

## **A Peircian Framework for using Systems Dynamics Modelling in Management Inquiry.**

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### **Introduction**

Management is about action designed to bring about change in some situation. Any sane management action implies the manager holds:

1. a representative mental model of the current situation and an understanding of why it has to change,
2. an acceptable and feasible mental model of the desired changed situation and an understanding of why it is more desirable than the current situation,
3. a representative mental model of how the world works in the particular situation under consideration that, and
4. a belief that the situation can be improved through management action.

Collectively these give the framework that provides the logic and the rationality of the management action. The effectiveness of the action will largely be determined by how appropriate these mental models are to the situation and how much coherence they give to the action.

### **Management Inquiry, Learning and the Scientific Method**

In order to promote more effective management action the ideas learning and the need to be more scientific have become popular over the past decade. Charles Handy has synthesised many of the ideas of learning into his cyclic learning model which consists of four phases: Question, Theory or Answer, Testing, and Reflection. The reflection leads to new questions and the cycle starts again.

Reg Revans has spent a life time in an attempt to give management a scientific basis. His work is finally starting to receive the recognition it deserves. Revans suggests that the scientific method consists of five phases:

1. observation of some phenomena,
2. development of a theory to explain the phenomena,
3. testing the theory in practice,
4. comparing the results of the test with those predicted by the theory, and
5. reviewing the observations and the theory in the light of the test results.

Revans suggests that the scientific method is the basis of sound management practice and compares it to the formulation of a manufacturing strategy which involves:

1. market survey,
2. development of a manufacturing strategy,
3. operations which realises the strategy,
4. comparison of actual sales with those predicted by the strategy, and

In fact the scientific method is nothing but the intelligent realisation of human needs which:

1. establishes what needs to be done,
2. decides how to do it,
3. does it in what seems to be the best possible way,
4. evaluates how well it was done, and
5. reviews steps 1 and 2.

Perhaps the best demonstration of this process is the Deming cycle: Plan, Do, Check, and Action or Adjust, which underlies Japanese management practice. This similarity is not surprising when one learns that Deming's mentor, Walter Shewhart, was a successful scientist in the Bell Laboratories.

Clearly there is a close link between management inquiry, learning and the scientific method. I would suggest they are different perspectives of the same process.

### **CS Peirce's Contribution**

CS Peirce the founder of American Pragmatism has given us the most elegant description of the scientific method:

1. Abduction: the process of generating an explanatory hypothesis that plausibly explains the phenomena one is faced with,
2. Deduction: the process of predicting the practical consequences of the hypothesis being true in a particular situation, and
3. Induction: the process of testing the hypothesis in that situation.

Peirce developed a comprehensive philosophical system to validate his description of the scientific method and in doing so gave birth to the Pragmatist School of Philosophy. It was William James and John Dewey who popularised it and whose names are more closely associated with it. Although Peirce has been hailed as the greatest philosopher to come out of the USA, it is only recently that his work has started gaining increased recognition outside of university philosophy departments.

This discussion so far has revolved around the ideas of learning and scientific inquiry. Peirce suggests that we know the world to the extent of the stable beliefs we hold about the world. Our actions are based on these beliefs since they predict the consequences of our actions. When the actual results of our actions are different from those predicted by our beliefs, we start to doubt our beliefs and they become unstable. Since we cannot act on unstable beliefs we start an inquiry process to "fix" new stable beliefs. While there are a number of "methods" of fixing belief, the scientific method is the only reliable method in the long term.

Peirce's idea of belief and the idea of a mental model are very similar. Management inquiry is about developing appropriate and stable mental models of situations which then become the basis of our action within those situations. If we are learners and scientific in our ways we will continually be testing our mental models against reality and changing them where necessary. The process is cyclic and cybernetic in nature in that if we

continue long enough our mental models will become better and better representation of reality. This is re-assuring in a physical world that is reasonably stable, but the management world is unstable and continually changing and what was a good mental model yesterday is not necessarily so today. So we often don't have the time to move through a number of learning cycles. Each time we get it wrong we cost the our organisations both financially and socially. We need to focus on "getting it right first time". It is in this context that we have found Peirce's idea of Abduction most useful.

In management terms abduction is the process of coming up with a plan of action. The better we are at this the more often we will be "right first time". Management abduction consists of three phases:

1. Immersion: This is an observation, questing and data collection phase. The idea is to immerse yourself in the situation and get a feel for it rather than just gathering "objective" facts.
2. Generating a range of plausible explanations or hypotheses that explain your observations and data
3. Selecting the hypothesis that best explains the observations and is most likely to lead to practical management action.

It is in this process that we have used Systems Dynamics modelling very useful.

### **Using Systems Dynamics Modelling**

When faced with a problematic situation requiring management action it is useful to conceptualise it as the output of a transformation system that has transformed an acceptable situation into a problematic situation. The problematic situation is a product of the transformation system which consists of a set of interacting parts that have co-produced the problematic situation. The purpose of the immersion phase is to discover the plausible parts of the transformation system. Russel Ackoff suggests three types of transformation systems:

1. A mechanistic system in which the systems have no choice of their own nor do the parts,
2. An organismic systems which have choice of their own but their parts do not, and
3. A social systems in which both the systems and their part have choices of their own.

Managers mostly deal with social systems. It is the different human elements of organisations that display different choices and the resulting behaviours that add to the complexity of management.

The transformation system can usefully be represented by a Systems Dynamics model. A range of different models can be built each with different parts and relationships between the parts. The different models can be built from different perspectives. The use of different metaphors as a basis for a modelling has proved useful. The purpose is to find a model that appropriately reflects the situation and that can lead to management interventions that are both systemically desirably (I.e. it will lead to the desired result) and culturally feasible within the problem situation.

The models consist of causal diagrams which are modelled either qualitatively by developing a story around them or quantitatively on a computer. The model that best explains the problematic situation is adopted as the problem description and becomes the basis for a plan of action. The GIGO idea is relevant here - the plan of action can only be as good as the problem description. The problem description is modelled under a number of practical implementation conditions and the insight gained is used to develop a plan of action.

This process is not unlike the work done by Arie De Gues and his colleagues at Royal Dutch Shell. The models become transitional objects on which managers test their understanding of a problematic situation, learn from the process and increase the probability of "getting it right first time". Peirce's work on abduction has given us the philosophical basis on which to design and manage the process of "getting it right first time".

### **Bibliography**

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