Problem Tree: A Problem Structuring Heuristic

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This paper offers a Problem Tree Heuristic as a useful thinking procedure for problem structuring, an initial step in policy analysis. The heuristic's nature and possible purposes are outlined. A specific procedure is recommended based on relevant literature and author's application experience. Some real-life applications and the problem tree's possibilities and limits are discussed.

Keywords*: policy problem, problem tree, problem structuring, policy analysis*

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Introduction

The process of policy problem delimitation—"what is the problem?"—sometimes referred to as problem definition, structuring, or modeling, is believed to be the key initial step in policy analysis. Hardly any methods book neglects to emphasize the importance of this step: "*policy analysts fail more often because they formulate the wrong problem than because they choose the wrong solution*" (Dunn 1988: 720)[1]. Paradoxically, despite the declared importance of correct problem formulation, specific procedures for problem formulation have been treated rather marginally by existing policy analysis textbooks. As a result, inexperienced policy analysts have had no indication of how to proceed (Veselý 2007).

Few procedures are available to analysts for formulating a problem in a form that is both generally comprehensible and susceptible to policy instruments. Problem structuring is a creative and iterative exercise and, similarly, the methods used in the process must be based on creativity and sensitivity to competing perspectives held by the various stakeholders, rather than a rigid, thoughtless application of a ready-made technique[2]. Therefore, the problem tree should be regarded as a heuristic rather than a method.

The term heuristic comes from the Greek *eureka* ("I have found") and means commonsense strategies for problem solving and discovery without strict logical rules. Heuristics are loose sets of rules that provide valuable pathways to problem solving or, in the present case, problem formulation. Merely a loose guidance, such heuristic can be applied differently by different users, and this can lead to greatly diverging results[3]. The utility of a heuristic depends on the creativity and open-mindedness of those applying it. The problem tree is an example of a problem structuring heuristic. Following the "use instructions" does not by itself guarantee success. However, experience shows that if applied creatively and patiently, it may significantly contribute to effective problem structuring.

Nature and purpose of the heuristic

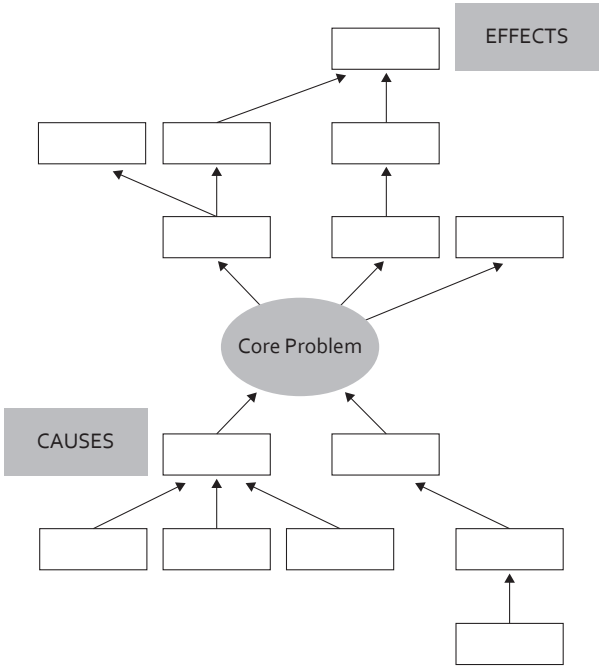
The problem tree is a heuristic that can be best utilized during the initial stage of problem structuring when the analyst faces a complex and vaguely defined problem. For example, the analyst is expected to recommend measures in fields like "youth delinquency", "education" or "unemployment". In my (and others') experience, policy analysis clients often do not know what exactly they want and implicitly expect to learn this from the analyst. Rather than facing a clearly

1 The importance of problem definition is now acknowledged in the actual public policy making processes of numerous countries. In several OECD countries, Regulatory Impact Analysis (RIA) has recently been adopted with the following justification: "A poor understanding of the problems at hand or of the indirect effects of government action can undermine regulatory efforts and result in regulatory failures. RIA is used to define problems and to ensure that government action is justified and appropriate." (Rodrigo 2005: 5)

2 This does not mean that quantitative and formalized methods cannot be applied in problem structuring.

3 According to *A Dictionary of Psychology*, a heuristic is "a rough-and-ready procedure or rule of thumb for making a decision, forming a judgment, or solving a problem without the application of an algorithm or an exhaustive comparison of all available options, and hence without any guarantee of obtaining a correct or optimal result" (Heuristic 2006).

