Solution Engineering

A Tutorial

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SOLUTION ENGINEERING: A TUTORIAL

BACKGROUND

This tutorial was prompted by a question about the possibility of me providing coaching or webinars to OD folks about the uses of the tools in my Knowledge Workers' Tool Room. Solution Engineering is one of my favorite tools so I will start there.

SOLVING PROBLEMS

One of the things we consultants do for our clients has to do with solving problems. Sometimes we work in concert with our clients, working together to solve a particular problem, and sometimes they pay us to tackle them on our own. We coach, we counsel, we guide, we direct and we take the lead but the focus is always on the problem to be solved.

THE LANGUAGE

The Solution Engineering approach emerged and evolved during the course of some 50+ years spent solving problems in the workplace. I took the time to articulate it because I thought the prevailing approaches were lacking. I still do. For example, problem solving is often described as a "search" activity, suggesting that we should go looking for solutions (as though they are lying about somewhere waiting to be found). Some approaches clearly focus on finding and fixing the cause of a problem and a problem is defined as a situation in which something has gone wrong. Well, there are lots of other kinds of problems and not all causes can be fixed, even if they exist and even if they can be found. Some approaches (e.g., brainstorming) are little more than occasionally useful techniques. More often than not, at least in my experience, we have to create or craft solutions to the problems we encounter. I was also less than enamored of many definitions of terms associated with problems and problem solving; chief among them "problem" and "solution." And so, as part of articulating the Solution Engineering approach, I also set about redefining the language of problem solving as used in Solution Engineering.[1] Let's begin, then, with some basic terms.

Problem

A problem is often described as a gap between actual and desired conditions. That might or might not be the case. What is the case is that a problem exists when (a) action is required and (b) the required action is not immediately apparent. Consequently, someone must figure out what to do. The figuring out of what to do is the very essence of problem solving.

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[1] See the Solution Engineering Glossary at http://www.nickols.us/SE_Glossary.pdf

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Solution

Coming up with a solution – a course of action – is only part of it. That course of action must also be put into effect, whether you choose to call doing so "execution" or "implementation." Far too many people believe the course of action as envisioned is the solution. It's not. A solution is a course of action that, *once carried out*, eliminates the requirement for action (whether that's a gap between what is and what should be, something gone wrong or some other basis for action).

Action

Here, to use a trite phrase, is where the rubber meets the road. When we take action, we do so with some outcome or purpose in mind. The technical term for that kind of action is "intervention." As problem solvers we are also interventionists. When we take action we act upon something, we change things. Responsible intervention requires that we are able to say with some degree of confidence that changing this will lead to that or, conversely, that in order to change this, we must change that. Most change agents learn early on that change is indirect and delayed, which is to say we change this over here now in order to realize that over there later on. Yet, the effects of our actions always begin with those that are direct and immediate. As a consequence, we must be able to link the direct and immediate effects of our actions with the indirect and delayed effects we seek elsewhere.

Proximate and Ultimate

What was just referred to above are the notions of Proximate and Ultimate. Implicit in that formulation is the notion of Intermediate effects, that is, changes in things that connect the direct and immediate effects of our actions (Proximate) with the indirect and delayed effects that are the true objects of our efforts (Ultimate). We are confronted, then, with the need to connect Proximate and Ultimate, to identify how they are connected and where and how we might intervene in order to create some Proximate effect that will lead to the Ultimate effect sought.

Structure

Proximate and Ultimate effects both exist in the same structure, be that the structure of an organization, a system, a society, a group, a process or some other arrangement of variables, connections and relationships. In order to say how Proximate and Ultimate effects are linked, we must have a good grasp of the structure in which both are embedded. On occasion, we know this well, even if only intuitively; on other occasions, our ignorance of circumstances impedes our action and we must spend time and energy in

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"mapping" that structure so as to be able to figure out where and how we can change things and then have those changes "ripple through" the structure of the situation, producing those effects we seek elsewhere.

Points of Intervention and Points of Evaluation

The preceding discussion leads to a couple of basic issues confronting all interventionists (i.e., problem solvers). First, where do we intervene? What is it we can and should change as a result of direct, immediate action? This constitutes a Point of Intervention (or perhaps Points of Intervention). We also need to know where and how we will assess our success. What will we measure and how will we measure it? This constitutes a Point of Evaluation (or perhaps Points of Evaluation). Because Proximate effects and Ultimate effects are linked by way of Intermediate effects, we might have numerous Points of Evaluation, beginning with Proximate Results, making their way along the paths marked by Intermediate effects and ending with Ultimate effects.

