Paradox

Systems Thinking at Its Best or at Its Worst?

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February 12, 2007
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1. Introduction

Stevens Institute of Technology has a course titled Systems Thinking (course number SDOE 775). Module 9 of this course includes a discussion of the concept of paradox, which it defines as:

“A paradox is an apparent contradiction; however things are not always as they seem. A Paradox can be explained, but only by seeking wisdom from above; for the systems guy this is to look up and out, not just down and in. Paradoxical thinking is systems thinking at its best.” (Boardman 2006)

This paper proposes to explore this definition as a test of the systems thinking tools and as a validation of this part of the course material.

2. Problem Statement

This statement provides a definition of paradox. This definition makes a strong assertion: “paradoxical thinking is systems thinking at its best.” However, the module does not provide a clear definition of paradoxical thinking. The remainder of the module provides examples of apparent paradoxes, but it does not further define paradoxical thinking or justify, beyond what has already been quoted, the assertion that paradoxical thinking is systems thinking at its best. The module does not provide metrics for best systems thinking either. Thus by the fifth day of the class, when this topic was introduced, the critically thinking student is left wondering whether paradoxical thinking is truly best (i.e., better than Systemigrams, SSM, and other methods), and if it is the best, how does one put it into practice.

3. Methods

This paper proposes exploring the paradox assertion using systems thinking methods; in particular, the assertion will be examined using Systemigrams, soft systems methodology (SSM), critical thinking, and perhaps paradoxical thinking itself. Systemigrams are a natural choice for investigating this assertion since the class materials provide this definition. In fact, this definition can serve as the starting point for investigating the definition and value of paradoxical thinking. Performing this exercise, may help to understand the linkages between paradox, paradoxical thinking, and systems thinking. The course provides several paradox examples. This investigation also uses other examples of paradox. These examples can be examined and compared to the SSM model of paradoxical thinking (as examples of reality) in order to identify differences. If differences exist the feasible and desirable examples can be translated into activities to improve the course.

An underlying assumption in this activity is that systems thinking must be useful. Useful can have many definitions. One definition that is frequently applied to systems thinking methods is that it is useful to stimulate discussion and debate to arrive at a consensus on a problem definition or plan of action. This paper may serve to achieve that function relative to paradoxical thinking. However, this paper also hopes to explore the utility of the systems thinking methods for sharpening thoughts and concepts into actionable (useful) forms. One possible output is an actionable description of paradoxical thinking that can strengthen module 9 in the SDOE 775 class. Alternatively, the investigation may demonstrate that paradoxical thinking is not actionable, but useful in a discussion stimulation context. From a paradoxical thinking
standpoint, the worst outcome would be one in which no clarification or better understanding of the concept is achieved. However, that may provide insight into weaknesses in using soft systems methods for clarifying or sharpening a concept into an actionable form.

4. Research Discussion

The research described in this paper loosely follows the soft systems methods, but it is a blend of the Checkland and Boardman methods rather than following one or the other explicitly. It more closely follows the Boardman version of SSM. However, this effort was done as a solo exercise. In this situation, step 5 is more aligned with the Checkland version in that it is a comparison rather than a dramatization and discussion.

4.1 Problem Structuring (SSM Steps 1 and 2)

The paradox definition quoted in the introduction may be represented in a Systemigram as shown in Figure 1. The Systemigram captures the important ideas in the paragraph, both explicit and implicit (e.g., the person doing the thinking). The yellow elements in the diagram represent the things and actions that appear to be implicit in the statement. The two tone red items represent the key characteristics of paradox. The solid blue bubbles are the constituents in the resolution of the paradox. The two tone blue bubbles are key subjects of this investigation: paradoxical thinking and systems thinking.

![Figure 1: SDOE 775 Paradox Definition Systemigram](image)

This diagram illustrates a few key points that will serve as the foundation for two root definitions. The person is the key element of this paragraph. The person observes the contradiction that is perceived to be a paradox, and the person does the paradoxical thinking. Beyond the person, the key point of interest is that paradox and paradoxical thinking are not
related except indirectly through the person. This separation suggests a possible need for further definition of paradoxical thinking and perhaps a defined relationship to paradox.

4.2 Structured Text and Systemigrams (SSM Steps 3 & 4)

To develop the structured text, this paper starts with root definitions for paradoxical thinking. The starting point for developing these root definitions is the term paradoxical. The definition of paradoxical most pertinent to this discussion, according to Merriam’s Collegiate Dictionary, is “inclined to paradoxes” (1994). This definition and the content of module 9 suggest at least two different root definitions that require development of structured text. This paper will develop two root definitions for paradoxical thinking that will be used throughout the rest of the SSM steps.

Paradoxical Thinking Root definition #1:
Consider the situation where a person observes a contradiction and attempts to resolve it within the constraints of a system boundary. The person is unconscious of the system; therefore, the person’s thinking is constrained by the system boundary. When the contradiction cannot be resolved within the bounds of the system, the person concludes that the problem is irresolvable and declares the contradiction a paradox. Thus paradoxical thinking sees paradoxes as real and irresolvable; it is the antithesis of systems thinking.