Figure 1—Problem tree – A General Structure



Source: Schiefer and Döbel (2001: 74)

defined problem, they often deal with a "topic" that includes a great many potential problems and an unlimited range of perspectives upon them.

The problem tree is a universal heuristic for identifying, prioritizing, and visualizing problems. It represents a scheme of problem causes (factors) and effects (consequences). Like every tree, the problem tree has its "stem", "roots", and "branches" (see Figure 1). Its stem stands for the core problem, its roots are the causes and its branches form the problem's effects.

While the problem tree can be created by a single individual, it should preferably be a group exercise. Ideally, analysts, clients as well as problem stakeholders should take part in the procedure. In such cases, the problem tree represents a participatory method. Providing informed recommendations, mapping out the variety of opinions, democratization, or achieving social consensus are among its possible purposes (*e.g.,* Elliot et al. 2005). It follows that a problem tree can be constructed for different reasons. While its outcome (i.e., a problem tree diagram) is important, the process of constructing a problem

tree is equally important. Those who are involved in the exercise should clarify the main purpose, such as "reaching a consensus about what the core problem is", "engaging stakeholders in a debate about what the core problem is and generate as many different perspectives as possible", "clarify the different aspects and parts of the problem", etc. It should be decided whether the resulting problem tree (as input for future work) or the process itself is more important.

In other words, the process of problem tree construction may be driven by cognitive purposes (improve and structure our knowledge of the problem) as well as political purposes (engage stakeholders in debating the problem). The following text focuses on the cognitive purpose, i.e., how problem tree can facilitate our understanding of a given problem. In this respect, the problem tree can help: (a) distinguish between the different parts of the problem and group them according to certain typical characteristics, (b) identify logical relations between elements (i.e., determine whether an element belongs to the problem's causes or rather to its effects), and (c) distinguish the different perspectives on the problem (i.e., demonstrate the diversity of problem definitions by different actors).

Procedure

Guidance on how to construct a problem tree is rare in relevant literature. Examples include Schiefer & Döbel (2001), Start & Hovland (2004), and Weiss, Bolton, & Shakar (2000)[4]. Based on this literature as well as my own application experience, I recommend the following procedure.

- Step 1: Decide to apply the heuristic and clearly define its purpose.
- Step 2: Explain the purpose to all participants.
- Step 3: Formulate negative statements about the issue area (round 1).
- Step 4: Publicize the statements and form clusters of statements.
- Step 5: Briefly discuss the causes and effects.
- Step 6: Formulate negative statements about the issue area (round 2).
- Step 7: Publicize the statements and form clusters. Eliminate duplicities and unclear statements.
- Step 8: Distinguish causes from effects. Spread statements around the desk or magnetic board.

4 Interestingly, the problem tree heuristic is currently not included in any policy analysis textbook. One of the possible reasons for this absence is its location in between the positivist and post-positivist approaches. While it is "not scientific enough" and too subjective for some positivists, it may be associated with problem modeling and causal modeling by post-positivists.

- Step 9: Identify the core problem.
- Step 10: Organize the causes and effects. Refine the tree's overall logic.
- Step 11: Redraft the problem tree on paper or in a computer editor.

In the first step, define when and where the problem tree should be constructed, who is to take part in the exercise and what the main purpose is. Decide whether the process will be expedient or rather preceded by a careful selection and preparation of participants. For example, participants can be encouraged to prepare by considering what the problem is, looking up the necessary evidence, and formulating their arguments. The number of participants should not be too high because the tree construction becomes difficult to manage with approximately six or more people. If it is desirable to involve more people, then they should be divided into groups and work separately. The problem tree moderator should prepare the necessary tools such as blank sheets of paper and markers.

