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PROBLEMATIQUES: DEVELOPMENT, USE, MISUSE, AND INTERPRETATION

John N. Warfield
Institute for Advanced Study in the Integrative Sciences
George Mason University
Fairfax, Virginia 22030
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A particular type of structural model has proved to be of very great utility in analyzing complex issues and, subsequently, in resolving them. This type is called a "problematique". In spite of the great utility of this type of structure, it has been found empirically that there is substantial confusion associated with their development, use, and interpretation. This document is written in response to what has been learned in observing numerous potential applications of problematiques, with the aim of helping to assure that (a) people will not misinterpret and/or misuse these structures ("first do no harm") and (b) people will know how to get the maximum utility from them ("then, do good").

In pursuit of these dual goals, this paper is organized to answer, in succession, the following questions:

- (1) What is a problematique?
- (2) How is a problematique produced?
- (3) Why is it important to produce it in that way?
- (4) What does a problematique look like?
- (5) Why do people have some problems in interpreting a problematique?
- (6) How can the information in a problematique be used?

What is a Problematique?

A problematique is a structural model, a graphic portrait, that shows how a collection (set) of problems interact in a certain way to create a problem situation that is much larger in scope than that produced by any single member of the set.

The kind of interaction that is portrayed on the problematique is one of showing how each individual problem may contribute to making certain other problems worse. For a

relatively simple problematique in which there are only two problems, say A and B, there are only three theoretically possible types of problematique:

- (1) The No-Way Type, i.e., the simple one in which neither problem makes the other problem in the set any more severe. This could be indicated by the two statements:

A does not aggravate B

B does not aggravate A

The graphic representation of this type would show the two problems A and B without any connecting arrows.

- (2) The One-Way Type, i.e., the type of 2-element problematique in which one of the problems, say A, makes B worse; but B does not make A worse. The graphic representation can be simply two boxes, one containing A and the other containing B, with an arrow drawn from A to B showing that A aggravates B but no arrow drawn from B to A showing that B is not thought to aggravate A.

- (3) The Both-Way Type, i.e., the type of 2-element problematique in which each problem makes the other worse. The graphic representation of this could be two boxes, one containing A and the other containing B, with one arrow drawn from A to B and another arrow drawn from B to A, showing that each aggravates the other.

Most problematiques contain 10 or more problems and many contain thirty or more. The number of theoretically possible structural types then is dramatically enlarged, which is one of the reasons the interpretation becomes much more challenging than for the simple 2-element problematiques where there are only three types of structure.

Aggravation Propagates. It is important, in interpreting, to recognize that aggravation propagates. If A aggravates B, and if B aggravates C, and if C aggravates D, and if D aggravates E, then the impact of A may be much greater than might first appear, because its aggravation propagates all the way down the line, making B, C, D, and E respectively worse than would otherwise be the case. One may then speak of aggravation pathways and the length of such pathways is a preliminary measure of the potential influence of a given problem on the subset of problems that it aggravates. If aggravation did not propagate, then the significance of the problematique would be negligible, and no attention would be given to that type of structure.

How is a Problematique Produced?

GROUP

A problematique is produced by assembling a group of knowledgeable people and facilitating their interaction with the aid of certain methodologies and support staff and technology.

GENERATE INITIAL SET

First the participants are asked to generate the set of problems to become the base for the problematique and to clarify each individual problem through group dialog.

PARTITION BY PERCEIVED IMPORTANCE

If the set is very large, the group may be asked to identify those members believed to be more important.

PUT SET IN COMPUTER

In any case, after clarification is achieved, the set to be structured is placed in a computer file, and the computer begins to present questions to the group designed to draw out the interrelationships among the problems. The process is called Interpretive Structural Modeling (ISM). At the conclusion of its use, the computer will print out in aggregated form the structural information supplied in primitive form by the group members as they responded to the computer-generated questions.

COLLECT AGGREGATION INFO

PRINT & DISPLAY

From the printout, the structure may be created on a large wall display, as well as on a photocopy printout, where it can be examined for accuracy and amended if necessary.

