Evaluating Organizational Change: The Role of Ontology and Epistemology

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ABSTRACT

The evaluation of organizational change is a thorny issue. Firstly, accurate data depicting the organization's response to a change process are very difficult to collect, and the process can be corrupted by the Macnamara Fallacy. Secondly, the evaluative conclusions derived from the data are complex high-inference chains of reasoning based on implicit, taken-for-granted beliefs and values. Specifically, ontological and epistemological paradigms broadly determine the context for the conclusions of the evaluative inference, even though they are rarely made explicit. This paper presents two sets of ontological and epistemological paradigms; one set is modernist, and the other is postmodernist. It then applies them to organizational change data to demonstrate the divergent evaluations that can be constructed.

INTRODUCTION

The role of ontological and epistemological paradigms in the evaluation of organizational change is the global focus of this paper (O'Donnell, O'Regan & Coates, 2000). Specifically, it deals with the interpretation of research data associated with the evaluation of a professional development program that aimed to assist a manufacturing organization to transform its firefighting culture into a learning culture. The impetus for the paper was the divergence in the interpretations of the evaluation data by some of the management and the researchers (authors).

In this paper, the authors analyse this divergence reflexively using the model of human action (Butler, 1994, 1996) that was the foundational model of the organizational change processes that they had implemented and researched. All designers of human change programs implicitly or explicitly make use of models which explain why people do what they do. The authors have explicitly researched changing workplace practices using the Butler Model of Human Action (Figure 1). The model has five components: two outside the self, two inside the self, and one connecting the inside of the self to the outside.

Public Information is outside the self in the form of theories, formal procedures, policy directives, research results, quality assurance processes, etc. that seek to direct and improve human performance and professional practice.

Personal Practical Knowledge is a store

of actionable knowledge and understanding attained through lived experience. It is enriched by wider and more complex experiences. It cannot be extended systematically, because it is dependent upon the contingencies of the work context. The system of personal practical knowledge is distinct from the system of abstract knowledge. This practical knowledge, these action schemas, are the greatest assets possessed by an adult in the workplace.

World View is a collection of personal beliefs, values, and assumptions. It is an individual's own way of looking at the world, derived in part from tradition and culture, and is, therefore, historical and contextual. The world view is a map by which one negotiates the progress of one's life. It is active in all meaning-making and all responses, and is, therefore, very visible in the workplace. It is hard to think about one's world view because it is what we think with.

Reflection is the central cognitive process in the model of human action. Reflection is the primary learning process in the realm of adult performance at work. Reflection is a learning interaction with professional practice and public information, leading to the enrichment of personal practical knowledge and the questioning of the world view of the self and the organization.

Professional Practice is the human action, itself undertaken to achieve important performance goals in particular contexts. Human action is expressive of the world view. This model proposes that workplace performance is developed and perfected in context by continually enriching one's personal practical knowledge and world view.

When the Butler Model is applied to the design of organizational change processes, it implies that the greatest leverage is in the world view domain, not in the public information domain. Changing one or more beliefs, values, or assumptions changes specific behaviours radically and forever. It also implies that if the responses of people to the same situation are divergent, then the most likely cause is divergent world views. The authors accept the postmodernist position that people with differing world views live in different worlds and routinely create divergent interpretations of shared events. Therefore, when some of the managers proposed a different interpretation of the evaluation data to the authors, the latter went searching for the root cause in the world views of the two groups, and hence the development

