Technical Problem-Solving: A Practical approach to an old model

by

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Abstract

This paper examines the traditional model for solving problems and questions the idea of beginning the process by defining the problem. The Bowman Problem Solving Model reduces assumptions and focuses on the early steps in the process. Exceptional solvers of complex problems must be highly motivated individuals and they must have a well-structured approach. A fear of problem solving is often associated with the risks of failure. Fear can be minimized, when the problem solver understands that all problems can be solved if the organization is willing to invest sufficient quantities of three resources, time, money and knowledge.
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Throughout the Computer Age, the quest has been to process data into information. The decade of the nineties produced the Information Age. The development of the Internet, satisfied the quest for information, and produced an abundance of information. According to Carretta (2007), the Information Age is over. Organizations do not need more information they need quality information. Quality information is knowledge.

Included in the definition of information is the word useful. Data processed into information must be useful. However, the glut of information has recreated the problem of millions of facts produced by computers that is not useful or is at least difficult to identify as useful.

The goal in the Knowledge Age is to convert the overwhelming quantity of information into knowledge. Each time a problem is solved knowledge is produced. Unless the knowledge is documented it will eventually need to be reproduced.

A Practical Approach

Technical and business problems may be categorized into two types, structured and non-structured (Bots, 2006). Structured problems are those for which a solution has been developed, and the solution is documented. Once the solution is documented, the documentation can be used to solve the problem if or when it occurs again. Procedure manuals and processes are the result of problems that have been solved, and documented.

Non-structured problems are those for which a solution has not been documented. The same problem may have occurred previously and may have been solved. However, if the solution was not documented, then the problem continues to be non-structured and the
problem has to be re-solved. Organizations are plagued with undocumented (non-structured) problems, resulting in avoidable expense. One objective for converting non-structured problems into structured problems is the accumulation of information. The objective is not just the accumulation of information, but also the creation of knowledge.

The traditional problem-solving model begins the process with a hypothesis or defining the problem. However, if sufficient data is not known about the problem an accurate definition of the problem cannot be determined. Beginning the process by defining the problem is similar to a police officer defining a victim as a suicide without gathering evidence.

Desire

People cannot be assumed, to be motivated to solve problems. Problem solvers must have a strong desire to solve problems because problem resolution may require persistence and risks are a side effect of problem resolution. Good problem-solvers commit to the task and they are persistent. Common reasons for people not wanting to solve problems are fear of failure, lack of knowledge, and unwillingness to take ownership.

People may fear to be associated with the problem. They may have a fear of failing to solve the problem. They may be unwilling to assume ownership of the problem because once the technician owns the problem, the problem is identified with the technician (Rooney & Hopen, 2004). Some people may not want to commit to solve a problem because there may be guilt by association. Once the employee has begun to solve the problem they are now associated with the problem.
However, a lack of knowledge or not knowing how to solve problems is perhaps the most common reason for not being motivated. When the problem solver has, a structured model to follow it can remove the knowledge barrier. Knowing how to solve problems begins by understanding that the problem solver needs three resources. 

**Time, Money and Knowledge**

Without sufficient quantities of time, money and knowledge the problem cannot be solved. Inversely all technical problems can be solved with sufficient time, money and knowledge. When employers hire employees, they are really hiring knowledge. If an employer is willing to hire an inexperienced person then the employer is willing to trade time/experience for knowledge. As the employer invests time and eventually money in the new employee, they eventually acquire the knowledge needed to solve problems.

Knowledge is the primary problem-solving tool. However, money can buy knowledge. If an organization does not have a knowledgeable person on staff to solve a problem, the organization may hire a consultant or contractor. If an organization has more time than money the organization may decide to acquire the knowledge by training staff with the skills/knowledge needed to solve the problem. Time can buy knowledge. Money can buy knowledge. Knowledge can acquire money. Time is always diminishing. Time can be utilized more efficiently but as time diminishes it become more valuable. Brooks Law of project management says that adding more people to a project, late in the project, will make the project later.

**The New Problem-Solving Model**

**Gathering Data**
The traditional problem-solving model starts the process with defining the problem. But, defining the problem assumes that enough information has been learned to define the problem. Starting the model with defining the problem can cause the solver to jump to conclusions about the problem. This can lead to the shotgun approach to solving problems. When a person fires a shotgun at a target a pellet may hit the target, but you cannot identify which pellet hit. Imagine that the pellets are possible solutions. One of the solutions you try works and the problem is solved but which solution worked? The shotgun approach is difficult to document and without documentation the solution remains non-structured. Starting the process by gathering data helps to reduce assumptions and prejudices about the cause of the problem.

In the first step of problem solving, data is collected, even if the problem solver is not sure the data is related. Environmental data, historical data, interviews with individuals (experiential data) and if possible quantitative data is gathered. Careful notes should be taken during the data-gathering step.

Analysis

The purpose of the Analysis step is to understand what the data is saying. During analysis, the problem solver would prioritize the data, categorize the data, sort it and draw pictures, create charts and use whatever tools, which, may help make sense of the data. Mind mapping and brainstorming can be helpful in understanding the data. Traditional statistical analysis and repertory grid method of data analysis can be helpful for solving complex problems. In the analysis step, the problem solver is processing data and trying to create information useful to understanding the problem. Near the end of the
Analysis step, a clearer understanding of the problem will develop (Stoyanov & Kirschner, 2007).

**Hypothesis**

The Hypothesis step is when the problem is defined based on the information created in the Analysis step. The problem-solver has a reasonable idea of what caused the problem and can define it but the problem definition still needs to be tested. Trying to recreate the problem can be an effective way to prove the hypothesis (Tjosvold, 2008). Statistical testing can be performed to prove the hypothesis.

**Develop Solutions**

When the Hypothesis has been tested, the problem solver can begin developing solutions to the problem. Documenting solutions is important during this step. Documentation can help explain the problem and possible solutions to the person who needs to decide which solution to implement. Developing solutions can be an iterative process that is a part of testing the hypothesis.

It is not unusual for more than one solution to be developed. Technical people often develop the solutions but management decides which solution to implement. The solution chosen by management can be based on the three resources needed to implement the solution. Solution A may require knowledge that is beyond the capabilities of the organization. If time is not critical, the decision may be made to train current staff to solve the problem. If time is critical, the decision may be to contract the knowledge needed to solve the problem.

**Implement the Solution and Document**
The final step is to Implement the Solution and Document the problem. A knowledge base system is a good way to track changes and document problem solutions. Knowledge base systems allow non-structured problems to become structured problems. They offer functions and features that allow easy retrieval of solutions to previous problems. They also have built in problem statistical analysis tools. Even without computerized documentation, the problem needs to be documented.

Conclusion

The line between value added processes and inefficiency is thin in 21st century business. It is expensive to re-solve problems. It is ineffective not to use a structure methodology to solving problems. According to Rooney and Hopen, (2004, p.24) “The fundamental approach that separates structured problem solving from other methods is root cause determination. The process assumes that if the implemented solutions do not address the true underlying cause, the problem will recur, wasting the resources that were invested in the original effort.”

Start by teaching employees how to overcome barriers to solving problems and instill a desire to accept ownership of a problem. With ownership there is risk but with risks can come reward. Problem solvers must resist the urge to jump to conclusions by using the shotgun approach to solving problems. Begin by gathering data and document the entire process.
References