Why is it Important to Produce it in That Way?

It is important to produce the problematique in that way for several reasons. Here are some of the most important:

- POOL KNOWLEDGE**
- a) Group vs. Individual. An individual can produce a problematique. Unfortunately, individuals seldom can generate the full set of problem statements and seldom are sufficiently knowledgeable to comprehend the extent of interactions among the problems. Even if an individual is sufficiently knowledgeable, there is seldom any way to make such a determination.

For this reason, when the stakes are high, it is important that a group of individuals with a variety of knowledge and experience work together to create the problematique.

- CUT TIME**
- CUT ERRORS**
- MAINTAIN ORGANIZED ACTIVITY**
- SEQUENCE FOR MAX SAVING**
- b) Computer Help or No Computer Help? When the computer is used to sequence the questions, keep a file of the answers, compute the structure, and maintain logical integrity very substantial benefits are achieved as has been documented elsewhere. Among the benefits are (a) the process is a good learning experience, (b) the time required to span the field of inquiry is reduced often by 80% or more, (c) human errors in

FACILITATE DISPLAY

FACILITATE AMENDMENT

transcription and determination of the structure are reduced almost (not quite) to zero, and (d) the full process theory is available to provide credibility to the logical underpinnings of the work as well as visibility to how the results are achieved.

- c) Prose Output or Graphic Output. In principle, a problematique could be produced entirely in prose. However the prose would eliminate the visual feature or being able to trace quickly the propagating aggravation that is much easier displayed with the graphic form.

PROSE BY
ITSELF IS
NO GOOD

What Does a Problematique Look Like?

It is easy enough to place a problematique in front of the reader and say "there, see what it looks like". You can find several and look at them yourself. But instead of taking this easy way out, let's talk a little more abstractly, as this will help us develop the nomenclature that we need to interpret a problematique.

If you re-read the part above called "What is a Problematique", you will refresh your memory about 2-element problematique types. One of the key changes that must be made in going to much larger problematiques is to meet the challenge of showing a situation where there may be 5 or 10 or more problems that mutually aggravate each other. This is the wider-scope version of the third type (Both Way Type) discussed above.

A set of mutually interacting problems is called a cycle. The number of problems in the cycle is called the "size" of the cycle. If the size of the cycle is 2, there are just 2 arrows to be shown. But if the size is 5, the number of arrows goes to 20, and if the size is 10, the number of arrows goes to 90. Clearly it is absurd to draw all these arrows. Instead, all the problems in the cycle are placed in a single enclosure, and a "bullet" is placed in front of each separate problem in the cycle. With this graphic convention, you can immediately count the number of members in the cycle by just counting the bullets. If you want to know how many interactions there are just in the cycle itself, you can readily compute them from the formula $n(n-1)$ where n is the size of the cycle.

In drawing the problematique, the graphic artist takes advantage of the structure as printed out by the computer. The computer printout shows all of the cycles with their respective memberships. It also shows what problem or cycle aggravates what other problem or cycle.

The structure can be laid out one level at a time, and the interconnecting arrows can be drawn to produce the problematique.

CYCLE

BOX-BULLET
FORM

LAYOUT
BY
LEVELS

ADVANCED SOFTWARE

(In a more sophisticated operation, one could develop software to lay out and print the structure using such special sub-algorithms as the Warfield crossing-minimization routines and the Fujitsu overall layout algorithms developed by three Fujitsu staff members.)

HYBRID MAP

The problematique then appears as a set of individual problems or cycles lying at different levels of what is called a "hybrid structure". If, however, there are no cycles with 2 or more members, the structure is just a hierarchy.

Why do People Have Some Problems in Interpreting a Problematique?

People sometimes have problems in interpreting a problematique. This should come as no surprise. People have trouble reading a paragraph of prose, and in order to overcome this, people study language for 10 to 20 years in their formal education. Most people have had no training in how to read graphics. The basic problem is that they have had no training, and yet many feel intuitively that they ought to be able to read a problematique without any training. Or perhaps they feel that their colleagues must be able to read them so they should not display any felt difficulty.