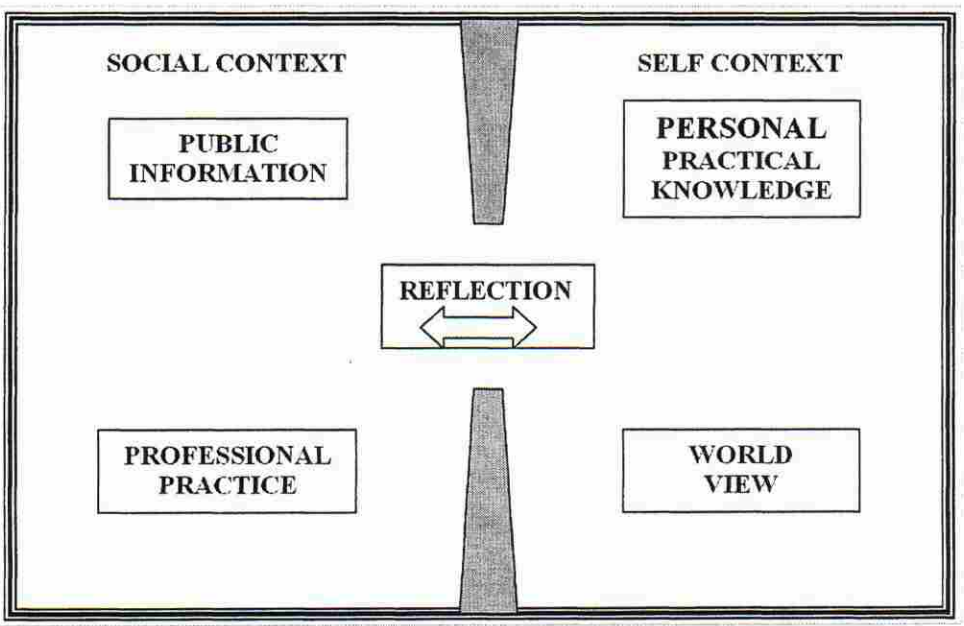

Figure 1: Butler Model of Human Action.

of this paper. The authors are idealists, rather than realists, and do not accept that there is a higher level protocol or set of principles for abstractly proving or disproving world views. Hence, the divergence between managers and the researchers can only be understood and discussed in a socially constructivist manner using all available tools (data, models, etc). However, this leaves open the possibility that the divergence at an individual level can be resolved by changing beliefs.

THE EVALUATION PROCESS

The analysis can be initiated by introducing the Kirkpatrick (1959a, 1959b, 1960a, 1960b) taxonomy of individual and organizational responses to change programs. The four Kirkpatrick responses are:

- Affective: participants like/dislike the program, find it useful/not useful
- Cognitive: participants achieve/not achieve meaningful knowledge
- Behavioural: participants change/not change workplace behaviours
- Organizational: organizational level indicators show change/no change

Organizations promoting change want their members to individually achieve positive affective, cognitive, and behavioural reactions, and then for these individual responses to flow through into a more effective organization. However, the relationships between these levels within the lived life of an adult in the workplace are known to be complex. Based on present research, the correlations between these levels are paultry, with most of the important cells in the correlation matrix empty (Allinger, Tannenbaum, Bennet, Traver & Shotland, 1997). One avenue of explanation for these nil results is that it is a consequence of the difficulties associated with collecting workplace data (as opposed to workshop exit data) and the costs of avoiding the Mcnamara Fallacy (Handy, 1994:219):

> *The first step is to measure whatever can easily be measured. This is OK as far as it goes. The second step is to disregard that which can't be easily measured or to give it an arbitrary quantitative value. This is artificial and misleading. The third step is to presume that what can't be measured easily really isn't important. This is blindness. The fourth step is to say that what can't be easily measured really doesn't exist. This is suicide.*

But a more radical explanation is that the assumptions of the Kirkpatrick quantitative research program are not valid. The Kirkpatrick program is modernist, it assumes a mechanical social order. Perhaps the empty correlation matrix is an empirical manifestation of the postmodernist critique.

Despite the acknowledged difficulties and possible fallacies, the data reported later in this paper were collected at the behavioural response level within a manufacturing organization. In other words the data represents the behavioural responses of the people in the change program. The data were collected in the workplace with the help of an ethnographic observer, placed there for twelve months.