In the second step, the group exercise begins. The moderator should clearly communicate its purpose, time frame, and procedure. Then the participants should be encouraged to formulate negative statements about what is wrong or could be better in the issue area (e.g., "what is wrong about the Czech educational system?") The participants should be told to formulate as specific and comprehensible statements as possible and to write them down on paper legibly. The number of statements need not be limited and instead, participants can be asked to formulate a given minimum number of statements (e.g., ten). A half A4 sheet is a convenient paper size.

If the group is larger or includes participants who do not know each other well, then it is possible and desirable to produce statements anonymously. To that end, statements should be collected in a single spot and mixed together. Then, the moderator should read out one statement at a time and group similar statements (such as all statements involving human resources, organizations, laws, or financing) together, be it on a desk or a magnetic board. At the same time, causes and effects should be distinguished from each other through short spontaneous discussions. Such short discussions should stimulate the group to formulate further statements that have been missing thus far.

After all statements have been formulated and publicized during round 1, the number of statements should be reduced. Statements consisting of identical or very similar formulations are eliminated or merged into a single statement (and written down on one instead of two sheets of paper). Unclear statements are put aside into a "treasure box of ideas"[5], separately from "approved statements". It is also recommended to eliminate all overly general statements that are difficult to work with (such as "materialistic culture" or "communist past"). Participants should be told that the removal of statements into the "treasure box of ideas" means that they merely cannot be worked with for the moment, rather than their final elimination. Indeed, the moderator may return to the "treasure box of ideas" later if they feel it is necessary or if asked to do so.

5 In a similar respect, Schiefer and Döbel (2001: 91) use the term "treasure box".

Distinguishing between causes and effects is perhaps the most difficult step in the entire process. Statements are shifted up and down the desk (or magnetic board), depending on their designation as the problem's effects or causes, respectively. Participants should discuss which statements belong to the deepest roots (causes) of the problem and which, in turn, are among its effects. Similar statements should be grouped together. If a combination of causes brings about a given effect, then these causes should be located next to each other at the foot of their shared effect. Some statements may represent general problems (such as long-term economic stagnation) that are beyond the given problem solving capacities, yet relevant to a given core problem. Such general problems should be removed to the "treasure box of ideas". Alternatively, if the group finds them particularly important, they can be placed in the scheme, outside the areas of causes and effects, as "underlying conditions" (provided their absence, the problem would not exist or would exist in a different form).

After the statements have been organized, the moderator should ask the participants about the ways the core problem might be formulated. Experience shows that core problems usually are not directly formed by any of the underlying negative statements from rounds 1 or 2 (steps 3 and 6). Rather, they should be defined in order to form the boundary between causes and effects. Core problems should be more general than most statements but, at the same time, should not be too vague or unclear. A core problem should also encompass all the causes included underneath it.

In the final step, the provisional problem tree is checked for coherence. The main links between statements are marked with arrows. In most cases, the group will conclude that in the complex reality, there are links between all combinations of statements and links can often be drawn in both directions. The group must be explained that the goal is to generate a simple, clear-cut scheme rather than a complex model that includes all important links between statements. However, the moderator should record all links between statements that are mentioned.

Once all statements have been organized and the linkages among them have been discussed, the resulting problem tree (in the provisional form of organized statements) should be redrafted. A (digital) picture of the outcome can also be taken. Then, the moderator redrafts the discussion outcome as a