Engineer

Last but not least, there is the term "engineer." As a noun the term refers to a profession, an occupation, a job title. And many will know right away that one use of the term as a verb refers to the work of an engineer. However, there is another meaning of engineer as a verb and it refers to the act of bringing about some result or condition through skillful, artful contrivance, as in "She engineered a turnaround of her company" or "He engineered the election of his candidate." Speaking personally, I like to believe that I have engineered a solution or two to the many problems I've encountered over the years.

HOW DO YOU ENGINEER A SOLUTION TO A PROBLEM?

With the foundation laid, let's proceed on to how does one engineer a solution to a problem? Enter here the Solution Engineering Model, one of the tools in my Knowledge Workers' Tool Room. At this point, let's review the Solution Engineering Model shown below.
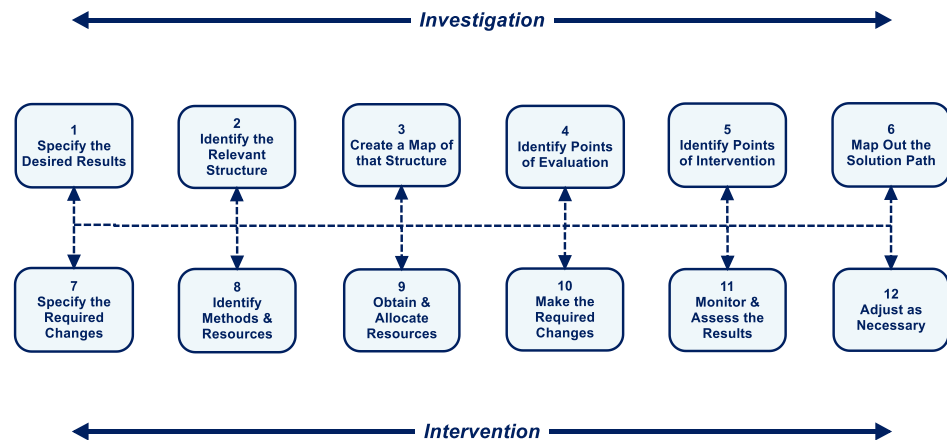
The first thing to note is that the process is iterative or cyclical. It is a "cover the bases" kind of activity, not one of trotting around them 1-2-3. The process cycles back and forth between the two major phases of the process: Investigation and Intervention.

The six blocks on the top indicate the major activities associated with investigating a problem. The six blocks on the bottom indicate the major activities associated with intervening. Admittedly, more has been written here

about the six blocks on the top than those on the bottom. This is because I assume most people reading this have been "implementing" and "executing" in the workplace for at least a few years and in some cases for many years.

The Solution-Engineering Bases

Investigation

1 Specify the Desired Results	2 Identify the Relevant Structure	3 Create a Map of that Structure	4 Identify Points of Evaluation	5 Identify Points of Intervention	6 Map Out the Solution Path
7 Specify the Required Changes	8 Identify Methods & Resources	9 Obtain & Allocate Resources	10 Make the Required Changes	11 Monitor & Assess the Results	12 Adjust as Necessary

Intervention

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The only additional comment I will make at this point has to do with the non-linear nature of the process. In many respects, figuring out what to do about a problem has much in common with detective work. It is a matter of finding and following leads and seeing where they take you. Then, armed with new information, it is a matter of finding and following new leads In this way, the process cycles back and forth between figuring out what to do about a problem and getting it done. Thus it is that solutions to problems are "engineered" (i.e., brought about through skillful, artful contrivance).

ABOUT YOUR TUTOR

Fred Nickols is a first-rate troubleshooter and solution engineer. He spent 20 years as a technician in the United States Navy where troubleshooting was an everyday part of his life. As a technician, he developed an appreciation for schematics, hence his continued reliance on diagrams of the systems on which he works, including processes and organizations.   The Navy trained Fred not just as a technician but also as a classroom instructor, a writer of programmed instructional materials, an instructional systems developer and an internal organization development (OD) consultant. Upon

retiring from the Navy, Fred took up a career in consulting, first in training and management development then in general management consulting. He also held senior positions with two client companies: Monarch Financial Services and Educational Testing Service. He has published more than 100 articles and book chapters in a wide variety of professional publications. Currently, he is Managing Partner at Distance Consulting LLC, a firm he founded in 2001. He writes as his Muse moves him and he consults as the Fates decree.

FOR MORE INFORMATION

Contact Fred Nickols by e-mail and visit his articles web site. There, you will find more about problem solving and Solution Engineering.

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