This root definition of paradoxical thinking is diagramed in Figure 2. It will serve as the model of this root definition for comparisons.

Figure 2: Root Definition #1 for Paradoxical Thinking
**Paradoxical Thinking Root definition #2:**
Consider the situation where a person observes a contradiction and attempts to resolve it within the constraints of a system boundary. The person is conscious of the system; therefore, the persons can think inside or outside the system boundary. When the contradiction cannot be resolved within the system, the person recognizes the contradiction is a paradox. The person then applies the lessons of Kurt Godel and seeks to find resolution to the contradiction in a larger system definition. Thus paradoxical thinking uses paradoxes as signals indicating a need for expanding boundaries and thinking outside the current system; it is the epitome of systems thinking.

This root definition of paradoxical thinking is diagramed in Figure 3. It will serve as the model of this root definition for comparisons.

![Figure 3: Root Definition #2 for Paradoxical Thinking](image)

### 4.3 Comparisons Using the Models (SSM Step 5)
As previously noted, this effort has been done primarily as a solo effort, so the usefulness of the SSM method for stimulating discussion cannot be evaluated until after this report is released. If this report generates discussion about module 9 and concept of paradoxical thinking, then it will demonstrate this utility. For this section, the comparisons will be used to evaluate the usefulness of SSM for sharpening concepts and evolving them into actionable forms.

#### 4.3.1 Model to Model Comparisons
The first comparison considered in this report is between the models and their corresponding root definitions. The problem defined earlier was recognition of the fact that there were at least two competing definitions of paradoxical thinking. The models that were developed demonstrate two
contradictory assertions – paradoxical thinking is the antithesis of systems thinking and paradoxical thinking is the epitome of systems thinking. Based upon the structured text definitions and Systemigrams developed in Boardman SSM steps 3 and 4, there are two key differences in the models:

- The person’s cognizance of the system
- The relationship between paradoxical thinking and the system boundary

Comparing these two characteristics suggest a relationship between the two items. As the paragraphs are written, the person that is cognizant of the system can apply paradoxical thinking to look to the exterior of the system for resolution. In contrast, the person that is not cognizant of the system believes the paradox to be real (irresolvable) because his thinking is constrained by the boundary that he is unaware exists. Thus, as currently developed, cognizance of the system appears to drive whether paradoxical thinking is the antithesis or epitome of systems thinking.

However, further consideration suggests that this relationship is not necessary. The model comparison suggests that it is possible to recombine components and conceive of a parallel definition in which the person is cognizant of the system, but believes the system boundary to be impermeable and thus the paradox is irresolvable. In this case the paradoxical thinking is still constrained to the system interior and would be the antithesis of systems thinking.

Perhaps less obvious, but maybe of greater interest is a fourth combination possible from recombining these two definitions. The person is not cognizant of the system but his paradoxical thinking makes him cognizant that the paradox must exist inside the boundary of a system. As a result, he consciously strives to expand the scope or boundary within which he searches for resolution to the paradox until the contradiction is solvable.

These two additional combinations suggest that the key characteristic is the relationship between paradoxical thinking and the system boundary. If paradoxical thinking is constrained by the boundary (it is real, fixed, and impermeable), then paradoxical thinking is the antithesis of systems thinking. In contrast, if paradoxical thinking is not constrained by the boundary and uses paradox as a stimulus for expanded thinking, then it epitomizes systems thinking.

4.3.2 Model Comparisons with Examples of Paradox

The bulk of module 9 discusses 6 examples of paradoxes: the boundary paradox, the control paradox, the intelligence paradox, the crowd paradox, the customer paradox, and the performance paradox. In these 6 examples, the general method of resolving the paradox is to assume “it is both” and then explain some methods by which the person can achieve both extremes. Comparing these examples to the root definition models it is interesting to note that the reader is the person experiencing the paradox but no system is implied. This suggests that the person (reader) is either not cognizant of the system or the person is cognizant of a system, but not necessary the system or all possible systems under which this paradox can occur. Yet an answer for resolving the paradox is provided, so there is a distinct difference between these examples and the two models. In fact, the resolution of these examples is like the fourth combination that evolved from model comparison.

Another interesting observation is the way that these example paradoxes do not seek resolution in a haphazard manner; the current models do not provide a structured method for resolving the paradox even when resolution is a product of paradoxical thinking. Instead, the solution in the
six examples uses a single method; upon seeing a paradox, the person assumes that both aspects of the paradox must be simultaneously true and seeks to find ways to make that possible. The positive assertion immediately helps to move the person outside the system boundary without ever being cognizant of it.

