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THE ROAD AND THE STREAM:

facing the turbulent stream of new product development

by

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Submitted in partial fulfillment of the requirements
for the degree of Doctor of Philosophy

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Bruce James Hanson
THE ROAD AND THE STREAM:

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ABSTRACT

This dissertation is an inquiry into the implicate order of a product development organization. The data for this inquiry are conversations within a new product development team and their immediate environment. It is an attempt to develop a generative sociotechnical systems approach by looking under the explicit chaos of the organization for the implicate patterns of order, due to the breakdown of traditional explicit structure and process in the organization.

One of the primary challenges to routine sociotechnical systems is professional individualism. In terms of evolution the challenge is similar to the deconstruction of the atom by quantum physics. What is more fundamental than the isolated individual? Process theory would suggest that events and occasions are more fundamental to reality than classes of objects. Chaos theory has described this implicate order as strange attractors, the consistent core path around which there appear to be constant varieties in the explicit nature of phenomena. The project cycle was found or speculated to be the strange attractor for this system.

The implicit holographic forms of the organization have become more salient as the organization seeks to thrive in a turbulent environment. What has occurred in many instances is the breakup of traditional
hierarchical organizations. Higher levels of organization such as job, group, function and department, have given way to multifunctional and multidisciplinary formations. At this fundamental level, the old orders of domination are breaking up whether by people or machines, calling organizations to be composed of peers coordinated through deliberative dialogue, supplanting the parental and arbitrary relationships of past organizational forms.

This dissertation is largely descriptive and projective in this implicit sense. This does not call for an intentional change in corporate culture, but the recognition of what has been called the informal organization. All people in the organization need to be able to respond to the stream of their experience beyond the road of their intentions and concepts. By better understanding their fundamental process, they can connect with others on this ground of Being and build the new organization in these green fields.
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TABLE OF CONTENTS

Abstract.................................................................................................................. ii
Acknowledgements.............................................................................................. iv
Table of Contents ................................................................................................. vii
List of Figures........................................................................................................ x

CHAPTER 1: INTRODUCTION.................................................................................. 1
  Road Building........................................................................................................ 3
  Conversations on the Road................................................................................... 6
  Two Worlds: Technology and the Environment.................................................. 8
  Ambiguity, Appropriateness and STS................................................................. 13
    Professional Intuition and Expertise................................................................. 16
    The Fundamental Value of STS...................................................................... 17
    Two Core Issues of STS.................................................................................. 19
  The Case Setting.................................................................................................. 23

CHAPTER 2: RELATED LITERATURE.................................................................... 27
  Overview of the STS Approach......................................................................... 27
  Historical Influences.......................................................................................... 28
  Theoretical Foundations..................................................................................... 34
    Open Systems.................................................................................................... 34
    The Primary Work System.............................................................................. 38
    Work System and the Environment................................................................. 46
  Principles of Design............................................................................................ 47
  Principles and Process of Implementation......................................................... 52
  Nonroutine Work................................................................................................ 56
  A Historical Review of Nonroutine Work........................................................ 56
  Deliberation Analysis: An Experimental Approach......................................... 63
    Variances.......................................................................................................... 65
    Delays................................................................................................................ 69
    Core Transformation Process......................................................................... 71
    Decision Heuristics........................................................................................... 72

CHAPTER 3: METHODOLOGY.............................................................................. 76
  Initial Methodological Assumptions................................................................. 80
  Story of the Inquiry............................................................................................ 83
  Subsequent Reflection........................................................................................ 87
  Analysis................................................................................................................ 91
  Unit of Analysis.................................................................................................. 92
  Validity.................................................................................................................. 93

CHAPTER 4: ENTRY & INITIAL SCAN................................................................. 96
"If It Is Not A Project, What Is It?" ............................................. 96
Listening to the Organizational Conversation .......................... 98
Organizational Structure .................................................. 98
We Need A Concept ......................................................... 103
Interests of the Steering Committee ..................................... 103
Wanting to Be a Pipeline .................................................. 111
Creating a Hierarchy of Teams ............................................. 115
Are You a Function or a Product? ......................................... 118
Breakdown and the Breakthrough Team ............................... 120
The Product Delivery Model .............................................. 129
Organizational Literature ................................................ 131
Project Driven Organization & Issue Driven Projects .............. 131
Management of Innovation .............................................. 137
Coordinating Methods and Integrating Mechanisms ............... 144
The Project Cycle As Coordinating Method ........................ 146
Conclusions ........................................................................ 148

CHAPTER 5: THE CORE TECHNOLOGY & THE PROJECT CYCLE .... 152
The Scheduling Deliberation ............................................. 153
Self-organizing Projects & Post-modern Conditions .............. 172
Post-modernism ............................................................... 173
Self-Organizing Systems .................................................. 195
Metaphor: Deliberations and the Project Cycle .................... 208
Reconsidering the Scheduling Deliberation .......................... 214

CHAPTER 6: ENVIRONMENTAL CONVERSATIONS &
OBSERVATIONS ................................................................ 224
Conversations from Theory Building .................................. 231
The Debuilding Deliberation ............................................. 231
The Concurrency Deliberation .......................................... 239
When Projects Do Not Ratchet Down ................................ 241
Conversations with the Local Team ................................... 242
Deja Vu Engineering ....................................................... 242
Ghosts of the Past ........................................................... 243
Missing Parties ................................................................. 245
Dropping Bombs ............................................................. 247
The Plan Is Not The Project .............................................. 249
The Execution Team Offsite ............................................. 255
A Sense Of Loss ............................................................... 256
Attention ........................................................................... 257
Conversations with Management ...................................... 259
Deep Cycle Projects ......................................................... 259
Give Me Decisions to Make ............................................. 260
The Fifth Size Deliberation ........................................ 260
The Experience of Simplicity...................................... 262
Launching Product Launch ........................................ 262
Asking The Right Questions ...................................... 264
Observations .................................................................. 267
    Site Convergence .................................................. 267
    Overlapping Experience ........................................ 268
    A Hierarchy Of Teams? ........................................... 269
    AD Board - Organizational Learning Sessions .......... 272
    Meetings ............................................................... 273
    Rewards .................................................................. 274
Response to the conversation ...................................... 275
    A Model of Project Ontology .................................... 275
    The Danger of Technology without Poetry ............... 284
    Boundaries As Bridges ......................................... 285
    The Pressure Cooker ............................................ 286
    The Organizational Dance ..................................... 288
    Breathing and Eating ........................................... 290
    Horse and Rider Crossing a Stream ....................... 291
Conversational Conclusions ....................................... 302

CHAPTER 7: CONCLUSIONS & IMPLICATIONS ................. 306
    Reconsidering STS Assumptions & Principles ........... 308
    Implications for System Management ..................... 318
    What I Have Learned .......................................... 322

BIBLIOGRAPHY ......................................................... 334
List of Figures

Figure 1: The Open Systems Model ......................................................... 36
Figure 2: The Product Development Scale-up Sites ................................. 101
Figure 3: The Product Delivery Model .................................................. 129
Figure 4: The Project Cycle ................................................................. 146
Figure 5: The Metaphor of Deliberation ............................................... 212
Figure 6: Phase Topics of the System Development Metaphor ............... 221
Figure 7: Horse & Rider Crossing a Stream ......................................... 299
CHAPTER 1: INTRODUCTION

"First there was the stream and then there was the road, and then there is the stream." So the Zen master started his talk. It occurred to me that this distinction was helpful in sorting out my research experience at AMPAP, a paper products company. The road of this dissertation is a Sociotechnical Systems inquiry to better understand non-routine work through deliberation analysis. Other researchers and practitioners trod this road. Two of the original trail blazers were Emery and Trist, who studied coal mining methods in England. However, we live in an unruly world beyond our words and concepts. Much is beyond our control and comprehension. The stream returns to us through unexpected anomalies and insights, interruptions in our road of assumptions. This is an exploratory field study of anomalies in the deliberations of a nonroutine STS inquiry at AMPAP.