NO TRAINING

In any case, it is generally true that with a half hour of concentrated effort most people can learn how to read a problematique with relatively little effort. Without this half hour, reading the problematique may be insurmountable.

CAN LEARN

Even with only minimal training, most people can figure out how to read the problematique. Here is a simple rule. If there is an oriented path (i.e., a sequence of one or more arrows) from a problem A to a problem B, this means that A aggravates B.

SIMPLE RULE OF READING

This simple rule is inadequate to completely deal with the cycles (where the arrows are suppressed, as explained above). With a cycle you must remember that every problem in the cycle aggravates every other problem in the cycle. Also a problem that aggravates any member of a cycle aggravates all other members of the cycle. Aggravation flowing into a cycle from outside the cycle aggravates every problem in the cycle. Also it propagates beyond the cycle to aggravate anything that the cycle aggravates.

READING A CYCLE

People may also have trouble interpreting a problematique because they try to read too much into the problematique. For example, it is common to hear people say (when the arrows are pointed from left to right) that the problems at the left are more fundamental and those on the right are more symptomatic. Also it is now becoming common to hear people say that the problems on the left are the "root causes" of the difficulty associated with the situation. The first of these two statements has some validity, in the sense that those members at the left aggravate more members to the right than do those on the right, as a rule. The second statement about "root cause" has no validity in general.

OVER-INTERPRETING

UNDER-INTERPRETING

"Stay with the relationships"

The problematique is not a causal diagram in the usual sense. The distinction can be brought out as follows. Suppose a child is playing with matches and starts a fire. What is the root cause of the fire. Now suppose someone throws some gasoline on the fire. We can readily see that the person throwing gasoline has aggravated the fire. However aggravation is not root cause. Perhaps the root cause is that the manufacturer of the matches did not manufacture a safety match. Perhaps it is that the parents didn't teach the child not to play with matches. The concept of root cause is more complex than simply working with problematiques as indicated above can handle.

(In spite of this, however, we may note that some of the aggravations shown on a problematique may actually correspond to root causes in some situations. One must not however use blanket terminology when it is perhaps relevant only a small percent of the time and may be very misleading in other instances.)

People may also have trouble in interpreting problematiques because they do not understand each of the many interrelationships shown on the problematique. If so, normal discussion with other people should help clear up this deficiency. Also the clarification sessions held before the problematique is constructed, and the dialog held during the structuring will help resolve most of these difficulties.

People may have trouble interpreting problematiques because the aggravation shown on the problematique is not quantified and people feel intuitively that proper decision making requires a more quantitative knowledge of the aggravation. This is a concern that can readily be addressed once the problematique is available, and one which can be addressed only at considerable risk before the problematique becomes available because of the absence of insight into the propagating aggravation.

How Can the Information in a Problematique Be Used?

The kinds of questions that are supported when a problematique is available are the following:

- A) In seeking a course of action, to what extent is the interaction among problems important in setting action priorities?
- B) What interactions are revealed that have not been systematically addressed, and what are the possible implications of overlooking such interactions?
- C) What problems and interactions do we already know how to deal with?
- D) What problems or interactions do we not know how to

• UNDER-EXPLORED INTERACTIONS

WELL-UNDERSTOOD INTERACTIONS

• SPECIAL EFFORT

GETTING DEEPER UNDERSTANDING

QUANTIFICATION

ASKABLE QUESTIONS WITH FEASIBLE ANSWERS

deal with; and what should we do to try to get the missing knowledge?

- E) What organization or group of organizations is the site of the problem or interaction? *ORGANIZATIONS INVOLVED*
- F) Which organization should deal with which problems and interactions? *LEAD RESPONSIBILITY*
- G) If some problems or interactions cut across organizations, who can put a team together to deal with this interorganizational situation? *TEAMING*
- H) Given the propagating aggravation, is it important to carry out corrective measures in some particular sequence that would have a much higher likelihood of succeeding by taking into account the propagating aggravation? *PREFERRED ACTION SEQUENCE?*