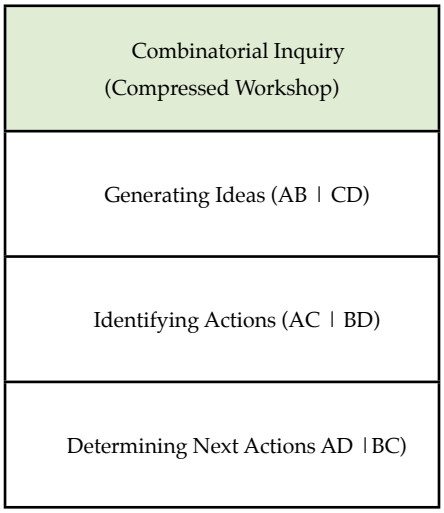
4 Combinatorial Inquiries in Action

How can we leverage combinatorial principles to get started? One response to this question is the design of events, with the following scenario of an extremely streamlined workshop.

4. 1 Designing Workshops and Conferences

At a most immediate level, combinatorial inquiry can be the basis for designing workshops and even entire conferences. The scope and depth would depend on the time available, with the following scenario describing one extremely compressed variation, and would not constitute a co-operative inquiry in itself. This scenario focuses on voting, but there could be additional intervening conversations between

rounds, time permitting, with an indeterminate number of other variations generating from collective creativity.



The workshop begins with an introductory session, where the group co-defines a topic. There would then be three cycles of inquiry: generating ideas; identifying actions; and determining next actions. The group would be split into four subgroups (with distinct pairs of two subgroups collaborating for each cycle).

For the first round, each subgroup generates ideas. The paired subgroups would review each other's ideas and vote (A voting on B's ideas, and vice versa, while C would be voting on D's ideas, and vice versa). After reviewing, the subgroups would vote on different subgroups (A on C's, C on A's, B on D's, D on B's). For voting, unique labels would be used, so that future analysis could explore how each idea was perceived through the conversations.

For the second round, different subgroups (AC and BD) would collaborate to identify actions for implementing the ideas just generated. These paired subgroups would vote on the other's actions: AC on BD's, while BD on AC's.

For the third round, the remaining pairings (AD and BC) would collaborate to generate next actions, based on their conversations in this round. They would not just be determining strategic importance of actions identified in round two, but generating their own language and set of next actions. The pairs would then vote on each other's (AD on BC's, and BC on AD's).

During the concluding conversation about next actions, people would self-select for implementing one or more of these actions. All of these votes would become the basis for one or more online forums, using an idea generation (ideation) environment, which can then be opened for public participation as appropriate.

4.2 Undesigning Workshops and Conferences

While the ways of forming groups are determined in the above scenario, other methods which are more open can be incorporated within the framework. One such method is Open Space Technology, developed by Harrison Owen. He's identified Four Principles and One Law that appear to explain its success:

1) Whoever comes is the right people;
2) Whatever happens is the only thing that could have;

3) Whenever it starts is the right time; and
4) When it's over it's over.

The law is the so called Law of Two Feet, which states simply, if at any time you find yourself in any situation where you are neither learning nor contributing -- use your two feet move somewhere more to your liking. [3]

4.3 Globalizing Local Collective Actions

These principles and law provide the underlying philosophy for what are being termed as unconferences. [4] The results from a workshop such as the one outlined above can be used to 'seed' an online idea forum, enabling the community or public at large to vote and take initiative. This leads to a proposed Second Law: If there's an idea you like, vote for it, comment on it, make it happen!

4.4 Localizing Global Collective Actions

This process can be reversed, as a means to 'make it happen'. A local group could develop an implementation strategy through a workshop as described above, serving as a test case.

5 Conclusions

Combinatorial Inquiry is an emerging open framework which enables the foundational co-operative inquiry method to be conducted in a scalable manner, and will evolve to integrate other personal and organizational development methods. By initially minimizing overlap among the subject of co-operative inquiries through a process of combinatorial reduction, it maximizes the potential for equity of influence among subject domains.

On the surface level, the principles of co-operative inquiry and combinatorial reduction/reconstruction imply a paradox, as they are both intended to foster self-organization, yet seem to be imposing an orthodox set of behaviors and overly prescriptive assignments to groups, respectively. However, at a deeper level, the more adherent groups are to the principles, the greater the opportunities for freedom and self-organizing. As desired, the combinatorial methods can provide the full spectrum. First, for each inquiry into each component-pair, any portion or approach of co-operative inquiry can be applied. Second, from complete self-organizing the reconstruction among component-pairs, to a structured combinatorial reconstruction

enabling a rigorous scientific process generating mutually independent perspectives of the whole system.

However, this is just one of the four theoretical outcomes, where actual outcomes of combinatorial inquiries will most likely be some hybrid of these constructs:

Outcomes of Combinatorial Inquiries	Combinatorial Reconstruction	Self-Organizing
Dionysian Inquiries	Constructing a systems perspective through connecting Dionysian inquiries into component-pairs	An emerging systems perspective through freely connecting Dionysian inquiries into component-pairs
Apollonian Inquiries	Establishing mutually independent system perspectives in a scientifically rigorous manner	Evolving a systems perspective by building connections among Apollonian inquiries into component-pairs

The challenge for our Knowledge Federation community will be how the artifacts of these inquiries can be brought together to provide the background knowledge to the task-at-hand, resulting in more informed decision-making leading to more effective collective actions to address our challenges.

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