Problem Formulation in Inquiring Organizations: A Multiple Perspectives Approach

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PROBLEM FORMULATION IN INQUIRING ORGANIZATIONS:
A MULTIPLE PERSPECTIVES APPROACH

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Abstract

Adapting Churchman’s (1971) Singerian inquiring systems and Mitroff and Linstone’s unbounded systems thinking (1993), Courtney (2001) proposed a multiple perspectives approach as a new paradigm for decision support systems (DSS). Problems should be formulated from not only a technical perspective but also personal and organizational perspectives. Using the notion of system dynamics (SD), Senge (1990) proposed systems thinking, among his five disciplines, as the most essential discipline of organizational learning. This paper, following Churchman, Mitroff and Linstone, Courtney, and Senge proposes a blending approach to problem formulation and decision modeling in Singerian inquiring organizations. System dynamics is used as the basis for the technical perspective, and a methodology that is developed to integrate the personal and organizational perspectives with the technical one. The main argument of the paper is that for an organization to learn it should consist of individuals whose mental models are updated and refined in concert with the organizational mental model, so that all learn together and work towards creating a shared vision.

Keywords: Inquiring system, problem formulation, systems thinking, mental model, and multiple perspectives

Many recent studies show special interest in building a process into organizational functions such as organizational inquiring and learning (Argyris and Schon, 1978, 1996; Senge, 1990; Courtney et al., 1998). In this paper, learning is defined as “either the addition of information to a participant’s mental model or an increase in the coherence of such a model” (Lane, 1994, p 99). The first part of the definition emphasizes the accumulative aspect of learning, while the second part is concerned about the removal of biases in the assumptions and beliefs behind the model. For an organization to learn, it should consist of individuals whose mental models are updated and refined in concert with the organizational mental model, so that all learn together and work towards creating a shared vision (Senge, 1990).

Courtney et al. (1998) approach learning organizations by adapting Churchman’s five models of inquiring systems (Churchman, 1971). Their inquiring organizations have the ability to learn and the ability to create new knowledge to different degrees. Among these systems, the Singerian inquiring system offers the broadest and the most comprehensive notion of learning (Courtney et al., 1998; Mitroff and Linstone, 1993). The essence of a Singerian inquiring system is the accommodation of multiple perspectives and a “sweeping in” process (Churchman, 1971). New perspectives will be swept into a problem model if the current perspective(s) fail(s) to solve the problem. Mitroff and Linstone (1993) identified the three most typical perspectives in addressing complex problems: T is the Technical Perspective; O is the Organizational or Societal Perspective; and P is the Personal or Individual Perspective. According to Mitroff and Linstone (1993, p98) “each perspective reveals insights about a problem that are not obtainable in principle from the others.” Given three (or more) different and potentially conflicting perspectives on a problem, one inherent concern in using the multiple perspectives concept is the integration of different perspectives.

Problem Formulation in a Singerian Inquiring Organization

Using the multiple perspectives approach to formulate a “messy” or “wicked” problem in a Singerian organization, we need to understand the problem from every possible participant’s personal perspective. Personal perspectives are, however, often ignored
when the problem is formulated from the organizational perspective that emerges from “dominant” perspectives of powerful individuals or groups. From the technical perspective, traditionally a problem is formulated objectively and quantitatively, often disregarding human and organizational factors. So to formulate a messy problem from the multiple perspectives approach, it is critical to minimize the gaps between perspectives. Before discussing how to close these gaps, characteristics of personal, organizational, and technical perspectives are presented.

The Personal (P) Perspective

The P perspective is the “window” through which an individual sees or perceives the world. The P perspective is generally difficult for modelers to develop because everyone is unique in terms of personality, background, and experience, among other things (Courtney, 2001). Each person in the organization sees things differently, and thus generates a distinct perspective. But, P perspectives are often ignored in problem formulation ultimately leading to organizational problems. Churchman believes that social problems happen because of the ignorance of P perspectives (Mitroff and Linstone, 1993). In other words, social problems can only be understood when they go through the process of individualization.

