THE LADDER OF INFERENCE

While many authors have discussed the concepts of mental models and the Ladder of Inference, one of the best discussions can be found in The Fifth Discipline Fieldbook: Strategies and Tools for Building a Learning Organization by Senge, Ross, Smith, Roberts, and Kleiner. Senge also covers this topic in The Fifth Discipline: The Art and Practice of the Learning Organization, but I find the Fieldbook easier to read.

Mental models "are the images, assumptions, and stories which we carry in our minds of ourselves, other people, institutions, and every aspect of the world. Like a pane of glass framing and subtly distorting our vision, mental models determine what we see." (Fieldbook, p 235) Mental models are a compilation of our experiences in dealing with the world and help us make decisions on how we handle future problems. However, as Rick Ross points out "We live in a world of self_generating beliefs which remain largely untested. We adopt those beliefs because they are based on conclusions, which are inferred from what we observe, plus our past experience." (Fieldbook, p. 242) However, our view of the world is often "eroded by our feelings that:

> **Our beliefs are the truth.**
> **The truth is obvious.**
> **Our beliefs are based on real data.**
> **The data we select are the real data." (Fieldbook, p. 242)**

Mental models are closely related to, and some feel the same as, paradigms. In technology, we are constantly dealing with the term "paradigm shift." But what exactly is a paradigm shift? Stephen Covey, in his book The Seven Habits of Highly Effective People, has a wonderful example of a paradigm shift. Taken from Proceedings, the magazine of the Naval Institute, Frank
Koch relates the following tale.

Example of a mental model fighting the world

Two battleships assigned to the training squadron had been at sea on manoeuvres in heavy weather for several days. I was serving on the lead battleship and was on watch on the bridge as night fell. The visibility was poor with patchy fog, so the captain remained on the bridge keeping an eye on all activities.

Shortly after dark, the lookout on the wing of the bridge reported, "Light bearing on the starboard bow."

"Is it steady or moving astern?" the caption called out.

Lookout replied, "Steady captain," which meant we were on a collision course with that ship.

The captain then called to the signalman, "Signal that ship: We are on a collision course, advise you change course 20 degrees."

Back came the signal, "advisable for you to change course 20 degrees."

The captain said, "Send, I'm a captain, change course 20 degrees."

"I'm a seaman second class," came the reply. "You had better change course 20 degrees."

By that time the captain was furious. He spat out, "Send I'm a battleship. Change course 20 degrees."

Back came the flashing light, "I'm a light house."

We changed course.

Discussion

The captain, as we were, was working under a certain mental model or paradigm. The final announcement of the seaman second class provided him with the one piece of significant information that allowed him to make a paradigm shift. A useful tool for helping us make such shifts is the ladder of inference.

In a nutshell, the ladder demonstrates how the world is made up of observable data, much as a videotape recorder might record it (see image below). Our mind selects the data we want to observe. We then add meaning to that data. From our meaning, we make assumptions about the world around us. As we move up the ladder we draw conclusions that, after time, we adopt as beliefs. From our belief structure, we take action. The "reflective loop" whether we are conscious of it or not, then determines how we select future data.

The ladder is a good tool to keep in mind when reflecting internally on your attitudes and beliefs. However, it can be very useful when trying to come to a shared meaning with someone else. If you are having trouble understanding someone's position, it is helpful to "walk them down the ladder" asking them how they drew their conclusions, what assumptions are they making, and what data they selected. If you feel you are being misunderstood, it is helpful to "walk up the ladder" starting with an observation and the meaning you added to it. From there you can discussion your assumptions and conclusions. A good example of walking down the ladder is found in the Fieldbook on pages 108 and 109. The Five Whys, as written by Rick Ross, shows how you can walk down the ladder to get to the true cause of a problem.

The Five Whys' Perspective

It's mid_afternoon, an hour before the shift changes at a manufacturing plant, and I'm the foreman. I'm walking through the plant, giving a tour to a friend who happens to be a systems thinker. Suddenly, I see a pool of oil on the floor. So I grab the nearest member of the assembly line crew: "Hey! There's oil on the floor! For Pete's sake, somebody could slip in that! Clean it up!"