The data, however are not the issue here. They are used in this paper as the substrate upon which to elaborate evaluative constructs from two congruent sets of ontological and epistemological paradigms, one modernist and the other postmodernist. As Boje (1994:450) wrote: 'postmodern theorists challenge modernist constructions that elevate the impersonal, functional, and mechanical social order over the personal.' The implications of the postmodernist stance for the evaluation of organizational change will be elaborated.

The modernist paradigm set is a combination of the implicit epistemology embedded in the transmissivist model of professional development, along with a Newtonian model of the ontology of organizations. The transmissivist model implies that the relationship between cognitive and behavioural responses is simple: telling leads to knowing leads to doing. The Newtonian model assumes

that the relationship between individual knowing and doing and organizational knowing and doing is linear and predictable (Antonacopoulou, 2001).

The postmodernist paradigm set combines a social constructivist epistemology with a complex adaptive system model of the ontology of organizations. These models make the relationships between individual knowing and doing, and the organizational response chaotic and non-linear.

The paper will now introduce the context of the manufacturing organization and the nature of the change program. Then, the two sets of ontological and epistemological paradigms will be described. This will be followed by the evaluative application of the two sets of paradigms to the data collected within the organization.

THE ORGANIZATION AND THE CHANGE PROGRAM

The organization manufactures white goods for the Australian and international market. Before the change program the production culture was described as loud, active, immediate, reactive, unplanned, and non-reflective. Fire-fighting was the metaphor most often used to describe the way the production imperative caused problems to be addressed. The emphasis was on 'speed,' as opposed to 'long-term solutions'. For example:

You have, one manager or a group of managers yelling and screaming above you, 'Fix this now!' So you will grab the closest thing that [does the job]. Because in those situations it comes down to 'I've got the line stopped, I have to get it running. What have we got in the factory I can use?' You don't have time to go back and find something else to do the job. So you virtually walk out into the factory. 'This is what we use here. Good!' slap that in and see what happens. And if it happens to do the job then that's exactly what they'll do, they'll just put it in and go.

Fire-fighting does not happen in the background. Instead, everyone is aware of it and of the importance of the task. Being 'seen to do' is more valued than thinking quietly:

It seems to be this environment that we're in, that he, he who talks the loudest benefits the most . . .. He who shouts the highest and says 'Look at what I did!' . . . Quick things and off the cuff . . . it can be an off-the-cuff thing but as long as you're seen to be doing something, it's more important than the quality of the thought that's gone into it. . . . So if you sit back and think and plan something, it's not seen.

These are negative descriptors, but a pride in performance coexisting with this negativity. While participants spoke angrily and forcefully about the injustices and dire outcomes from the emphasis on 'doing' above 'thinking' (which usually resulted in lack of planning and non-revision of 'band-aids'), there was also a pride expressed in having saved the factory from certain disaster.

The management agreed to join the research project because they wished to move the organization towards the ideal of the learning organization. A change program – The Action Thinking Program – was designed and implemented (Argyris, 1994; Butler, 1996; Edwards, Butler, Hill & Russell, 1997). Simultaneously, research was conducted on the interaction between the program and the organizational culture to understand how actionable learning developed in this particular setting (Scott, Butler & Edwards, 2001). Specifically, the program aimed to enhance and/or sustain the development of:

- People who take responsibility for their own actions;
- People committed to life-long learning through reflection on action;
- People skilled at thinking and learning: metacognition;
- People understanding individual differences and able to design for synergy;
- People skilled at helping others to reflect, learn and grow professionally;
- People with models for managing their own

time and priorities;

- People skilled at giving and receiving feedback;
- People who are proactive in solving systemic problems in the workplace;
- People who believe in their own rich knowledge and that of others;
- People who understand models of human action and professional growth.

To achieve these objectives the Action Thinking program had four main strategies:

- Offering skills, understanding and models derived from the research literature;
- Offering processes to promote personal reflection in a challenging and supportive environment;
- Using action plans to connect the workshops to the workplace so that participants are encouraged to take the knowledge and processes back into their workplace behaviour and not leave it inactive in their minds or in their notes;
- Attending to adult learning principles to create the best possible learning environment at both the workshops and in the workplace.