The road of language can cover only so much of our world. Intuition can begin to bridge to the stream of awareness that connects us to that for which we do not have words. A more familiar phrase, perhaps, is mistaking the map for the road. But I am talking about not just our cognitive concepts but also the world of our expectations constructed also in the intentional actions and artifacts in our world. So the stream is our fluid experience, perhaps beyond rational cognition.
I asked the Roshi, "When is the stream the road?" He said, "When you sit." It is in the practice of our most basic methods that realization occurs. In Zen practice one returns to the extremely ordinary and basic activities of living — sitting, walking, eating and breathing — to find their practice. It is the reconsideration of the utterly obvious. There is wisdom in returning to the basics. In the engineering culture of AMPAP, this is indeed what I found. When in doubt, the engineers returned to fundamental engineering process they learned in school. But, of course, this is a return with a difference. Each time one seeks to return with an open mind. Suzuki-Roshi called this beginner’s mind in contrast with the expert’s mind, which is filled with expectations. Often this travel returns to simplicity on the other side of the complexity of life. One can return to beginner’s mind (Suzuki, 1969).

Both the road and the stream are present always. The road is created with my constructs and intentions about the world, and the stream is my direct experience beyond my intentions and constructs. The road feels solid and lasting, productive and energizing. The stream is ever-changing. The stream is our experience of living in an environment without intention. As William James noted, "To an infant the whole world is blooming and buzzing."(1870?) The road is our world of purpose and direction in that largely equivocal environment. Organizations can be seen as systems of order that transform that equivocality into unequivocal action (Daft & Lengel, 1987).
The metaphor of the road is commonly used, as when we wonder if we are on the right road or if we took the wrong fork or path. This issue of guidance and direction has increasingly become a part of our everyday lives in organizations, where once hierarchically determined, goals are now increasingly formulated by everyone in the organization. Many theorists such as Berger and Luckmann have come to see this road as socially constructed (1966). Phenomenology, out of which social construction perspective emerged, sought to understand the stream of experience by approaching all experience as phenomena without making claims of "objective" truth, that there is one correct way of perceiving reality. We build our road from our most direct and fundamental experience of the stream, so that there may be a congruence, harmony, and appropriateness between the road and the stream.

Road Building
In Minnesota they say that they have two seasons: winter and road construction. We constantly tend our constructs. Our cultural tradition of materialistic individualism downplays the importance of "road maintenance." Particularly in an American culture of disposable products and the image of perpetual opportunity, we have a tendency to create and forget. We do not have a strong tradition of maintaining tradition as in older cultures with perhaps a clearer sense of deep commonality... like genetic identity. Our culture of utilitarianism (Levine, 1994) is bound by more transient bonds (Etzioni, 1967). This creates "thinner" experiences in the sense that there is relatively little meaning attached to actions which are often seen as "purely" economic
or political, thus allowing dramatic compartmentalization of life (Gergen, 1989). This certainly has some efficiencies, but the concurrent isolation and atomization can be quite costly by finding our selves saturated with parts without a sense of unity or grounding.

One of the primary problems of human consciousness is being caught in illusion where we mistake the road for the stream. This means that we reify distinctions that we once created to clarify and begin to see them as the world (Gould, 1984). Generalizations about other people may serve as heuristic guides, but can be unfortunately restrictive as unquestioned stereotypes. We then are often unaware that much of our world or "life space" (Shutz, 1958; Lewin, 1949) is socially constructed through language and concepts. On the other hand, something beyond language does exist. The goal of phenomenology and other social/philosophical approaches is to return to the stream, the source of our experience, and refresh our road, our concepts and intentions, so that there is a better fit between our experience and our intentions.

As I conducted the STS inquiry at Ampap, I soon found that existing organizational theory could assist only minimally in understanding how the organization worked, let alone how it should work to become more productive. Socio-technical Systems and Quality approaches were quite successful in traditional manufacturing organizations, but in less routinized work systems their effect was problematic.
I believe that a large part of our resistance and ineffectiveness in life is that we lose touch with the stream, the ability to create our "world," and take our concepts and thinking as objective. This is why the "mystic center" of the religions of the world has always taught through metaphor and parable. The objective of my dissertation is to examine the relationship between the road and the stream in a consumer products company as it seeks to develop new products. The central contention of my dissertation is that the relationship between the road and the stream determines the productivity and satisfaction, and the generativity of the organization, its ability to refresh and reformulate itself.

My observation is that we often act with an understanding that is beyond concepts, call it art, intuition or tacit knowledge (Polanyi, 1958). On the other hand, sciences have developed in the concern for the construction of a solid and verifiable road. There is both a science and an art in road construction and reconstruction over time. New challenges in the environment, many the result of our road building, demand that the road become more "organic" (complex and dynamic) in its nature. We are called increasingly to be both artists and scientists, crafts people and engineers, as the rapidity of change calls us to learn and perform at the same time. For this calling to work we have to draw deep within our "professions," the source of our knowledge, and examine our paradigms particularly in light of the need for fast, sure and creative responses to our changing world. This demands that we discover a vital philosophy, or consideration of life's issues, so that as we return to the world, our
practical philosophy ensures a road that is as wisely built as we can fabricate. In this dissertation I will offer some closure on methods of deliberation analysis by opening the source of innovation and artistry.

Conversations on the Road
This study is an exploration of organizing activities and reflection in a new product development organization. My research follows the deliberations of a project team over a period of several months in order to develop some concepts that might help us understand what has been called non-routine or knowledge work. The theoretical basis of my work comes from the sociotechnical systems perspective. The project team is charged by the organization to develop and implement a product line extension at Ampap, a "new and improved" personal care paper product, here called "pidgets."