When I'm finished, my systems thinking friend breaks in with a quiet question: "Why is there oil on the floor?"

"Yeah," I repeat to the crew member. "How'd the oil get on the floor?"

The crew member replies, "Well, the gabungie's leaking." All of us automatically look up. Sure enough, there's a visible leak up there in the gabungie."

"Oh, okay," I sigh. "Well, clean up the oil and get the gabungie fixed right away."

My friend pulls me aside and murmurs, "But why is the gabungie broken?"

I say, "Yeah, well, the ga_" and turn to the crew member. "Why is the gabungie broken?"

"The gaskets are defective," is the reply.

"Oh well, then, look," I say. "Here. Clean the oil up, fix the gabungie and, uh, do something about the gaskets!"

My friend adds: "And why are the gaskets defective?"

"Yeah," I say. "Just out of curiosity, how come we got defective gaskets in the gabungie?"

The shop floor crew member says, "Well, we were told that purchasing got a great deal on those gaskets."

I can see my friend start to open his mouth, but this time I get there first. 'Why did purchasing get such a great deal?"

"How should I know?" says the crew member, wandering off to find a mop and bucket.

My friend and I go back to my office and make some phone calls. It turns out that we have a two_year_old policy in the company that encourages purchasing at the lowest price. Hence the defective gaskets_ of which there is a five_year supply_ along with the leaking gabungie and the pool of oil.

In addition, this policy is probably causing other problems throughout the organization, not closely related in time or space to the root "cause."

From Peter Senge' book The Fifth Discipline Fieldbook

We live in a world of self_generating beliefs which remain largely untested. We adopt those beliefs because they are based on conclusions, which are inferred from what we observe, plus our past experience. (As previously quoted)Our ability to achieve the results we truly desire is eroded by our feelings that:

> *Our beliefs are the truth.*
> *The truth is obvious.*
> *Our beliefs are based on real data.*
> *The data we select are the real data.*

For example: I am standing before the executive team, making a presentation. They all seem engaged and alert, except for Larry, at the end of the table, who seems bored out of his mind. He turns his dark, morose eyes away from me and puts his hand to his mouth. He doesn't ask any questions until I'm almost done, when he breaks in: "I think we should ask for a full report." In this culture, that typically means, "Let's move on." Everyone starts to shuffle their papers and put their notes away. Larry obviously thinks that I'm incompetent __ which is a shame, because these ideas are exactly what his department needs. Now that I think of it, he's never liked my ideas. Clearly, Larry is a power_hungry jerk. By the time I've returned to my seat, I've made a decision: I'm not going to include anything in my report that Larry can use. He wouldn't read it, or, worse still, he'd just use it against me. It's too bad I have an enemy who's so prominent in the company.

In those few seconds before I take my seat, I have climbed up what Chris Argyris calls a "ladder of inference," __ a common mental pathway of increasing abstraction, often leading to misguided beliefs:

> *I started with the observable data: Larry's comment, which is so self_ evident that it would show up on a videotape recorder . . .*
>
> *I selected some details about Larry's behaviour his glance away from me and apparent yawn. (I didn't notice him listening intently one moment before) . . .*
>
> *I added some meanings of my own, based on the culture around me (that Larry wanted me to finish up) . . .*
>
> *I moved rapidly up to assumptions about Larry's current state (he's bored) . . .*
>
> *and I concluded that Larry, in general, thinks I'm incompetent. In fact, I now believe that Larry (and probably everyone whom I associate with Larry) is dangerously opposed to me . . .*
>
> *thus, as I reach the top of the ladder, I'm plotting against him.*

It all seems so reasonable, and it happens so quickly, that I'm not even aware I've done it. Moreover, all the rungs of the ladder take place in my head. The only parts visible to anyone else are the directly observable data at the bottom, and my own decision to take action at the top. The rest of the trip, the ladder where I spend most of my time, is unseen, unquestioned, not considered fit for discussion, and enormously abstract. (These leaps up the ladder are sometimes called
"leaps of abstraction.")