The following section describes the two contrasting ontological paradigms by which the change process will be evaluated in the final section.

TWO ONTOLOGICAL PARADIGMS

The advent of the learning organization (Senge, 1992) has sharply challenged the traditionally assumed relationship between training, learning, and work; "The field formerly known as *training* faces an onslaught of serious change." (Sugarman, 1998: 63). The older models assumed that there was a linear causal process: first training, then improved performance; and they assumed that the training venue was the major locus of learning (Antonacopoulou, 2001). The learning organization involves the learner more than the trainer, and proposes that "a small fraction of all learning comes as a result of formal training or teaching." (Sugarman, 1998: 64). Instead of learning being confined to a training event, the new perspective emphasises daily learning at work, and "We are not just learning to do the work better; we are building the organization's knowledge base and revising its tools, processes, and products as we work." (Sugarman, 1998: 65).

The recognition that a learning culture is required in a successful organization has thrust learning into the forefront of the program evaluation process. Explicit models that take account of workplace learning, of personal practical knowledge (Butler, 1996), must now underpin evaluation designs. Therefore, models of the learning process, models of the evolution of the learner (Butler, 1996; Buckler, 1998; Kakabadse & Kakabadse, 1999), and models of the evolution of the organization are needed (Eoyang & Berkas, 1998).

There are two dominant organizational ontologies. The first paradigm is associated with the name of Isaac Newton. Newton's mode of scientific thinking, his world view for the physical sciences, was characterised by stability, linear relationships, instantaneous effects of causes, laws independent of time or space, the tendency to equilibrium, and the promise of control. This world view dominates management thinking to this day (Laszlo & Laszlo, 1997). As Kiel (1994: 1) says "Scholars have, for at least a quarter century, recognised that management theories emulate the dominant scientific world view." Its assumptions of stability, linearity, and equilibrium lead management to aspire to predictable organizational change. Such an ontology assumes a mechanistic world, and assumes organizations are ordered, predictable and fixable machines.

With the advent of complexity theory, another scientific model is available to think about organizational change (Waldrop, 1992). Complex dynamic systems exhibit dynamism,

instability, nonlinearity, and emergence. In such models, prediction of causal relationships in organizations is impossible, and management control is an ephemeral goal (Williams, 2001: 82).

The two paradigms, linear and nonlinear, are presented for comparison in Table 1. Like all paradigms that control thinking about organizations, the Newtonian paradigm and the Chaos paradigm each have their own exclusive and incommensurable concepts, models, metaphors, assumptions, and values. These features of a paradigm are formative of the human actions of managing, developing, and changing an organization. In particular, they each have very different models of what an organization is, and how it evolves over time, and how it responds to change processes. Table 1 also gives some indication of what form evaluation takes when one adopts the different ontologies. The details in this table have been derived from many sources (for example, Stacey, 1996; Eoyang & Berkas, 1998; Henderson & McAdam, 1998).

TWO EPISTEMOLOGICAL PARADIGMS

In the last century many academic disciplines radically challenged traditional thinking about knowledge construction. The postmodern critique is the focus of this paper. Giles (2001:404) has this prediction for the remainder of the 21st Century:

Epistemologically, we create disciplinary narratives that offer certainties limited by the assumptions of those disciplines. ... Science's earlier attempt to substitute its grand narrative for that of religion was thwarted by the postmodern recognition that all knowledge is a construct, even scientific knowledge. ... (U)nless something causes a resurgence of interest in grand