The underlying assumption of deliberation analysis is that by understanding the thinking process of the organization, the work system can then be re-designed so there is a better fit between the social and technical systems. The social and technical systems parallel the stream and the road respectively. One of the primary approaches in analysis of the technical system is to look for variances or "problems which affect the quality or quantity of outputs from the system" (Pasmore, 1988). In other words, variances are unexpected irregularities in productive processes.
The notion of variances is central to the technical analysis of routine work systems. Just as in the metaphor of the road and stream, there is a shift implied in this dissertation from the desire to eliminate variances in routine work to promote some variances in non-routine work systems. Not all variances are to be promoted, but specific anomalies are. Anomalies are observations that do not fit our prevailing paradigm. Discoveries and surprises occur as we go about our routinized and productive processes, and it is by recognizing these anomalies, analyzing and amplifying them, that fundamental discoveries are made. While the routine activities help us survive, it is often insight and anomalous events that allow the organization to thrive and create new roads, new paradigms of understanding.

One primary influence that seems to create a non-routine and non-linear path to this research project is the reflexivity of the organization. The organization keeps changing and reacting to inquiry. We follow the topics of deliberations through various forums; however, the topics kept changing and interweaving. A larger framework was needed than just to follow the thinking of the organization: an action-reflection cycle.

But at the heart of my inquiry is the questioning of assumptions, and in this way I found myself backing into philosophy. And given that post-modern organizations tend to deconstruct themeselves, the questioning of assumptions, particularly perspectives and language, becomes necessary. The term post modern simply points to the experienced
fragmentation of the road of modernity and its illusion of a single inevitable path toward progress.

One primary lesson I have learned in doing this research is that it is important to conduct one's routine projects in as rational a manner as possible, but also be on the lookout for the unexpected. This could be called displaying an aesthetic awareness in addition to an instrumental rationality (practicality). For instance, in the world of engineers of Ampap, the primary value in terms of this aesthetic awareness was perhaps "elegance" in problem solving. This awareness implies a pleasing integration of form and function in the new tool.

TWO WORLDS: TECHNOLOGY AND THE ENVIRONMENT

At the root of the STS tradition, I wish to focus on two aspects of social life, the road of technology creation, and the stream of technological life as it encounters the environment. A large part of who we are is our technology and its fit in the broader environment. Our identity as tool builders and users is certainly the primary characteristic of our work life. By *environment* I would include both the external physical environment and the depth environment of our experience. Each is an aspect of the stream. The environment is that unbounded mystery that lies beyond our intention or control. The environment is the "circumstances or conditions that surround one" (AHD, 1994). The reformulation and refreshment of our technology occurs in our
relationship to the environment. We return to the stream for refreshment, just as we breathe in new air with each breath.

From the same tradition of existential phenomenology out of which developed the social construction of reality brought to note by Berger and Luckmann (1967), the philosopher Heidigger identified this central distinction of the road and the stream as the essential tool-making nature of human existence. In his terms it is the act of Gesell or Enframing that creates our world (Heidigger, 1954; Lovitt, 1990). It is in this very act of bringing form and being into existence that we are trapped. The relationship between the social and technical systems has been central focus of STS and yet remains elusive. Heidigger is perhaps one key to understanding how we are related to our technology.

Heidigger creates a set of language or poetry to present his philosophy, as did Hegel. While the use of poetic terms is often difficult to understand because they are not familiar words or connotations, it creates the possibility of a deeper connection with the ground of our experience. There are many possible root metaphors for our interaction with the world through techne, or co-creation. Eating and breathing are two primary examples. We consume the world and metabolize it. We merge with the world, and the products of this synthesis are what propels us and gives us form.
Part of the reason for the simplicity of illustrations is that, subtly, we both are and become the life we live. Our identity is integral to what we do and with whom we are affiliated. The decontextualization of technology creation results not surprisingly in our own alienation (Marx) and anomie (Dirkheim). Each falls respectively into the extreme poles of objectivity or relativism, and each then results in the isolation of existential angst (Bernstein, 1994). Our current experience of post-modernity is a profound expression of the depth of our isolation and the result of our technological lives with others. The expressions of post-modernity in the organization are not the antagonism or listlessness seen by Marx and Dirkheim, but rather a sense of loss in the perception of chaos and disorder.

How do we achieve integration and unity? It is not through the denial of technology or tool making, but through a more profound knowledge of the process, and perhaps through the small practices we maintain in organizational life. It is certainly through an opening to the environment we are in, beyond the narrow focus of our intentions and concepts. In one sense, we do indeed need to start all over again each day. We live in the result of our building. Everything we do contributes to the creation of that environmental context. We also live in the Karma that is created by me, which I cannot get away from. All my actions eventually return. All the unintended consequences of my actions return. We can indeed choke in the environmental garbage.
One of the primary experiences of relationship to the environment that will be highlighted in his dissertation is the fear of return in this recursive aspect of life. We continue to repeat and live in the aftermath of the karmic garbage we have created, and indeed must create by nature of our limited awareness and creative stance. It is by incorporating all we have created and again metabolizing it that we may make a creative advance (Hartshorne, 1974).

The basis of "wisdom" is the development of breadth and depth in the technology and environmental interaction.

Something happens as we cycle through the internalization and externalization process. There is the possibility of presencing the whole, when we internalize the world and ourselves in it. This fusion/transformation occurs in the midst of our enactment of work.

At first we wish to simply become a part of the organization, and this occurs through our creation (often in a period of isolation) or contribution. At the core, we engage in organizations to build something that did not before exist. We wish to bring being into the world, as we do in bringing children into the world.

The relationship of these two worlds is quite fascinating. To borrow another koan, "A mountain is a mountain, a mountain is not a mountain, a mountain is a mountain." In the first instance, we are
novices and learn to build in this extension of technology, so the
technology is not us, and in fact, we are not us, for our world has taken
on a duality through the distinction of our analysis, understanding or
creation. Then as that duality resides in us, the distinction can find
integration by seeing them as two aspects or facets of the same reality.

This realization of the integration occurs through the internalization of
the objectivized “external reality.” We consume the duality in our act of
creation. I think the metaphor of consuming and metabolizing fits well
here.

We seek greater harmony between our creations and our most profound
experience of life. We wish to create with nature, with the environment.

Just as seen in group theory, the stages or sequence of development
issues and the simultaneity of issues are both true and helpful
distinctions.

As we cycle through the project cycle, we proceed from novice to expert
to “novice” again. Not everyone chooses to continue all the way through
to the “novice” stage again where the breadth of awareness and
knowledge expand. One properly loses their narrow focus of expertise, as
one takes on the identity of the whole system. Hopefully these people are
promoted in the system.
However, it is also possible to be caught in our distinctions and not "metabolize our food." We will often increase our pace and become more frantic, living on the stored energy of our youth. It is only through a profound experience with the ground of being that our spirit is renewed. As instruments and mechanisms, we experience the "laws" of entropy. What renews our spirit is our ability to embody our ideals.

AMBIGUITY, APPROPRIATENESS AND STS

Another distinction I would make is between the process and the product of that toolmaking. In the first instance this is a sociotechnical inquiry of the non-routine work of new product development, using deliberation analysis as presented by Calvin Pava (1984). However, in the second instance it is an inquiry that questions the assumptions both of non-routine work and the sociotechnical systems approach. The study questions the road of both organizational life and STS inquiry, in order that a more generative process of technology and technology creation and application may be entertained.