The Organizational (O) Perspective

The organizational perspective is the “window” through which the whole organization as a social entity perceives reality. According to Mitroff and Linstone (1993, p102) “the O perspective reflects the culture and the myths that have helped to mold and bind the organization, group, or society together as a distinct entity in the eyes of its members.” The goal of the O perspective is to maintain the stability of the organization when it takes action (Mitroff and Linstone, 1993). Building the O perspective is essentially “building a shared vision” in which people are bound together around a common identity and sense of destiny whereby they excel and learn (Senge, 1990).

The Technical (T) Perspective

The technical perspective considers the organization as a mechanistic entity, in which man is viewed as a rational, objective, thinking being (Courtney, 2001). Through the T perspective a problem is quantified, reduced or separated, optimized and finally “solved” (Linstone, 1984). Several authors (Axelrod, 1976; Senge and Sterman, 1994) have used the T perspective to surface P and O perspective assumptions, hence improving the communication between the P and O perspectives. To effectively view things from a technical perspective, most authors would suggest systems thinking as a basis (Senge, 1990; Mitroff and Linstone, 1993). Systems thinking refers to seeing things as a whole within a framework that helps us to deal with complexity in a holistic way (Senge, 1990). Many tools such as causal modeling, structural modeling, cognitive mapping, system dynamics, and so forth can be used, to different degrees, as a support for systems thinking.

The O-P Gap

The O-P perspective gap happens when the organization’s O perspective views a problem differently from its members’ P perspectives. Effective organizations are characterized by a strong congruence between the O perspective and their members’ P perspectives (Mitroff and Linstone, 1993). In practice, organizational members may tend not to share the organizational vision due to their holding different mental models, which are built on implicit and likely-to-be-biased assumptions or beliefs. The O-P perspective gap appears because small P perspectives are ignored. The disadvantage of the group consensus process is that “small P perspectives” are often ignored prematurely when conflicting with a “powerful P perspective,” which is likely to become the O perspective. As a result, this O perspective is translated into the individuals’ espoused theories while their theories-in-use remains untouched or unchanged. It is not easy to distinguish between an O and a P perspective because a persuasive individual may impose his or her individual perspective on the entire organization. According to Mitroff and Linstone (1993), P and O perspectives actually reinforce one another or cancel each other; frequently they interact in a dialectic mode. To close the O-P perspective gap, two efforts should be made: every individual needs to learn to build a shared vision and the organizational vision needs to pervade every individual.

The P-T and O-T Gaps

An alternative way to approach the O-P perspective gap is via the T perspective. Instead of directly examining the O-P gap, both the O-T gap and the P-T gap are studied. The P-T gap is the difference between how a person perceives a problem and how the problem can be represented in a scientific language. In a way, the P-T perspective gap is the difference between a participant’s
mental model and a product of a cognitive mapping process. A similar definition can be applied for the O-T perspective gap. It is the difference between how the organization, represented by dynamically interacting groups, perceives the problem and how the problem, as a result of dynamic interactions of group perspectives, is mapped into a model.

Mitroff and Linstone (1993) observed that there is a “gap” between analysis (T focus) and action (O and P focus) and suggested that implementation of a decision consider human perspectives. What typically happens is that when analysts or modelers (representing the T perspective) are asked to formulate a problem, they tend to impose their technical framework on the organization (representing the O perspective) without considering the role of the individuals (representing the P perspective). Failing to incorporate the dynamics of the organizational perspective (causing the O-T gap) and the dynamics of the personal perspectives (causing the P-T gap) into problem formulation is one of the main reasons for the ineffectiveness of management support systems. To be effective, the technical perspective should play the intermediary role in bridging the O-P perspective gap. Organizational knowledge that is dynamically developed from individual knowledge should be effectively distributed to all individuals with the help of appropriate technical tools. There cannot be a perfect tool that can quantitatively capture the richness of human and organizational factors. An approach that combines soft (cognitive mapping and qualitative system dynamics) and hard tools (inquiring systems and system dynamics) can move in the direction of such a capability.