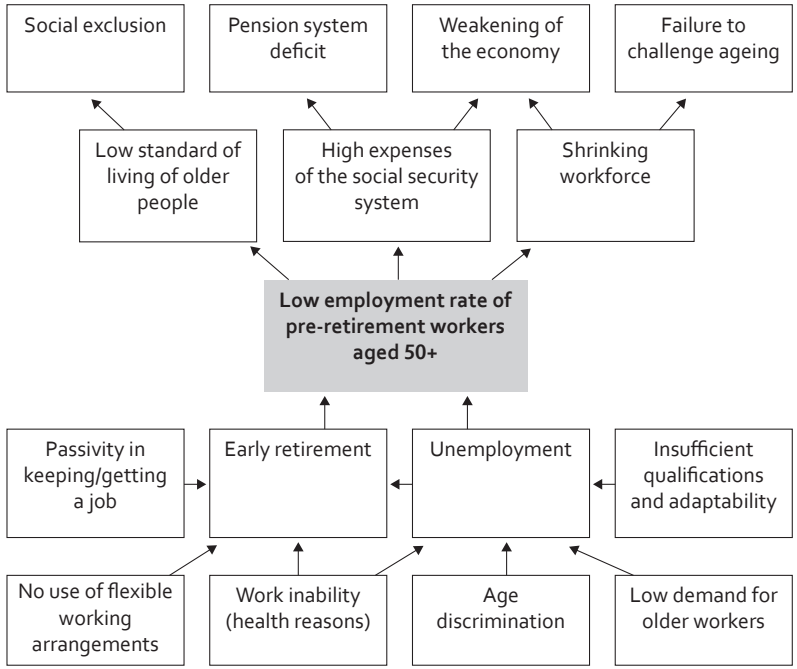
clear-cut diagram. Major or minor adjustments may be done, provided agreement among participants. Such adjustments are often necessary because an individual, rather than the entire group, is better capable of ensuring the tree's consistency and coherence. The group may also be unable to reach an understanding about which statements represent the problem's causes and its effects, respectively, and what should be designated as the core problem. In such a case, several problem trees can be constructed, for instance one for each participant. It is also possible to convene another session and discuss whether everyone agrees with the problem tree that originates from the previous session.

Application

The character of your final problem tree depends on the purpose for which it is constructed. If the process itself is the main purpose then the final outcome need not be given much attention. The outcome should be as concise and comprehensible as possible if it is intended for direct publication (for instance, as part of a strategic plan's analytic chapter). Another problem tree may, in contrast, be constructed by a group of researchers and serve as input for creating more complex causal models. In such a case, the scheme should be more complicated. Finally, a problem tree may be constructed in order to record the various perspectives on a problem that are held by different actors. In this case, the diagrams represent the basic beliefs and models of their creators and key features of their thinking about the problem (such as level of complexity), and should be left exactly in the form created by their original authors, and should not be changed by analyst.