The primary deliberation example in this system concerns the scheduling of the project and provides a rather fascinating example of the erosion of assumption bases within projects. There were so many issues rising all the time and so many fundamental decisions that were equivocal.
In information processing view of organizations, there are two primary issues in organization: uncertainty and ambiguity (March & Olsen, 1967). Issues which are uncertain tend to be those which are questions of probability and most often occur among organizational members of the same level in the hierarchy. Ambiguity, on the other hand, usually involves the formulation of alternatives and the reduction of equivocality, either internally or externally. So in ambiguity one deals with the unformed or under-identified. The "menu of options" has not yet been created for selection. This is one of the primary functions of the organizational hierarchy in the creation and identification of the telos or framework, aim or purpose of tasks.

The current notion in STS approaches to non-routine work has used the concept of uncertainty but not ambiguity. There is a danger in pursuing the notion of ambiguity. One can fall into the deconstruction of terms that cannot be fully explicated, but only pointed to. Never the less ambiguity needs to be explicated because of its centrality in the organizational life at Ampap. Fortunately, the recognition of the importance of ambiguity has been recognized in several academic disciplines such as process philosophy which contains a principle of ambiguity (Whitehead, 1929).

I also saw that it would be instructive to go back and pick up the notion of appropriateness and fit from early STS and action research theory, in complement to the current emphasis on quality. The underlying notion
of appropriateness through ambiguous sensing is core to understanding non-routine systems. This is equivalent to the expert's recursive knowledge of their system after many iterations of practicing their craft. How do they orient in the system, and not just optimize for greater immediate productivity?

When it comes to questions of orientation, literal process models in a literary, metaphorical sense. This understanding and internalization is what distinguishes an expert from a novice. Instead system guidance requires an ambiguous sense of appropriateness. System guidance is ambiguous in the sense that it is not clearly explained by words in a sequential ordering. We cannot gain greater precision through explication. We often call this the intuitive sense of the expert.

An expert is able to detect and incorporate anomalies within his or her field of expertise. This calls also for an ability to improvise, as an experienced jazz musician or an improvisational comedian (Weick, 1969; Nachmanovitch, 1990). Even more fundamentally, we may experience a discontinuity ... and then what? How does one reorient? One reorients through the repetitive rehearsal of an even more fundamental recursive process.

This process is a "philosophic" one in which an individual has access to the core assumptions and processes of one's everyday experience and actions. Greater attention to both detail and abstraction, only possible
through training in the "deeps," is required hence; deep structure, and deep ecology are important because these are the ambiguous continuities that become the foundation or bedrock for our new creation, only interpreted in our current context.

Thus, the core technology (Thompsen, 1967) and core professional paradigm of the organization become the topic of the reflective inquiry and the orienting guide to improvisational action. The core professional paradigm is the fundamental process that lies within a profession. While introduced to the novice at a literal, cook book, procedural level, the paradigm becomes internalized as the basis for improvising new technologies in the profession. Deliberation analysis of the core technology in the first instance is too small and specific a frame to generally get a handle on the fundamental orientational process of the organization. The core professional paradigm is difficult to specify or objectify, and discussion of this paradigm often does not make sense in relation to the first instance.

**Professional Intuition and Expertise**

However, there is a great danger in complex and dynamic organizations to fall into immediacy and lose the profound and fundamental sense for the core paradigm of the organizational process, which is an extension of the composite professional paradigms (eg, engineer + marketing + many others). The apparent chaotic nature of organizations is due to both the plurality of perspectives and the development of technology in the
organization. Thus each person and group in the organization becomes in essence a holographic image of the organization, with all the complexities of the inherent interpersonal and organizational relationships. This core professional paradigm provides a sense for appropriateness in organizing an equivocal environment. It suggests what the practitioner can do next to make progress on an issue.

**The Fundamental Value of STS**

The fundamental value of STS that I appreciate is appropriateness: that the conditions of work in organizations be *Right*. By Right I do not mean a sense of romantic idealism where there is a clear and objective norm which prescribes right and wrong behavior subject to a superordinate being, but a fundamental sense of appropriateness at the tacit, non-critical level. This is what allows for performance ultimately. To the extent that things conform to our romantic ideal of the work place, market place or achieving personal goals, we will never be satisfied because the world defies our inane desires. They are local and ultimately trivial. The unity of the stream we are in is much bigger than we can imagine.

The surprise and mystery that is life, is an animation beyond prescription. Yet, we have rituals, routines and practices that help make it Right and add meaning. We bring closure and certainty to processes which by any empirical standard defy closure and certainty. Whatever we intend always seems to create unintended consequences. If
unattended these unintended consequences become prisons and chaotic morass' which can engulf the performance of our lives.

To truly be high performance and find satisfaction, we need to reach deeper than techniques can indicate. We need to wrestle with the complexity and chaos, not until we have vanquished it, but until the underlying order and more fundamental Rightness emerge. It is a perspective of organizational life which will allow us to be ourselves and not create organizations in which we cannot live. It is finally deciding to accept the consequences of what we have done and what we have left undone. We can do no other. But we can seek appropriateness by allowing beings to follow their nature in accordance with all that is.

There are some values that we find in the depths of life that can hopefully transcend what we have in the past viewed as fundamental values. This new awareness in this post-modern period comes from the tacit sense of appropriateness and implicate order, which defies the explicate order and bureaucratic propositions that have in the past defined our organizations.

This dissertation is driven by a personal quest to reach a more fundamental understanding of appropriate relationships between people and technology. What was experienced in the coal mines of England was the hegemony of technology over people. Before the industrial age, as I experienced in Japan, it was often a hegemony of people over people.
Hegemony is a very powerful force that makes the other a non-being. What fundamental understanding and practice of appropriateness can better evoke being in others, then to evoke those who work with us into life? It will not be a simple answer where one size group fits all organizations or the elimination of variances in technical processes. It is the tacit awareness that is evoked when STS approaches are conducted with wisdom and compassion.

It is sometimes difficult to find organizations willing to create that time of reverence in their organization. It is the kind of space where realization can occur, but is not in our efficient rush toward productivity. I do not fault changes of the first order in organizations which aim at efficiency or simply down sizing because it seems we should for some reason, do so. We do the best we can with the available awareness. However, after we spin our wheels for a few years, we begin to realize that the organization does know what it is doing at a tacit level, and these explicit programatic efforts often do not acknowledge the subtlety of this implicate order. The search for poetry to express the fundamental experience of our professions can help open up the mystery at a deeper level of experience.

Two Core Issues of STS

There are core issues in STS. The issues are task completion, and the creation and framing of tasks. This distinction might be seen as means and ends. Traditionally STS has shifted responsibility for the completion
of whole tasks to groups, with a certain degree of responsibility for defining the ends. However, the responsibility for defining ends grows in non-routine work, and this is a tremendous open challenge. As we have experienced, non-routine activities like management and research and development can engulf a great deal of time, and do not in the first instance feel productive. A central dilemma in office work is the plague of never-ending meetings.