Methodology

System dynamics (Forrester, 1961) is used as the base for developing the T perspective. First, individuals’ mental models, in qualitative forms, are captured, stored, challenged, and improved. Second, group maps and models are built through a complicated process: clustering (individuals’ mental models), quantifying, simulating and interacting. Third, an organizational model is built through the join-synthesis process of groups’ models. All steps are repeated to create a learning effect. Each step is presented in detail below.

Capturing Personal Mental Models

Qualitative models (Vennix, 1996) or cognitive maps (Axelrod, 1976; Eden, 1980; Markoczy and Goldberg, 1995) are used to represent individual mental models (P perspective) for every feasible participant in the organization. Initially, participants are helped to map their mental models, but afterwards they should be encouraged to create and own their own maps. Although this research applies qualitative modeling at the individual level, this is not a constraint. For future development, when individuals’ cognitive and modeling abilities are well developed, the application of quantitative modeling can be extended to the individual level. This extension may require a great deal of training and consulting (at least initially), which is still not a guarantee for the success of the task. Only when modeling, learning and using models become a routine activity is the task easily accomplished. If the extension can be implemented, individuals can test their assumptions with their own models. The result of this stage is a mental model base, which can be considered as the raw material for the process of building group perspective maps and models. Representing, improving and validating individual mental models in forms of a qualitative model or a cognitive map imply tackling the P-T perspective gap.

To avoid the problem of using different terminologies referring to the same thing, an initial concept base including a dictionary of synonyms may be built in advance. It is shared among individuals in the organization and will be updated during mapping and modeling process in a real time manner to avoid incongruence. The concept base is a part of a knowledge base, which store relationships, maps and models. Loosely speaking, the concept and relationship base can be considered a fact net in a Leibnizian inquiring system (Courtney et al., 1998) as it can be considered as a set of elementary axioms.

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1 Organizational knowledge in this context is defined as knowledge that takes an O perspective. For example, the mission, goals, strategic plan and so on are organizational knowledge.

2 Some experts in system dynamics hypothesize that it is not easy to train individuals to express their mental models in quantitative terms. To be a good modeler, normally training is required.

3 A true Leibnizian inquirer is a closed system, which is not applicable to this research.
Building Group Models

First, groups will be formed through clustering similar cognitive maps. To cluster, distances between maps should be measured and compared (Markoczy and Goldberg, 1995). The purpose of clustering is to minimize the differences within groups but maximize the differences between groups. The goal of clustering is to look for similarity and to achieve consensus within groups. The notion of a Lockean inquiring system (Courtney et al., 1998) can be applied here. In a Lockean inquiring system participants based on their observations decide whether they agree with the “labels” assigned to variables and relationships: importance and certainty that are assigned to every assumption. To create a homogenous community, the guarantor for the Lockean inquiring system is consensus.

Although groups tend to be homogeneous, there still exist differences in individual assumptions that will be resolved via within group dialectic debates. According to Mason and Mitroff (1981), a dialectic debate examines a situation systematically from two or more points of views to improve judgment or assumptions by subjecting them to critical evaluation. Within group dialectic is done through plotting an importance and certainty graph. Candidates that are both important and certain become pivotal assumptions while unimportant assumptions are candidates for elimination. Important but uncertain assumptions require careful consideration and may be subject to sensitivity tests.

Second, group maps now will be quantified by assigning each causal relationship in the map a value or a look-up table (Forrester, 1961). Assigning a value (constant) to a relationship indicates that the relationship is linear while a table indicates non-linear. A causal relationship also requires a time delay between the cause and the effect. An unspecified delay may imply an immediate impact between the cause and the effect, which may not be true. When quantification is done, group models can be simulated to create model behaviors (G model behaviors). Group assumptions now can be tested quantitatively by analyzing and evaluating the model behaviors. Past simulation tests including sensitivity tests, assumptions become groups’ critical assumptions. These assumptions will be challenged at the organizational model to become organizational assumptions.