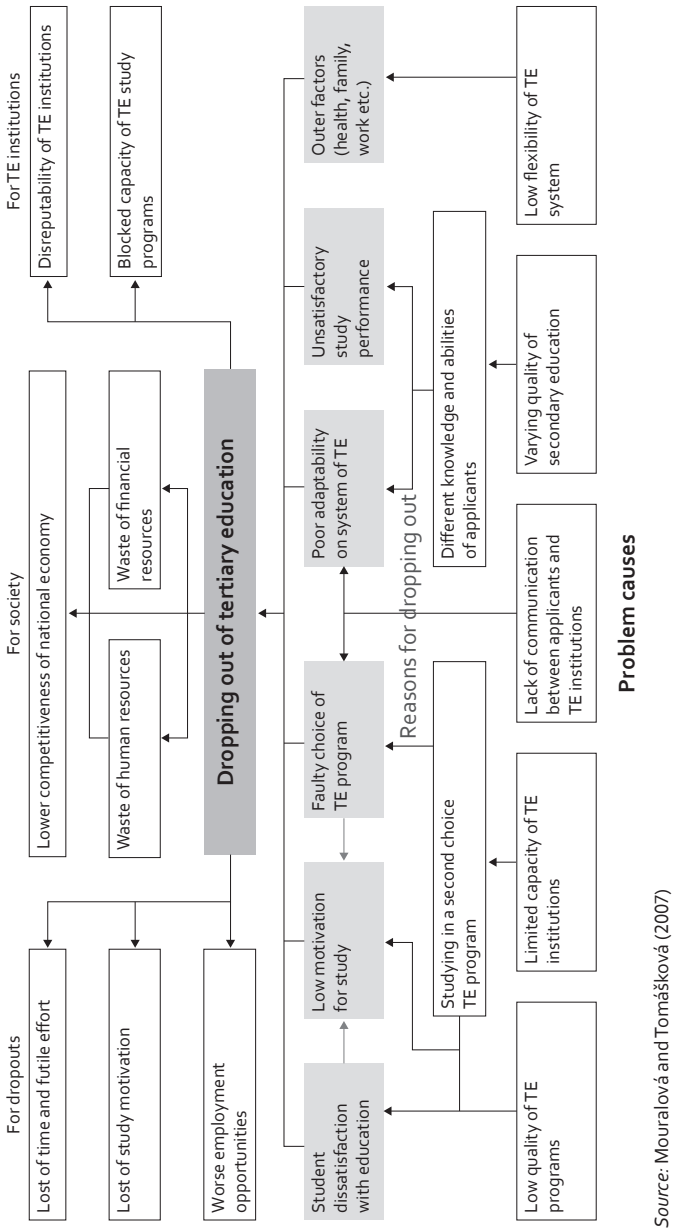
Examples of real-life problem trees are shown in Figures 2, 3, and 4. It is clear that their forms are quite different. The first example (Figure 2) is relatively simple and simplicity is precisely its main advantage. Basic and broader categories of factors are distinguished (e.g., the low employment of workers aged 50+ is attributed to only two basic factors, early voluntary retirement and involuntary unemployment). The second example (Figure 3) is more complex in that it distinguishes between direct causes of tertiary education failure at the individual level (e.g., unsatisfactory study performance and failing to meet school demands) and more or less indirect structural causes (e.g., low quality of tertiary education programs). The third example (Figure 4) tries to capture the broad problem of education inequalities, and, as such, becomes quite complex, less self-evident, and more difficult to understand for readers. Its value, however, lies in structuring the issue into several layers and considering several possible paths through which inequalities are generated.

Figure 2—Example of Problem Tree: Low Employment Rate Of Pre-Retirement Workers Aged 50+



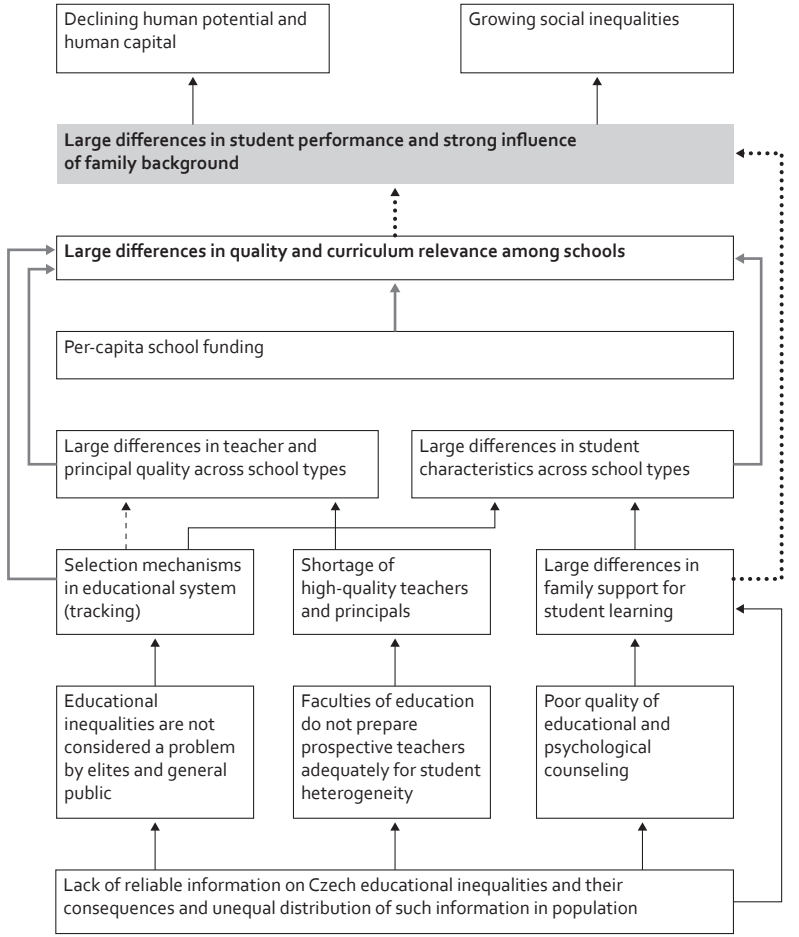
Source: Doleželová (2007)