The challenge is similar to that posed in democratic societies where a larger portion of the societal members are called to actively participate in societal guidance. Etzioni estimated that perhaps no more than 5-15 percent of a population assume responsibility for guidance, and the remaining members are satisfied to work within the framework created by that minority (1967). The shift in work groups to responsibility for their own guidance is often resisted by group members, who would prefer greater certainty and have limited tolerance for ambiguity. I also found a similar attempt to partition non-routine work at Ampap to perhaps 10%. Even though 90% of the project tasks were routine and known, the organization was confused and little work could be accomplished, for the 10% pervaded the entire order of the organizational environment. As products and organizations have become more complex and dynamic, it is increasingly difficult to expect the hierarchy of managers and experts to handle the 10% that was ambiguous and leave only probabilistic issues of certainty and uncertainty to the workers.
Self-management requires new sets of skills and perspectives for the group members. The focus of training to be team members includes skills like negotiation, conflict resolution and goal formulation. As mentioned earlier, the shift toward guidance requires a more implicit rather than explicit knowledge. For engineers this means having to create the specifications through interaction with their environment, and not just design machinery from given specifications. This is a big challenge and one which is not easily seen in the traditional core engineering paradigm. This requires a deeper and broader sense of profession.

In my project at Ampap, the members from Paper Product Development (PD) had less ownership of the current phase of the program, and therefore were much less attentive to project guidance. Thus, opportunities for guidance, which most often come in the form of issue resolution, were not resolved as well by members from PD as they were from Product Engineering & Manufacturing (PEM), the process engineering and manufacturing group. Actually, the members of the study team from manufacturing had a much more concrete setting for guidance (ie. manufacturing lines), and had a tendency of resolving issues to greater unequivocality.

There was increasing modularization in this environment of the internal tools, seen in the deliberations explored later in this dissertation.
Both in their view of the manufacturing lines themselves and in the components that compose pidgets, the challenge was to debundle (and bundle) these elements. The majority of the costs associated with the program were actually in the creation of the modularized environment, but had to be supported by the immediate needs of the product line extension.

There was a strong desire by the engineers to be able to create these modules so they could be assembled or reconfigured more quickly in Short Cycle Management. However, because the whole process was often seen as one large project, it was difficult to create this setting. One of the primary recommendations I had was to create a deep cycle organization to augment the short cycle organization, to allow for the development of this modularized environment of tools. But I am far beyond myself in this discussion. We will return to it after more of the case has been presented.

**Key Questions Addressed by This Dissertation**

The primary aim of this dissertation is to develop a more generative basis for sociotechnical systems and the study of non-routine work. The primary question of this dissertation is: How is it possible to guide non-routine work? To answer this question we must answer: What is most fundamental basis for analysis and organization development?
From these core questions, the primary question of organizing for innovation involves the politics of Being. The issue of power and authority in organizations is central to understanding organizations by the challenge environmental turbulence and its demand for increasingly complex and dynamical organizations and products. So, the secondary set of questions in this dissertation are: What is the nature of effective coordinating methods in turbulent environments? How can knowledge and power be appropriately supported by organizational structure and process?

THE CASE SETTING

After spending several months with an electronics company in Japan, I found myself in the middle of an American consumer products company, here called AMPAP, for several more months. This is a story both of my efforts to understand the issues of organizing in that company and of my efforts to be productive and useful in my reflections with them on their environment. I spent the entire year of 1990 at Ampap, and lived on site for May, June and July of that year.

My strategy is to conduct a co-inquiry with a program team that integrates product and process development. The purpose of this program team was to create the next extention of a line of personal care paper products, here called "pidgets." Our interest is in reflecting on their deliberations so that the team can work smarter and not just harder. A large part of these deliberations is decision-making, but the
deliberations also involves other conversations or discussions in the organization.

We will explore two major deliberations that occurred on the program. The first occurred when I arrived in May 1990, and it concerned the scheduling of the project, here called the Scheduling Deliberations. The General Manager of the team's product category wanted them to shorten the length of their program by a significant degree. I gathered most of the data concerning this deliberation through observing a month of meetings and reports as they occurred.

After the scheduling issue was supposedly resolved, the team found themselves in the middle of another deliberation which they called "debundling." (It is interesting that awareness always seems to occur in the middle of something.) In this deliberation a number of people became aware that (particularly during the scheduling deliberation) the program had grown tremendously to the point that it cost too much, was immensely complex, and might not finish on time. So, the effort of this deliberation was to de-bundle or break the program down into smaller parts or modules which could be considered and accomplished in smaller bites.

The greatest lesson I learned from this experience was that whatever we did we needed to do quickly. The organizational members had an even shorter attention span than I did! Talk about your hyperactive, ADD
organization. It was very fast moving and had little time for reflection, which I did; that was my job. It has taken a couple years after this event to sort out what was occurring in this turbulent internal environment.

The project at AMPAP involved three studies. First was a case study of a project team as they conducted their project. Most of the data for this dissertation came from this first study. The second study was a historically reflective assessment of vertical deliberations in the organizations. Vertical deliberations looked at three or four events which occurred between levels of the organizational hierarchy. And thirdly, the work flow study was to be a more extensive evaluation of the entire work flow of the product and process engineering organization's work process. This turned out to be a single-day event preceded by a series of interviews. These last two studies also contributed to the data for this dissertation but to a lesser extent than the case study.

In our consulting relationship with AMPAP, we agreed to produce four results. We wanted to understand the work process of the organization and make some kind of assessment of its capability. The interest was also to increase the system outputs in terms of quantity and quality. The third result was improvements to the product launch model that guided the overall process of product development through successful introduction into the market place. The last area in which we were to comment was about the knowledge process itself in the production, accumulation and utilization of knowledge in the organization. These
were admittedly rather vague goals, but we were entering into a very new area for all of us.

My personal research objectives were to advance STS and action research theory and methods into non-routine organizations. I had conducted an earlier STS redesign with an administrative subunit of a steel company, and one of the primary areas that was difficult to address in that study was, "What about the hierarchy?" Most STS redesign projects were with work systems on the shop floor, and had left the rest of the organizational hierarchy relatively intact. Often these hierarchies had difficulties interacting with the customer-oriented multi-functional teams. In addition, there were parts of the work systems, particularly in the 'up stream' areas of research and development, which also were not subject to simple proceduralizing of the work flow. Lastly, I had noticed that STS and action research theory had not been very generative, but instead had largely been a list of values and principles of work system redesign (Davis & Chernen, 1974). I wish to contribute to a more generative theoretical basis for the sociotechnical approach to work.
CHAPTER 2: RELATED LITERATURE

One of the tenets both of action research and of the department of organizational behavior is the emphasis on the practitioner-scholar, one who both does and knows. Hopefully this unites and we "practice what we preach" so to speak. Therefore the method and content of this dissertation are very similar to each other. The is a self-similarity to all aspects of process and structure, means and ends. This is seen in the most general principle of STS design stated by Cherns as Compatibility: "the way in which the design is done should be compatible with the design's objective." (Cherns, 1987, p.157).