Characteristics	Linear Newtonian System	Nonlinear Complex Adaptive System
Assumptions of Each System	1. Organisations exhibit predictable and controlled performance toward a goal 2. Change can be measured against predicted goals 3. Organisations are closed, have low dimensionality and are stable and predictable	1. Organisations consist of interdependent people 2. The behaviour of each person conforms to a short list of simple rules 3. The group of persons exhibits emergent, system-wide patterns of behaviour
Characteristic Behaviours and their Evaluation	1. Any continuous change implies a smooth curve of effects over any given time interval 2. It moves in a predictable way towards a pre-determined end point 3. Can be evaluated by means of periodic sampling or end-point evaluations 4. Most evaluation systems seek to identify a small number of key variables that effect change and to establish the relationship among those variables 5. Usually assume unidirectional causality 6. Quantitative approaches to evaluation assume that uncontrolled interdependence among participants is minimal; the behaviour of the whole group is the sum of the behaviors of its parts	1. Expect high levels of interdependence 2. Expect unreliable causality 3. Expect dynamic, massively entangled, scale independent, transformations 4. Change does not follow a smooth, predictable pattern 5. Change is continual but not continuous, it will be characterised by discontinuities 6. An evaluator may assign the beginning and end of an intervention, but the system itself recognises no such boundaries in time 7. It exhibits emergent, or self-organising behaviour. Two aspects of emergence are of interest to an evaluator: sensitive dependence on initial conditions (butterfly effect) and attractor regimes
Goals of the Evaluation Processes	1. To find the discrete objective elements obeying law-like mechanisms 2. To find the decontextualised ideal or model that permits prediction and control of the organisation 3. To measure the organisation's attainment of the proposed goal	1. To understand the organisation's decision making which is grounded on the a rational body of collective knowledge that has historically developed 2. To explore a desired goal through attention to feedback and the unexpected

Table 1: Linear and Nonlinear Ontologies

narratives, it looks as if the twenty-first century will be devoted to developing an ethics and an epistemology of limited range and persuasiveness. It will be an interesting century.

In this section, two epistemologies will be contrasted: one with a supposed wide coverage and certainty, and the other with a very limited range and socially constructed. The summary of the contrasts between the two epistemologies is displayed in Table 2. The details in the table have been adapted from many sources (for example, Eoyang & Berkas, 1998; Gayeski, 1998; Boshyk, 2000).

The two epistemologies have very divergent assumptions and expressions of the process of individual and social knowing and learning. The linear transmissive learning model is extensively analysed by Venzin, von Krogh, and Roos (1998:38), and they present a paradigmatic example from "Herbert Simon talks about the 'absorption of strategic plans' - which means that it is possible to reach consensus about policies and to *implant* 'them firmly in the hundreds of heads' Simon (1993)." Gayeski (1998: 36) similarly concludes that the "Traditional step-wise, linear models for

Characteristics	Linear Epistemology Implicit in Transmissivism	Nonlinear Social Constructivist Epistemology
Assumptions of Each System	1. There is a body of correct knowledge that is held by experts 2. The expert presenters know the answers to performance problems in the organisation 3. There is little debate or diversity of values about topics and solutions amongst participants 4. The correct information should be given out in the most efficient manner 5. Top-down is the best way to get a single coherent message across to everyone in the organisation 6. Learning is an exchange from the expert to the participant 7. The participants are efficient passive receivers if the messages in clear and they are attentive 8. The participants are 'blank slates.'	1. Some of the best business solutions can come from fellow employees 2. All participants possess knowledge that is of high value 3. Participants are viewed as constructivist and active thinkers with emerging theories about working and learning 4. Participants can be encouraged to change through support and modeling from the group 5. Learning involves reflection on action in a group setting and involves effective feedback to individuals 6. Participants need to be offered learning with no taught answers 7. Participants add value to themselves as they contribute value to others 8. The most powerful determinant of what participants can learn is what they already know
Characteristic Behaviours and their Evaluation Design	1. Workshops are sequenced part to whole 2. Strict adherence to the workshop program is highly valued 3. Workshop activities rely heavily on prepared notes and workbooks. 4. Presenters generally behave in a didactic manner, disseminating information 5. Participants primarily work alone 6. Passive, bookish, listening, reading, case-studies, application-type learning is dominant 7. Evaluation is viewed as separate from the program and occurs almost entirely through measuring the attainment of prespecified objectives 8. Evaluation seeks the correct answer or perfect replication to validate learning.	1. Workshops are presented whole to part with emphasis on models 2. Discussions amongst participants are highly valued. 3. Workshop activities rely heavily on participant input 4. Presenters generally behave in an interactive manner, mediating the environment for participants 5. Participants primarily work in groups 6. Active, project driven, reflective learning-by-doing experiences are dominant 7. Evaluation of learning is interwoven with the program and occurs through observations and reflective processes at the workshop and in the workplace 8. Evaluation seeks to understand what the participants have learnt, what meanings have they made and thus to determine the future direction.
Goals of the Evaluation Processes	1. To make the presentation process more focused 2. To package the message more explicitly and coherently 3. To measure the attainment of the goals by the organisation.	1. To give feedback about learning to everyone involved 2. To improve the learning contexts and processes 3. To determine the level of meaning attained by the participants.