In *The World is Flat*, (Friedman 2005) Thomas Friedman offers many paradoxes that are the result of the convergence of 10 political and technological changes. One example is that the flattening simultaneously allows large companies to act small while allowing small companies to act large. Another example is the fact that outsourcing of jobs frequently causes a company to ultimately hire more people both domestically and abroad. In contrast with the examples in the class, comparison of Friedman’s paradoxes with the models reveals a strong correlation to the second root definition model. Friedman is very cognizant of the world views and limited perspectives that support the paradoxical view. As a result, he deliberately leads the reader outside these system boundaries to resolve the paradoxes. Interestingly, just as Godel demonstrated, Friedman often points out that even as the paradoxes are resolved, new problems are generated within this new system.

These examples point to an interesting observation that in one sense is obvious but perhaps circular in its logic. The concept of paradox is in itself paradoxical. All paradoxes are both irresolvable and at the same time eminently solvable. The corresponding question is whether or not the corollary that paradoxical thinking is both the antithesis and epitome of systems thinking true? Answering this question with “it is both” does not seem to be very helpful at first. However, if the concept of “it is both” allows the introduction of the ideas of time dependence, different persons, situational dependence, or paradoxical thinking as a continuum then suddenly paradoxical thinking may also be both the epitome and antithesis of systems thinking.

### 4.4 Identify Changes and Taking Action (SSM Steps 6 & 7)

These comparisons suggest several changes that may be desirable. One possible change is to refine the paragraph in module 9 to more explicitly define what is meant by paradoxical thinking. If the confusion over paradoxical thinking is common, then it is probably desirable and is also an easy (feasible) change.

A second possible change is to leave the paragraph alone in SDOE 775 and develop an advanced systems thinking class that more deeply explores the idea of paradoxical thinking. One exercise in that class might be to develop a definition of paradoxical thinking and tease out unanticipated consequences of that definition through further exercises. Both the desirability and feasibility of this change are not nearly as easy to characterize.

A third change is to go back to steps 3 and 4 and redo the structured text and Systemigram defining paradoxical thinking and incorporate the ideas developed in this document. This activity is very feasible. The desirability is less easily evaluated. It is unclear at this point what further insight might be gained from this exercise. However, if it developed a better definition of paradoxical thinking, it might be incorporated into SDOE 775.

The final possible change that will be discussed in this paper is adding some additional discussion to module 9 that discusses the domain independent principles underlying paradoxical thinking. For example, if the idea of assuming both sides of a paradox are true is a principle, the module could discuss the principle and methods for implementing it. If the domain independent principles can be identified it can be argued that this would be a very desirable change. It would
give future students additional tools and methods (beyond SSM and the conceptagon). However, the feasibility is relatively low right now. The domain independent principles (beyond seeking outside the boundary) are currently unknown or at least not well proven and documented. Additional research is required before this change can be implemented.

The actual act of taking action is beyond the scope of this report’s author. The decision to implement any of the other changes lies with the course owner and teachers.

5. Conclusions

This exercise in using soft systems methods proved to be very useful. The genesis of this report was a vague question of what did it mean to say that paradoxical thinking was systems thinking at its best – particularly if a person saw the paradoxes as real. The act of writing structured text and refining it through model building helped make explicit assumptions in the starting text as well as unrecognized assumptions in the author’s mind. The act of comparing the models to one another and to examples in the world further sharpened both the questions and the answers. Going through the SSM process even identified aspects that could be considered actionable or at least methods of practice that may be considered as examples of paradoxical thinking.

An interesting development in the process was the emergence of one of the conceptagons in this activity. The text was written and the models were built without ever intending to integrate a conceptagon. However, the conceptagon (interior/exterior/boundary) emerged as a critical tool for investigating and understanding paradoxical thinking. This result demonstrated the value of the conceptagon despite the fact that it was not originally intended to be part of the exercise. The systems thinking tools presented in the class proved to be very valuable for sharpening ideas and honing concepts. It is likely that they would only be better if applied in a group setting that allowed more people to wrestle with the structured text and Systemigrams.

6. Future Study

A tangential result of the exercise documented in this report is the identification of areas for potential research. A few of these are:

- What is the time dependence of paradox? Can a paradox be resolved through consideration of time? Is this true for all paradoxes or only a certain category of paradox? If it is limited to a certain category of paradox, what are the defining characteristics of this category?

- What is the spatial dependence of paradox? Can paradoxes be resolved by moving them spatially or geometrically? Is this true for all paradoxes or only a certain category of paradox? If it is limited to a certain category of paradox, what are the defining characteristics of this category?

- Zen Buddhism uses riddles called koans; one famous example is, “what is the sound of 1 hand clapping?” Students of Zen study a koan intensely until the rational, logical mind gives up and there is an intuitive paradigm shift. When this occurs, the student is said to have experienced a satori (mini-enlightenment). This leads to the question: Is there a relationship between the Zen use of Koans and paradoxical thinking? How might these two areas be related? How might lessons learned in one domain be applied to improve the results in the other domain?
• Are there domain independent principles of paradoxical thinking? If so, what are they? If not, are there categories and appropriate methods and principles for these categories?

These four examples represent opportunities to expand the concept of paradoxical thinking. Exploring these ideas might be starting points for graduate student projects. They may also serve, as suggested earlier, as the basis for an advanced systems thinking class.
Works Cited