The basic theme of this dissertation is that we continually build our road by incorporating the stream of events. In this chapter I will first describe the basic tenets of STS, and then explore how this paradigm is changing to include both routine and non-routine aspects of work systems. Last, I will describe the method of deliberation analysis used in this study as an attempt to develop better STS tools.

OVERVIEW OF THE STS APPROACH

Socio-technical systems approach responds to the need for both greater productivity and satisfaction in work systems of organizations. In the next three sections I would like to highlight the historical influences on the approach, the theoretical foundations of the open systems model, the primary principles of organizational design, and the principles and process of implementation.
Historical Influences

The origins of STS are associated with Eric Trist and his colleagues at the Tavistock Institute in London, England. The approach grew out of a practical problem and "discovered" the work group and the open systems perspective in its search for a resolution. The original work started in England over 40 years ago, where Bamforth were post-graduate Fellows training at Tavistock (Trist & Bamforth, 1951). In the course of their final studies each student was encouraged to return to his original industry to observe to note how his perceptions had changed. Bamforth had been involved with coal mining and Trist came with him to inspect a particularly successful coal mining operation, the Haighmoor seam. This led to a further project with the coal board to find out why the recently introduced technological improvements in coal mining were not achieving the expected increases in production. What they found was that the new "long-wall" technology disrupted the existing social unit of the work group, by isolating individuals, and thus created alienation of workmen from each other and their work (Trist, 1981).

Sociotechnical systems were in many ways discovered through visits to innovative organizations. Trist & Bamforth (1951), Rice (1958), Burns and Stalker (1961), and Woodward (1958) each identified appropriate organizational forms given different social, technical and environmental circumstances. The contingency approach to organizational theory thus developed with the open systems model.
Noting in the coal mines that the new machinery isolated individuals and broke down the social interaction that made work both satisfying and productive, it was reasoned that one should allow people to jointly decide how to conduct a whole piece of work. Give the workers the responsibility and freedom to choose how to do their work. The resulting objective of the STS approach to organizational design was to create conditions for the appropriate fit between people and technology in work systems.

The development of the STS approach coincided with a number of other developments in England and the U.S. in social and scientific thinking. One was the human relations movement. The multidisciplinary group at Tavistock was formed after W.W.II to aid in the transition from war to peace time. From their psychoanalytic tradition, they discovered the importance of the group. The group created an internal environment for assessing the technology and creating the arrangements for task accomplishment. Bion saw that the work group itself needed to face and at least temporarily resolve three primary assumptions of group life: fight/flight, pairing and dependence. Theories of group development also continued in the U.S. and have contributed a great deal to the development of teams in STS systems.

In the U.S. this early work in the 1950's was paralleled by Davis in the development of job design. Building from the previous success of industrial engineering in rationalizing work systems to become more
efficient, Hertzberg's two factor theory and Mayo's Hawthorne studies prepared the way with the development of the human relations movement. Davis's approach developed from Hertzberg's concern for job enrichment, by bringing the context of the job into job design. There was a decided bias toward the individual level of analysis in the U.S., where it was more difficult to "sell" industry on the group as a unit (Trist, 1983).

Different aspects of the STS approach have found reception in various countries depending on the interests of corporations and the nature of inter-organizational relations. In the competitive economic atmosphere of corporations in the U.S., there has been a stronger emphasis on the technical sub-system through High Performance Organizations. The application of the work group was more difficult in the U.S., and interest continued early on at the level of job design, perhaps most clearly exemplified by Hackman and Oldham's Job Diagnostics Survey (1980). However, the development of work groups did have some receptivity by U.S. companies. AMPAP had been one of the first U.S. companies to redesign its manufacturing plant work systems according to socio-technical principles almost 30 years ago, starting with a plant in California. Perhaps because of the difficulty of bringing the concept of group to the individualistic and materialistic perspectives of American industry, the group took on even greater importance in the U.S.
The developments in the U.S. in the 1950's were concurrent with the emergence of the systems approach to organizations. Bertalanffy quickly applied his sentinel work in open systems approach from biological systems (1956) to a wide range of social issues. Industrial engineering and operations research developed during W.W.II, to which Russell Ackoff applied open systems perspective. Ashby later started the Department of Social Systems at the University of Pennsylvania with Trist. The open systems approach was an ecological view which stressed the relationship between a system and its environment, and its concern for boundaries. As an extension of operations research, the technical analysis emphasized the linearization of the core transformation process.

Since the early years of STS, there has been an interest in replicating innovation. A.K. Rice casually mentioned the success of working groups he observed to some of the workers in the looms of Ahmedabad, India. The workers immediately picked up the idea and presented a proposal to their management to change their individual work system to group arrangements (Rice, 1958). Kurt Lewin developed an approach to social psychology called action research in which field experiments were conducted, and used to build theory in complex environmental relationships. He also was prominent in bringing the group to the U.S. as a unit of analysis resulting in the establishment of National Training Labs in Maine. At the heart of the STS approach is the use of operational experiments, which could test changes in the work system and then replicate the successes in the broader organization. As such the early
work in STS was often done in industrial locations such as manufacturing plants where the conflict between people and technology was most apparent, and the systems were the most sequential and clearly analyzable.

It was in Norway and Sweden where the STS approach was perhaps most strongly and broadly embraced by industry. This is where environmental relationship made the most sense as community-based decision-making in industrial democracy was broadly accepted. There was a relatively greater concern for social welfare in Canada and Scandinavia. Because of the action research orientation of STS, meaning one learns through active change projects, the opportunities for conducting research varied in these different environments. The strongest broad acceptance of the approach was probably in Norway, which had the greatest interest in cooperative corporate community and industrial democracy, seen in the Norwegian Industrial Democracy Project. However, the success and acceptance of STS has not been smooth or overwhelming over the last several decades, depending a great deal on change opportunities and the interest of industry.

Baburoglu has recently looked at the various "tracks" in the development of the Trist-Emery paradigm of systems thinking. The Trist-Emery Paradigm developed along 4 tracks: primary work system, organizational system, social ecology, and recognition of a vortical hyperturbulent and environment (Baburoglu, 1991). Each of these levels
of systems continues to receive attention in action research. This analysis suggests a progression to consideration of ever broader systems. These broader system perspectives have found their strongest acceptance in Scandinavia. There has been a great deal of interest in dialogue, through the use of search conferences involving several companies at a time (Gustavsen, 1992).

A theme that emerges in all of these tracks for Baburoglu is that of liberation; from the domination of the machine and external control, from experts and expertise, from a single social system referential design, and from harmony and consensus orientation. With the coming of this broader environment and the greater acceptance of group decision-making, a wider set of designs have been evident in Norway than in the U.S. I suspect that with the stronger relationship with the environment, also came a synergy for new arrangements and a strong sense of responsibility.