Table 2: Linear and Nonlinear Epistemologies

instructional design no longer fit learning and performance improvement environments." The social constructivist model, on the other hand, argues that knowledge cannot be directly conveyed from one individual to another, because the receiver is always going to individually interpret and make meaning of the input from the world, and be aided and transformed in this process by the social group within which the receiver is situated.

The following section will present a sample of the data from the organization involved in the research. Then it will apply these paradigms to the data to derive the evaluative inferences.

THE DATA

The research project produced a longitudinal data set for thirty-five individual participants in the organizational change process. There is strong evidence in the data to show that participants accepted the value and efficacy of the program at different times, for different reasons, and responded to different segments. Initially, most participants found cognitive interest and value in the program, but this interest did not interrupt their regular path in terms of the way they worked and interacted with their colleagues. Then, very suddenly, some entered a process that led to behavioural change as evidenced by themselves and others. They had learned something new, and were now actively attempting to behave differently.

Many participants also reported that the process of changing behaviourally was like entering a pit of confusion and doubt (Butler, 1996), but that eventually they came out of the pit into the 'ecstasy' of learning, a profoundly useful and fulfilling process. The depth and the duration of the pits were different for different people, again echoing the uniqueness of the learning responses.

The program was implemented and researched within the organization for about eighteen months. The times when participants first responded in observable ways to the program are as follows:

- One to six months: 10 participants
- Seven to twelve months: 8 participants
- Thirteen to eighteen months: 7 participants

These learning transformations were triggered by events that were diverse in their nature and origin. One common transformation that the program had to promote was the realization that the production ethic could coexist with personal learning. One person expressed the difficulty of spending time at work on anything which will benefit him personally in these words:

I found it hard, initially I found it really hard to work on, to spend time working on things for me . . . And a lot of that was because of the work level, the workload that I had, but I just felt guilty about giving time to me during work.

We interpreted this response as deriving from the belief that only the organization should benefit from his efforts spent during work-time. This is a construction of the person as a 'technically-focused worker,' whose purpose is production, and where the personal 'self' is secondary or even irrelevant for the purpose of work. The program brought with it a construct of the person at work as 'whole' and, therefore, the development of 'self' at work is an integral part of our responsibility to ourselves and to our organization's future knowledge and wisdom. This person, and others, made this transformation successfully.

Another person, a Team Coordinator responsible for the final segment of the manufacturing line where the product was tested and packaged, stated that he was not going to change until he saw personal evidence of the program's efficacy. The evidence became available when a new model was introduced. When it came to testing the new products, it

was found that the liners were splitting, and so the product had to be sent off to the rework section. In the past this Team Coordinator would have said: 'You guys are doing it and it's not my problem,' and he would have not been interested in the proposed solution of putting on more tape. Instead, the Team Coordinator decided to try out Argyris Model 2 Feedback and Double Looping, and insisted that the other production line Team Coordinators and operators solve the problem with him. Following an investigation, it was found that a blade was not cutting the liner properly because the support under the liner had been somehow removed. This was rectified, and the connections made to other problems in the process. This resulted in a saving of many thousands of dollars a year for tape and other materials, plus saving the cost of reworking the damaged products. Thus, the person obtained the data and the personal experience of the worth of the ideas and processes, and changed his performance radically and efficaciously.

