

Rehabilitation engineering as the crow flies*

PART V—A PROBLEM-SOLVING METHOD FOR REHABILITATION ENGINEERING

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This paper, the fifth of a series, deals with dynamic group problem-solving and shows how this can give radical solutions to problems and at the same time enhance group cohesiveness.

Dialogue:

Steve: You might think that the usual unstructured method of attacking problems works fine. I've not found it satisfactory on a number of counts, but rather than go into that I feel we should examine the alternative way and build a case for it. Mainly, I feel that engineers should follow procedures for problem-solving that make it attractive—that is efficient—to have engineering procedures applied to problems in rehabilitation. For that, the solutions must unfold in an attractive way and lead to an obvious advantage in the shortest possible span of time for the least amount of money spent. Ultimately our responsibility to patients and the recipients of our talents requires that we use the best methods available to us.

Jim: As an old-timer in the field, I look back on my various attempts to solve problems by a hit and miss method and feel a bit ashamed when I compare the impulsive launching of projects on quickly formulated ideas to what we have been doing latterly. How can we convey the improvements I have experienced to others so that more groups can make what they do more effective.

Richard: Let us show how we generate innovative solutions and, in the process, show how that brings people together. Perhaps we can do that best by first outlining what happens in most problem-solving encounters, highlighting the

faults and pitfalls and then using an example from our own experience to show how it could be. Steve, tell us how it is.

Steve: Usually participants at a meeting consciously or unconsciously perceive the encounter as a competition between the members of the group. A winner infers a loser. So right away a part of a person's energy is directed away from solving the problem to protecting himself.

Jim: That's right. Often when I have made suggestions intended to get the ball rolling people have taken it as a threat to themselves and have dumped the idea before it had a chance to get started. Also, I have felt attacked for not giving "complete" solutions when proposing ideas which seemed nebulous or even off the track. Looking back on it, what I would have appreciated was a leg up toward the solution so that I could have felt that I had made a contribution toward a solution. The sharing of the solution would also have made me feel appreciated and made me appreciate more the other members of the group.

Richard: Yes, I've often seen group leaders using their power unwisely so that free thinking was inhibited. The aim should be to examine as many alternatives as possible in order that the most suitable can emerge.

Steve: We have all seen group leaders who do that. Every participant brings two characteristics to a meeting: *sensitivity* and *aggressiveness*. These really can detract from the efficiency of generating solutions. You see this all around in daily life too. The job of the group leader is to direct these feelings toward solving the problem.

Jim: You are getting onto *how it could be* Steve. Could you summarize that for us?

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Steve: I would like to see group interactions relieve people of the burden of self-protection. This could be done by *building* on speculative concepts that initially seem unworkable, such as some of the suggestions you have made in the past and which you would have liked to see developed, Jim. That would be my first point.

My second point would be to have group interactions ensure that each idea has a *hearing* and is given support and consideration. No one loses and everyone gains.

My third point would be that creative aggressiveness be directed to build on both the negative and positive aspects of an idea.

Richard: Now I see the leader as the servant of the group. He creates an atmosphere of security where all ideas are considered worthy. Can we have an example of the value of what we are suggesting?

Steve: Sure. One key to generating solutions is good *listening*. Remember the crazy sessions we had on fracture bracing?

Jim: As a matter of fact, those sessions really stand out vividly in my mind. It seems to me that more ideas came out of those short sessions than I've been used to experiencing in a month of Sundays.

Richard: Let's review it using the flowchart we prepared Steve. What was the *problem as given* by the orthopaedic surgeon?

Steve: We were asked to improve fracture bracing. We redefined the problem to mean "distribute the forces optimally on given locations of the skin". This became the *goal as understood*.

Richard: We generated a number of goals as understood before we selected the final one, remember. These were:

1. Optimize force on the skin
2. How do we make the skin determine the force
3. How do we make the location optimize the force on the skin
4. How do we make the force responsible to the skin
5. How can the skin choose the location of the force application

The fourth one appealed to us most and

became the goal as understood which we selected.

Jim: The next part of the process, selecting *paradoxical book titles* really seemed crazy to me at the time when we first tried this method. Now I can understand the value of diverting our thoughts from the problem.

Richard: Yes, that is the objective—to *divert* our minds from the problem so that we are freed from the preoccupation with the immediate problem. That leads us to see the problem from unexpected viewpoints.

Steve: Remember the fun it was developing the list of paradoxical book titles in the fracture bracing experience. They were so far from the point they were on the face of it quite ridiculous.

Jim: I remember we chose "Steady Uncertainty" as the paradoxical book title which would lead us away from the immediate problem. I could certainly see that it did, but what bothered me at the time was what would lead us back!

Richard: You were in a hurry to get to the point! We took the example of geology as the topic we would discuss in relation to the paradoxical book title so that we would get even further away. From that we tried to *force fit* the example of geology to the book title in the hope that a solution would emerge.

Jim: This was the most interesting part of the problem-solving method to me. We were able to very quickly generate fifteen paradoxes in geology that were parallel to the idea of steady uncertainty. The Theory of Evolution was one. What appears to be steady is constantly changing.

Richard: That's where we got our ideas for corrugations—like scales of fish, or the shells of armadillos, or the scales of snakes and so on.

Jim: Again, I was tempted to break into fracture bracing at that point, but we went on to other examples of steady uncertainty.

