Closed World – Inventive Thinking Inside the Box

NASA's Fisher Space Pen

Legend has it that NASA invested millions of dollars in developing a "space pen" that would perform well in zero gravity conditions. At the same time Soviet cosmonauts simply used pencils.

Regardless of the fact that we now know this story to be a myth, it provides an important insight into the characteristics of inventive ideas and solutions. It is that most of us prefer simple inexpensive solutions over complicated costly ones. This is also true when we address new product development processes. Obviously, we favor ideas that are easy and inexpensive to implement over those that require the introduction of new technologies and heavy investment. All this may sound trivial. Yet the really interesting question is: why do we so often come up with needlessly complex ideas, and how do we get to the inventive, *in*expensive solutions?

The *Closed World* condition – thinking under constraints

Dr. Roni Horowitz, one of the developers of the SIT methodology, indicated in his PhD thesis, that any solution that complies with the following sufficient conditions will necessarily be Inventive: the *Qualitative Change* condition and the *Closed World* condition.

The *Closed World* condition stipulates that in the development of a new product or when addressing a problem, one must utilize only elements already existing in the product/problem or their immediate environment. This condition forces us to rely on resources that are already at our disposal instead of "importing" new external resources for the solution.

The wetsuit

The wetsuit is a simple example of the *Closed World* condition. It functions in cold water environments, where body heat loss is a problem potentially causing hypothermia. Solutions that call for external resources, i.e. ones that are far from the *Closed World,* employ added elements such as external heaters embedded in the suit or thicker insulation layers. Indeed, when it comes to extreme diving situations, such as deep-water or ice-water diving,

these types of solutions are in fact required. However, they are expensive, complicated and cumbersome. By contrast, the simple wetsuit utilizes a resource that is abundantly found in the scuba diver's environment – water. The suit's fabric absorbs water from its surroundings and envelops the diver's body with a thin layer of water. The diver's own body-heat warms the water in the suit, producing a layer of warm water insulating the diver's body from the cold environment. The diver's body is kept warm using resources from the *Closed World* of the problem, namely the diver's own body heat and the water from his or her *immediate environment*. It is actually an especially elegant example of the condition, since the cold water, the original cause of the problem, is converted into a resource for its solution. This kind of reversal, in which the problem is transformed into a solution, is also an example of the *Qualitative Change* condition mentioned above. More about the *Qualitative Change* condition in an upcoming article.

The meaning of the "Immediate Environment"

The concept of the "Immediate environment" is relative, and depends very much on context. Nevertheless, there are several principles that help one identify elements from a product's (or system's) immediate environment: first we look for resources that have **physical proximity,** i.e. are actually touching the product or problem system, or are close to them. Next we look for resources that have **functional proximity,** i.e. their function is similar to that of one of the resources found in the problem system or product. For example a pen and a pencil have similar roles and thus one can say that the pencil is functionally close to the pen. Last, we look for resources that have **structural proximity,** i.e. their structure is similar to that of resources found in the product or problem space. For instance, one could say that a cellular phone is structurally close to a calculator since they both have a key pad and a screen.

Thinking *Inside* the Box

The *Closed World* condition often provokes resistance as it runs counter to some of the most common intuitions about creative thinking, especially the ubiquitous notion of "thinking out of the box". The essential claim of "thinking out of the box" is that in order to produce ideas that are new and different, you

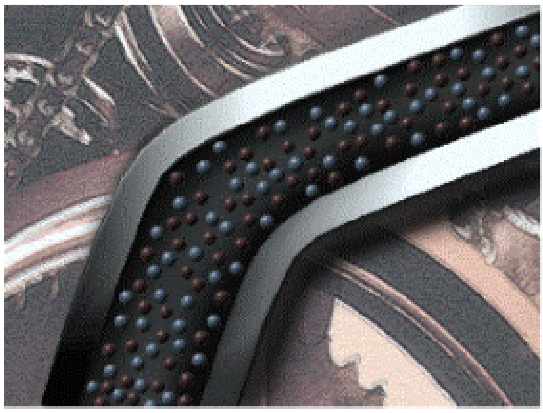
need to somehow move beyond normal thinking patterns, to a universe located outside the metaphorical box. The problem is that the imperative to "think out of the box" is not usually accompanied by clear instructions of how to actually do so. The *Closed World* condition, by contrast, forces the thinker to find a creative solution by heavily limiting his or hers space of possibilities. It forces one to wander down new thinking paths, with the constraint that these paths are found in the immediate environment of the problem, in its closed world. Since the scope of possibilities is artificially limited there is no choice but to reconsider the relations between elements found in the problem or product and pay closer attention to them: their arrangement in space and time; their assigned functions and their necessity. Thus, the *Closed World* condition sets us on a collision course with our fixedness, allowing us to arrive at solutions which are both innovative (different from the usual) and simple (since based on existing and known elements).

A *Closed World* brainteaser

To round off this introduction to the Closed World condition, we'll leave you with a problem to solve.

The problem

An engineer working at a metal processing factory encounters a problem. Hard metal pellets, used for processing metal sheets, are accelerated by an air jet in a bent pipe. The systems works continuously and the pellets abrade the pipe at the bend or “elbow”. As a result the bend must be replaced every four weeks. An attempt to install a tougher elbow did improve the situation but as the elbow had to be replaced every seven weeks, the solution was deemed unsatisfactory.



Your turn to use *Closed World* thinking

Take a few minutes to try and solve the problem. Remember that in order to work within the *Closed World* of the problem, you must use only elements and resources found in the immediate environment of the problem space.

One *Closed World* solution

The engineer decided to create a cavity or pocket in the elbow (see diagram). Since the pocket is always full of pellets, the collision energy of the moving pellets is absorbed. The result is that the elbow itself suffers little or no abrasion and is seldom replaced. This solution is an example of an inventive solution in the closed world since no new resources were employed, nor any new technical capabilities that were not easily accessible to the engineer.