Some other triggers that led to transformations were personal conditions that existed before the program commenced and of which the participant only became aware once they entered into the program. Some other events were conditions that arose during the program, either associated with the activities of the program or outside the program. Some observed triggering events were:

- A person in trouble: facing a crisis in self development, seeking answers to the pain they are experiencing;
- A person in the midst of change: who is looking for ideas, is a model maker, a learner, open, questioning, looking for added value to his work;
- A person habitually looking for growth: looking for outside help, willing to learn;
- A person locked away in the science of engineering: who discovers from a colleague that to be promoted he must learn how to manage people;
- A person with a limited circle of concern: who discovers that more could be done at work, and he perceives a responsibility to help the organization improve;
- A person who thought his development was complete: who then discovers through the program that there is a world of ideas that he never knew existed;
- A person who suspected he needed to change but didn't know how to: who then discovered the very models and skills in the program that he needed;
- A person desperate for his own personal development: who finds in the program the focus on the self very rewarding and uses it for strong personal growth.

About ten of the participants were observed to be unchanged by participation in the program. The model of human action (Butler, 1996) that was the foundation of the Action Thinking Program instigated the collection of data concerning the belief systems of these participants. The beliefs of the following participants were never observed to be displaced by the Action Thinking Program:

- A person who believed that the program was for all the others in the organization and not for himself ;
- A person who believed that his career would never need what the program had to offer in terms of personal and professional skills and processes;
- A person who believed that he was too busy to have time to learn anything new at this point in time;
- A person who believed his personality would unravel if he allowed any change;
- A person who believed that work improvement was not about his own personal self and who only wanted to learn work skills and technical skills ;
- A person who believed that the workplace was hostile to workers and new programs were not to be trusted;
- A person who believed he would soon

leave the company.

In the three years since the completion of the program, the participants have reported to the researchers that profound learning and understanding is still continuing and being fed by processes and models delivered by the program. In the following section, this data will be interpreted by the two sets of paradigms to complete the evaluative inferences about the Action Thinking Program.

THE TWO EVALUATIONS

Firstly, these data can be interpreted within the modernist set of ontological and epistemological paradigms: Transmissivism and the Linear Newtonian System. Evaluating the data from this perspective the following inferences are possible:

- The professional development program was very incomplete in its impact, as not every participant demonstrated learning and behavioural change; and of those who did change, the areas of learning were partial;
- The very delayed responses of some of the participants imply that the delivery of the program was not forceful or clear at the beginning;
- The program had a very uneven and disorganized pattern of responses, which implies that the participants were insufficiently prepared for the course, or the course was disjointed, or the presenters were inconsistent;
- A proportion of the participants not showing any behavioural change implies that the program was ineffective and poorly designed and delivered;
- The results imply that the organization was not ready for the messages in the program, it was perhaps a premature step in its development;
- People experiencing deep confusion and loss of competence means that the program was unclear in its formulation and delivery;
- The Learning Organization idea has been tried and found to be ineffective in a manufacturing organization, the production imperative is just too hostile for widespread personal learning.

In summary, interpreted within the modernist, linear paradigms, this Action Thinking Program was not totally effective. The participants have learned some parts of what was required, but the program has not reached all of them with the required impact. The organization as a whole has not made sufficient progress towards becoming a learning organization. The expected cognitive response by all participants did not occur and, therefore, did not flow onto behavioural change. The very uneven response at the individual cognitive and behavioural levels meant that the organizational response was unsatisfactory in the projected timeframe.