Richard: Many possibilities must be considered to see how often a similar solution suggests itself. The idea of corrugations recurred in discussions we had on erosion, and on crystal formations. The most striking analogy for me was comparing the cross section of the world (Fig. 1) at the equator with a cross section through the thigh. The core was like the femur, the mantle like the soft tissues and the crust of the earth as the skin. Around this floated the

FLOATING CONTINENTS

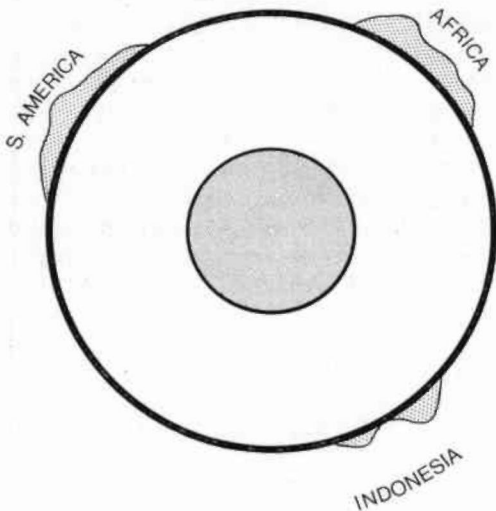


Fig. 1. Cross section of the world.

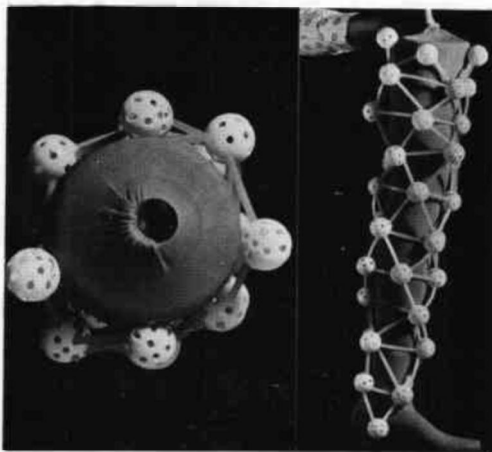


Fig. 2. Golf ball model around the thigh. Left, end view. Right, side view.

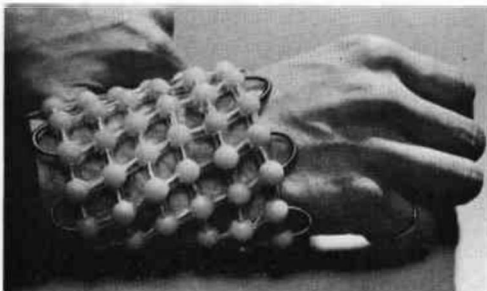


Fig. 3. Bead-cylinder model.

continents, seemingly steady, but uncertain. From this we went straight to the golf-ball model we made. (Fig. 2).

Jim: And from that Steve came to the beautiful working model he made in England which I believe will set a new direction in the making of all sorts of support surfaces, even sockets and brace cuffs as well as seats and fracture brace support surfaces. (Fig. 3).

Steve: This process which leads to force fit of seemingly remote ideas has taken us a long way from plaster of paris and hinged irons. We are on the road to modularized support surfaces for prosthetics and orthotics.

Discussion

You can see how good listening can lead to graphic generation of a radical solution. Good listening means setting aside your usual critical analytical urges so that you can get the fullest possible picture of the new idea emerging into your mind leaving aside any ambiguities or worries about incompleteness. Behind those first hesitant words lie intentions, feelings and intuitions. By disciplining your negative concerns about a new idea, holding them back, you can release a neglected capacity to contribute, to advance, to add to the creative sum of an emerging idea.

The emerging idea has in it a spectrum of good and bad points. In most meetings people at times focus on and discuss the bad points. This is natural because the bad points loom threateningly in the forefront of your mind. But when you indulge this natural tendency, you pay a large price in teamwork, in involvement, and in the probability of developing solutions. People protest that it is unrealistic and a waste of time to pursue an idea that has fatal flaws. However, in the early stages of an emerging idea no one can know with certainty that a flaw is in fact really fatal. It seems universal that the faults in an idea will take precedence in your mind, so don't fight it; simply do not voice the faults. You will get to them in good time. Then temporarily focus your intellect, your feelings, your intuitions on that small portion of the idea that is worthwhile. Then talk about it. Now you have earned the right to bring out the faults, but choosing your words not to prove a negative point but rather to help in finding a solution.

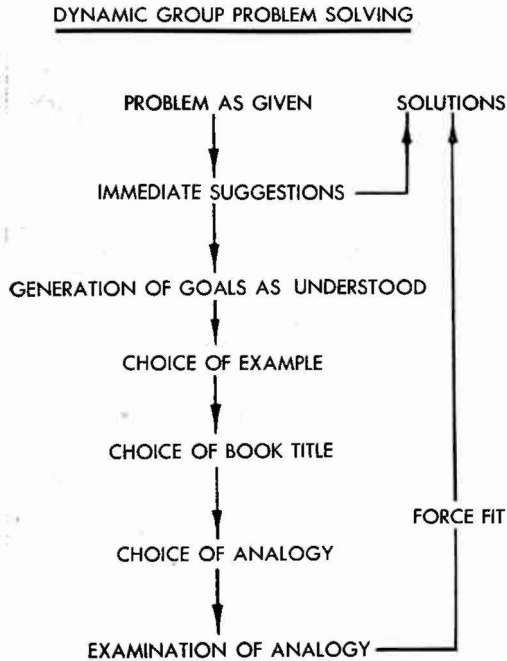


Fig. 4. The flowchart provides a model that can be modified to suit the needs of the group.

Comment

We view the procedure outlined above as a way of developing an attitude and approach to problem-solving and not a rigid, inflexible system. You will find that this approach to problem-solving can be easily adapted to a given group and may not follow the flow chart at all.

Old methods not emphasising positivity will more than likely result in run of the mill solutions. A radical change in attitude is needed from what one usually finds if remarkable innovations are to result.

FURTHER READING

George M. Price (1970) *The Practice of Creativity, a Manual for Dynamic Group Problem-Solving*, Harper and Row.