In summary, the STS approach was strongly influenced by the emergence of open systems thinking from the natural sciences and the discovery of the work group in the human relations movement in social sciences. Its early contact with psycho-analysis and its interest in metaphor at Tavistock, was not developed instead favoring the science of social arrangements. Its American biases toward group designs and technical systems are also reflected in these origins, because of the difficulty of securing industrial opportunities and the strong industry bias toward
productivity improvements. With a relatively small number of theoreticians, STS drew its theoretical foundations from a number of developments in different areas of the sciences. For the future, it will be instructive to note and ingest further developments in these areas of social science, natural science and the humanities.

**Theoretical Foundations**

In this section I wish to further explore the theoretical foundations of STS. After first presenting some features of open systems, we will turn our attention to the primary work system and its relationship with the environment. This parallels the main distinction in this dissertation between the road and the stream. The value of opening up systems to the human element and broader environmental context brought perspective to the work system.

**Open Systems**

What distinguishes a system from a collection of parts for Bertalanffy is that a system is more than the sum of the parts (Bertalanffy, 1981). The emergent quality of systems thinking is that one could then attempt to deal with the whole. Miller gives the following definition; "A concrete, real, or veridical system is a non-random accumulation of matter-energy, in a region in physical space-time, which is non randomly organized into coacting, interrelated subsystems or components." (1965, p202). Cummings and Srivastva adapt this definition for socio-technical systems, saying, "A sociotechnical system is a non-random distribution
of social and technical components that coact in physical space-time for a specified purpose." (Cummings & Srivastva, 1977, p.60).

A further distinction that must be made is that there are closed and open systems perspectives. Closed systems perspective ignores the relationship of the system with the environment. This is helpful to simplify analysis by focusing on the interrelationships of a limited number of elements or components. However, an open systems perspective conforms more closely with systems we see in the field because all systems do interact with a broader environment. Katz and Kahn explain that open systems theory,

is used to describe and explain the behavior of living organisms and combinations of organisms, but it is applicable to any dynamic, recurring process, any patterned sequence of events. It is a recurrent pattern of events, differentiated from but dependent on the larger stream of life in which it occurs and reoccurs, that constitutes an open system. (Katz and Kahn, 1966, p.1)

The basic notion of open systems is simple, illustrated in figure 1. There is a cycle of import, conversion and export in which the system interacts with its environment. The conversion process is considered the primary task of the system (Cummings & Srivastva, 1977; Miller & Rice, 1967). The import and export exchanges occur through a boundary between the system and the environment which must be controlled or regulated so that the internal climate of the system can be maintained, and so the conversion process remains intact.
The open systems model focuses on the conversion process itself as the relationship between the social and technical subsystems. The open systems model was helpful in gaining perspectives of the bigger picture so the incremental and often revolutionary hegemony of technical subsystems over social sub-systems could be seen and controlled. Within the conversion process, there are often smaller units of activity, as in the sequence of assembly or the conversion of raw inputs to finished outputs. Unit operations are separated by unit boundaries.

The primary focus of the open systems model is its emphasis on the relationship between the organization and its environment. The organization is contingent on its environment and needs to respond to the demands of the environment. But as STS rejects technological determinism, the approach rejects environmental determinism. There must be a dialogical relationship between the system and the environment, again, where the whole is greater than the sum of the
parts. As noted by Markus, "Boundaries are important to socio-technical systems approach because they regulate the flows of inputs and outputs; obviously if boundaries fail to work properly, the systems they enclose may starve or choke" (Markus, 1984, p.22).

Emery and Trist (1965) create four categories to describe different environmental conditions and therefore hypothesize about the organizational response. The complexity of the environments range from placid, randomized; placid, clustered; disturbed, reactive; to turbulent field. The turbulent field means that the organization itself creates the environment and through this reflexive activity, the environmental conditions cannot be easily anticipated.

McWhinney (1968) correlates the type of role of the decision maker and the appropriate decision modality with each ideal type. Greater direction is demanded by the decision maker as the environment grows turbulent and the decision modality shifts from certainty through risk and uncertainty to appreciative. Direction becomes more of a creative and appreciative art when one interacts with a turbulent environment, which is seen as increasingly characteristic of modern society.

The open systems model is a cybernetic basis. Feedback from the environmental relationship helps the internal coordination of the conversion process. Cybernetics is an information processing view of the organization describing how an organization may reach a stated goal.
But how are the goals of the organization determined? While seen to be an interactive process (McWhinney & McEwen, 1958), it becomes precarious in turbulent environments. As environments become more turbulent, goal setting needs to shift from competitive and bargaining towards coalition and cooperative forms, even though cooperation appears to be precarious. The assertion of force in the environment creates greater turbulence.

The traditional emphasis has been to identify the conditions to stem both technological determinism and environmental determinism and place the social system more centrally in the primary work system. It appears to be a tradition for the social system then to be presented first (Pasmore, 1988; Cummings & Srivastva, 1977).

The Primary Work System

The primary focus is the work system. The definition of work that I wish to employ is; "Work is an agreement between two or more persons to perform a stated task" (Cummings and Srivastva, 1977, p.26). The central feature of the organization is the core conversion process by which the central task of the organization is accomplished, whereby inputs from the environment are converted into outputs that return to the environment. Something of value to the environment is added by the organization through this conversion process.

The people in the organization and their relationships compose the social system, and there are a few different definitions about what is
meant by identifying the social as distinct form the technical system. For Pasmore, "The social system of an organization is comprised of the people who work in the organization and all that is human about their presence" (Pasmore, 1988, p25).

Cummings and Srivastva define the social system as "a relationship between people who interact with each other in a given environment for the basic purpose of achieving an agreed upon task or goal.... This task or goal ... requires that people develop mechanisms for its accomplishment and these mechanisms are the basic components of the social system" (Cummings & Srivastva, 1977, p49). Pava views the social system primarily as the division of labor and the methods of coordination (1983). So the social system is the patterns in which people relate to each other and the nature of their agreements.

STS has historically been a normative approach towards the social system and therefore promotes a set of values to support the people in the work system. The traditional "Taylorist" perspective of industrial engineering often resulted in changing people from craftsmen into automatons by simply making them an appendage of a machine. The job enhancement approach of Hertzbergs could only help a bit, but many of the values were similar.

Emery (1964, 1976) summarized the intrinsic characteristics of person-task relationships. The need:
1) Variety and Challenge: For content of a job to be reasonably demanding in terms other than sheer endurance and to provide some variety (not necessarily novelty).
2) Continuous Learning: To be able to learn the job and go on learning. Again it is a question of neither too much nor too little.
3) Discretion, Autonomy: For an area of decision-making that the individual can call his own.
4) Recognition and Support: For a certain degree of social support and recognition in the work place for the value of what he does.
5) Meaningful Social Contribution: To be able to relate what he does and what he produces to his social life, for it to have meaning and afford dignity.
6) Desirable Future: To feel the job leads to some sort of desirable future (not necessarily promotion.)