The notion of a Kantian inquiring system (Churchman, 1971; Courtney et al., 1998) may be applied to the quantification of a causal relationship because it is involved with both Leibnizian and Lockean inquiring systems. A causal relationship is a fragment selected from a fact net of the Leibnizian system that seeks the Lockean community’s consensus on assigning a label to the relationship. Consensus on a causal relationship does not mean that the relationship is uniquely true but rather means that a temporary agreement is achieved. Each relationship is subject to multiple interpretations reflecting alternate worldviews of the problem.

Building the Organizational Model

Given a collection of group models, an organizational model can be built through a join-synthesis process. When group maps fall into different domains, the organizational model is built by joining the group maps. An algorithm of merging, or what Lee et al. (1992) called joining, group mental models into a common organizational model, may be devised. The algorithm can actively search for the common knowledge across the maps or models. The commonality is determined on the basis of counting similar patterns (i.e., variables, concepts, and relationships) in terms of statistics or probability. For example, a statistic might be how many people hold the same relationship R. When group maps fall in the same domain, but hold different assumptions, the organizational model is built by synthesizing the group maps through dialectic debates between groups. Again the same assumption-plotting chart as used in within-group dialectic may be applied here. The only caution is that groups’ internal dynamics may prevent groups from deciding whether they agree or disagree (Mason and Mitroff, 1981) with the labels. The join-synthesis process in essence is a combination of the joining and the synthesis process.

The final synthesized organizational model should be already quantified and can be simulated. The organizational model can be stored when created. It can be updated when repeating the building process in the same but much easier manner. The process of building the organizational model from the mental model base contributes actively to problem formulation in Singerian inquiring organizations as it attempts to bridge the O-P perspective gap. The O-P perspective gap can be closed at the moment the organizational model is created; but it will change very soon as both the O and P perspectives are dynamic in nature. Maintaining a minimum gap between the O and P perspectives is an adaptive process, which relies heavily on the updating process. The updating process will start from the organizational model, which will be distributed to the entire organization for participants updating their mental models, and will resume the process of building group models and the organizational model.
Distributing the Organizational Model

The organizational model should be distributed automatically to all individual members in the organization for updating their mental models. The Internet may be the best way to do that. Distributing is a core activity that updates individual mental models and contributes to closing the O-P perspective gap. As the organizational model is received, participants will compare it to their own models, which have been captured in the forms of cognitive maps being stored in the knowledge base. Modifications or revisions of mental models might happen and notes of these modifications are recorded if needed.

Repeating the Process

The O-P perspective gap may be closed only temporarily. As the organizational environment changes, the gap may become widened. To close the gap, every individual must learn and incorporate changes into his or her mental model. Group models will be rebuilt and different clusters may be found. Rebuilding group models and the organizational model is a core activity of the updating process that is aimed at maintaining the closed O-P perspective gap. The organizational model will be updated as the whole building process is repeated until convergence is reached and several scenarios are developed. The loop works continuously on a periodic basis so that the organization can learn. In this way the organizational model is captured through an O perspective in a real-time, dynamic, and updated manner.

Summary and Conclusion

Problem formulation from the multiple perspectives approach poses the need to integrate all three (or more) perspectives (O, P and T) in viewing a problem. When formulating a problem in a Singerian inquiring organization, gaps among the perspectives...
need to be analyzed to propose ways to close them. A methodology using the mixed soft (cognitive mapping or qualitative modeling) and hard (inquiring systems and system dynamics) tools to close these gaps is proposed and described.

Formulating a problem from the multiple perspectives approach implies learning. Individuals learn when their perspectives are developed through the interaction of their elicited mental models and their assumptions and beliefs. The organization learns when its perspective is developed through the synthesis of many current perspectives. Learning also happens when mental models are improved through the interactive process of building group models and obtaining feedback from the organizational model. These capabilities create an organization that may learn.

References

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