Figure 3—Example of Problem Tree: Dropping Out Of Tertiary Education



Source: Mouralová and Tomášková (2007)

Figure 4—Example of Problem Tree: Educational Inequalities In the Czech Republic



Source: Veselý (2008)

The above-stated examples (especially Figure 4), and arguably any problem tree, should be accompanied by verbal explanation. It is often not possible to find the best words and formulate the contents of each box in a few words. Therefore, it is useful to explain to the reader the basic principles and "the logic" behind a problem tree (e.g., why certain factors and links among them are detected, while others are not). In any event, it must be kept in mind that

one purpose of the problem tree is to visualize the problem in a meaningful and clear way. Neither the diagram nor its description should be too complicated and difficult to understand in a short time.

Conclusion

As discussed above, problem trees are constructed for different purposes and goals. There is no one "correct problem tree". The "correctness" of the exercise depends on the degree to which it serves its purpose. The main and overall aim is to structure public issues in a way they can be solved and actually are at last solved. Thus, it is sometimes better to present a very simple, but coherent, problem tree rather than a very complex, but hardly comprehensible, diagram of numerous causes and effects.

In any case, the problem tree should be regarded as a thinking instrument, rather than a final product. It serves more to structure the analytics' and stakeholders' thinking, rather than to provide a definitive or "scientific" position on a problem. It also facilitates initial clarification and structuring of the issue area, rather than modeling relationships. Therefore, the problem tree is an intermediate step in which the issue area is structured, but not necessarily in a causal fashion. It primarily provides an instrument for future work, e.g., for constructing a causal model or a conceptual analytical framework. It must also be stressed that the problem tree is only one of several possible methods or heuristics for problem structuring (for other methods, see e.g. Dunn 1988, 2004).

Since the problem tree is applied for different purposes and in different contexts, it may take many different versions and forms[6]. It can be simple and economical as well as more complex. Similarly, different instances of problem tree construction may include different processes. The above procedure should not be adopted dogmatically. It is merely an attempt to summarize my application experience. The process can also be much simpler than I have just described and, in fact, a problem tree can be constructed by one or two individuals using a pencil and a sheet of paper, without any preparation.

Making "hard science" out of problem tree construction would be a great mistake. Quite the opposite, it is a creative heuristic which relies on spontaneity and flexibility. This does not mean that the process is always easy and entertaining; even creative thinking may hurt. While I have seen, in my analytical and teaching career, numerous fine problem trees that facilitated further work,

6 For example, the causes are or are not categorized and classified.

in other cases, when students followed the prescribed procedure dogmatically, efforts to construct a problem tree were ineffective. Furthermore, this article does not imply that every problem analysis must include a problem tree.

However, based on my own experience, the problem tree often provides a "window" into the analytic's mind. It clearly shows their way of thinking—its advantages and pitfalls—as well as the degree to which the thinking is clear or chaotic. In my experience, the correlation between the quality of a problem tree and the quality of the entire analysis is high. Those who are able to construct a clear and coherent problem tree are usually also able to write a well-structured and well-argued study. Conversely, a messy problem tree often predicts confusion throughout the study. And that is, after all, another reason why the problem tree should become part of the policy analysis repertoire and be used critically.

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