Secondly, from the perspective of the postmodern paradigms, the nonlinear models, there are different interpretations:

- The non-linear model predicts that a specific impetus is needed to initiate change. The apparent stability of the system must be disrupted to initiate a transition to a new state. Applying this understanding to personal development implies that unless a person's stable state is disturbed, he or she will stay plateaued at the particular level of performance they have. "If the (individual) is not stressed to the point of chaos, then no change in behaviour will occur." (Cavanaugh and McGuire, 1994: 11). The data can be interpreted in this framework. Specific events were identified for most participants who significantly changed. Those that did not change may not have received the specific impetus that they needed.
- Constructivist models predict that participants will respond differently to the program because of their very divergent starting points into the program. So the program

must offer them a range of models and concepts to meet participants where they are. In the data, each person responded to a different part of the program, this is to be expected.

- The butterfly effect has immediate and profound implications for the study of the responses of the participants. First, it clearly emphasises that even the slightest difference in person-context interactions between two people could eventually become manifest as large differences in behaviour. Some random interactions between participants were documented as having major effects. "Clearly such variance in human behaviour due to the butterfly effect cannot be treated as error." (Cavanaugh and McGuire, 1994: 7).
- The study of human development requires a methodology that uses multivariate longitudinal time series data with a focus on the individual. Individuals appearing to scatter throughout the program space is exactly what one would expect within the nonlinear models. The design and delivery of the program must respond to this variance, not be condemned because of it.
- The program is still having effects on learning in the organization years after the completion of the program. This is to be expected from the nonlinear model, and can be presumed to continue for many years yet. The nonlinear model implies that such data should be collected.
- "It has been known for many years that the conscious experience of transitions from one level of knowledge to another is often an abrupt, all-or-none shift" (Cavanaugh & McGuire, 1994: 9). The data from this organization clearly shows this effect. Those participants who did change made the realisation of the need to learn new strategies very abruptly.
- When chaos occurs: "Phenomenologically, a person may feel as if he or she knows nothing and is totally confused" (Cavanaugh & McGuire, 1994, p.18). What this means to the evaluation of programs is profound. Development of learning and behavioural change are expected to be accompanied by experiences of chaos and restructuring of knowledge. Therefore, the confusion reported in the data is a positive sign that real organizational change is authentically happening. As Cavanaugh and McGuire (1994: 19) put it, "Confusion may even be a good sign in the right context."

In summary, the Action Thinking Program, evaluated from the nonlinear, postmodernist paradigms, appears to be making an impact on this organization, and it is becoming a more profound learning organization. The data shows that the responses of the individuals within the organization are close to the pattern that would be expected if the organization is modeled by a nonlinear ontology and constructivist epistemology (Butler, 1996; Buckler, 1998; Kakabadse & Kakabadse, 1999). Not everyone could be expected to cognitively respond positively and move directly to behavioural change. Similarly, it is expected that those that did reach behavioural change would do so with great variance and, therefore, would initially have a very scattered impact on the organization.

The two evaluation reports prepared from the two perspectives give strikingly different results. Evaluation is an inference. As such it uses beliefs, values, assumptions, and paradigms to arrive at evaluative conclusions. The beliefs underpinning the inferences may not always be explicitly stated, but they cannot be avoided (Butler, 1996). The nonlinear paradigm set appears to the authors to offer a more meaningful evaluation process and to show the way forward in helping the organization to change and develop into a learning organization within a realistic timeframe.

CONCLUSION

Evaluation is a form of knowing about a program's impact on an organization. Thus, evaluation is an epistemological issue which is intrinsically bound up with the prior ontological issue. The previous sections have drawn the

distinction between two epistemological and ontological stances regarding organizations: the Transmissivist/Newtonian and the Constructivist/Complex Adaptive paradigms. Corresponding to these two paradigms, there are two forms of inference from data depicting individual and organizational learning and behavioural changes based in changes in beliefs. Certainly, the epistemology of evaluation needs to address the ontology of organizational learning. Models of existence, of the process of learning, and of the evolution of the learner, determine what is known through evaluation about the design and implementation of organizational change programs.

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