I've probably leaped up that ladder of inference many times before. The more I believe that Larry is an evil guy, the more I reinforce my tendency to notice his malevolent behaviour in the future. This phenomenon is known as the "reflexive loop": our beliefs influence what data we select next time. And there is a counterpart reflexive loop in Larry's mind: as he reacts to my strangely antagonistic behaviour, he's probably jumping up some rungs on his own ladder. For no apparent reason, before too long, we could find ourselves becoming bitter enemies.

Larry might indeed have been bored by my presentation __ or he might have been eager to read the report on paper. He might think I'm incompetent, he might be shy, or he might be afraid to embarrass me. More likely than not, he has inferred that I think he's incompetent. We can't know, until we find a way to check our conclusions.

Unfortunately, assumptions and conclusions are particularly difficult to test. For instance, suppose I wanted to find out if Larry really thought I was incompetent. I would have to pull him aside and ask him, "Larry, do you think I'm an idiot?" Even if I could find a way to phrase the question, how could I believe the answer? Would I answer him honestly? No, I'd tell him I thought he was a terrific colleague, while privately thinking worse of him for asking me.

Now imagine me, Larry, and three others in a senior management team, with our untested assumptions and beliefs. When we meet to deal with a concrete problem, the air is filled with misunderstandings, communication breakdowns, and feeble compromises. Thus, while our individual IQs average 140, our team has a collective IQ of 85.

The ladder of inference explains why most people don't usually remember where their deepest attitudes came from. The data is long since lost to memory, after years of inferential leaps. Sometimes I find myself arguing that "The Republicans are so_and_so," and someone asks me why I believe that. My immediate, intuitive answer is, "I don't know. But I've believed it for years." In the meantime, other people are saying, "The Democrats are so_and_so," and they can't tell you why, either. Instead, they may dredge up an old platitude which once was an assumption. Before long, we come to think of our longstanding assumptions as data ("Well, I know the Republicans are such_and_such because they're so_and_so"), but we're several steps removed from the data.

Using the Ladder of Inference

You can't live your life without adding meaning or drawing conclusions. It would be an inefficient, tedious way to live. But you can improve your communications through reflection, and by using the ladder of inference in three ways:

> *Becoming more aware of your own thinking and reasoning (reflection);*
> *Making your thinking and reasoning more visible to others (advocacy);*
> *Inquiring into others' thinking and reasoning (inquiry).*

Once Larry and I understand the concepts behind the "ladder of inference," we have a safe way to stop a conversation in its tracks and ask several questions:

> *What is the observable data behind that statement?*
> *Does everyone agree on what the data is?*
> *Can you run me through your reasoning?*
> *How did we get from that data to these abstract assumptions?*
> *When you said "[your inference]," did you mean "[my interpretation of it]"?*

I can ask for data in an open_ended way: "Larry, what was your reaction to this presentation?"

I can test my assumptions: "Larry, are you bored?"

Or I can simply test the observable data: "You've been quiet, Larry." To which he might reply:
"Yeah, I'm taking notes; I love this stuff."

Note that I don't say, "Larry, I think you've moved way up the ladder of inference. Here's what you need to do to get down." The point of this method is not to nail Larry (or even to diagnose Larry), but to make our thinking processes visible, to see what the differences are in our perceptions and what we have in common. (You might say, "I notice I'm moving up the ladder of inference, and maybe we all are. What's the data here?")

This type of conversation is not easy. For example, as Chris Argyris cautions people, when a fact seems especially self_evident, be careful. If your manner suggests that it must be equally self_evident to everyone else,

you may cut off the chance to test it. A fact, no matter how obvious it seems, isn't really substantiated until it's verified independently __ by more than one person's observation, or by a technological record (a tape recording or photograph).

Embedded into team practice, the ladder becomes a very healthy tool. There's something exhilarating about showing other people the links of your reasoning. They may or may not agree with you, but they can see how you got there. And you're often surprised yourself to see how you got there, once you trace out the links.