This list specifies the requirements for social satisfaction in work, and was drawn from Lewin’s (1935) Berlin experiments on task-person relations as well as on his and Bion’s later work with groups (Trist, 1981). This list summarizes the values of respect for human beings, and creating the conditions in which we can be more fully human.

As STS coincided with the discovery of the work group, it is common to assume that the primary social unit or pattern in the work system is groups of perhaps six to eight, following the perceived optimal size for therapy groups. For instance Rice (1958) included the optimal group size of six to twelve in his list of propositions for joint optimization. However, Trist identified the primary work system, not simply limited to small groups, but included perhaps 100-200 people. Cummings and Srivastva explain,
In a developed role system, an individual does not have to identify psychologically with other workers to perform a group task. Instead, an individual has to understand only a limited number of related work roles and know the others in terms of their role requirements. Thus, the key determinant in group size is not interaction that results in psychological identification, but interaction that permits role holders to understand and mutually test our each other's roles. (p. 99)

The most important quality to this work system is the freedom and discretion for people to determine as many factors of their work as possible. While large groups may exist, when change and flexibility is required the psychological identification of the small group can be very helpful in creating the setting for meaningful decision formation.

Technology is an extension of human faculties in the accomplishment of task and has been defined in a number of ways by different authors. Emery (1959) articulated the special role of technology as follows:

the technological component, in converting inputs to outputs, plays a major role in determining the self-regulating properties of an enterprise. It functions as one of the major boundary conditions of the social system in mediating between the ends of an enterprise and the external environment. Because of this, the materials, machines and territory that go to making up the technological component are usually defined, in any modern society, as 'belonging' to an enterprise, or are excluded from similar control by other enterprises. They represent, as it were, an 'internal environment'. This being the case, it is not possible to define the conditions under which such an open system achieves a steady state unless the mediating boundary conditions are in some way represented amongst 'the system constraints' (cf. Von Beralanffy, 1950). The technological component has been found to play this mediating role and hence it follows that the open system concept, as applied to the enterprise, ought to be referred to the socio-technical system, not simply the social system.
Cummings & Srivastva (1977, p.51) state, "In conceiving of technology, we are often conditioned to think in terms of concrete objects; tools, machines, and gadgets." The technical system consists of the tools, techniques, and methods of doing that are employed for task performance. Markus says, "Technology refers to the total set of knowledge, skills, and devices which people have accumulated for accomplishing a particular goal." (Markus, 1984). Gjersvik (1993, p.204) makes the following distinctions about technology:

1) The objects and artifacts that are used in production.
2) The knowledge about how to produce, and about how to use the objects and artifacts.
3) The routines for production.
4) The language to communicate about production.

As discussed in the introduction, technology covers a very wide range of tools used by humans to accomplish tasks. These tools appeared rather self-evident in factory work as in the first point by Gjersvik. More subtle technologies from knowledge and routines to language are more difficult to identify distinctly and often appear to be transparent in work systems.

Technology pervades the structure and process of work systems, becoming an seemingly inextricable part. Cummings and Srivastva (1977) identify the following characteristics of technological systems: the characteristics of the material being produced, the physical work setting, the spacio-temporal dimension, the level of mechanization, unit operations, and the degree of centrality of different operations.
How distinctive are the social and technical systems? Cummings and Shrivastva respond, "Unlike the social system, which is self-generating, the technical system cannot generate itself; it exists and has meaning only when social groups bring it into existence and bestow it with meaning. They go on to say,

In contrast to the social system that functions according to laws of the animate - biological and psycho-social laws - the technological system operates according to the laws of the inanimate - mechanics, hydraulics, electronics. Both kinds of laws operate jointly when social groups employ technology to task accomplishment; yet both systems may be treated as independent by virtue of the different kinds of laws that govern their behavior. When we talk of a social system, we are referring to the people and the relationships between them that are the basis for a task agreement; when we refer to a technological system, we mean tools, techniques, and methods of doing employed in task performance.

What is the relationship between the social and technical systems? The principle of joint optimization between the social and technical subsystems has been a central tenet of STS thinking. It was first articulated by Emery in 1958. We have wanted systems to be both productive and satisfying. The primary value was wholeness, so that the work groups were responsible for whole pieces of work, rather than becoming "cogs" in the machine conducting isolated tasks. Thus, there was a concern for defining appropriate unit boundaries, so that humans were not subjugated to machines. The group would be responsible for perhaps creating a whole unit of work.
Stemming from the observation that assembly line work "de-skilled" workers and valued their "robotic" behavior, the structural propositions for joint optimization primarily pertain to the social system. These were seen to be based on the notion of redundancy of functions in the work group, and the meaningful variety of work offered to the individual. Building from Emery's intrinsic and extrinsic characteristics of the person-task relationships, several theorists have contributed to the principles of work design (Hackman & Lawler, 1971; Hackman, Oldham et al., 1975; Herrick and Maccoby, 1975; Walton, 1975a; Hackman and Suttle, 1977). Trist summarized the following principles of work design:

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<th>At the level of the individual</th>
<th>At the group level - interlocking where:</th>
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<td>Optimum variety of tasks within the job.</td>
<td>There is a necessary interdependence of jobs for technical or psychological reasons.</td>
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<tr>
<td>A meaningful pattern of tasks that gives to each job a semblance of a single overall task.</td>
<td>The individual jobs entail a relatively high degree of stress.</td>
</tr>
<tr>
<td>Optimum length of the work cycle.</td>
<td>The individual jobs do not make an obvious perceivable contribution to the unity of the end product.</td>
</tr>
<tr>
<td>Some scope for setting standards of quantity and quality of production and a suitable feedback of results.</td>
<td>The linkages create some semblance of an overall task.</td>
</tr>
<tr>
<td>The inclusion in the job of some of the auxiliary and preparatory tasks.</td>
<td>There is some scope for setting standards and receiving knowledge of results.</td>
</tr>
</tbody>
</table>
The inclusion some degree of care, skill, knowledge or effort that is worthy of respect in the community.

Some control can be exercised over the boundary tasks.

The job should make some perceivable contribution to the utility of the product for the consumer.

Channels of communication are such that the minimum requirements of the workers can be fed into the design of new jobs at an early stage.

Channels of promotion to foreman rank which are sanctioned by the workers.

The group setting of STS approach takes it beyond simple job enrichment and rotation of prior human relations theory. The key word at the group level is interlocking. The various roles and responsibilities in the groups are interdependent and overlapping. There is a wider span of discretion within the group for how to accomplish a task.

What is particularly striking about this set of propositions about the arrangement of propositions for joint optimization, is that they primarily relate to the social arrangements. They are striking in their application to assembly line work. It would appear difficult to develop a generally applicable set of principles beyond a particular set of technology relationships.

**Work System and the Environment**

The focus on environmental relations has focused primarily on feedback loops and boundary conditions. The importance of the relationship is in protecting primary task by buffering, leveling, anticipating, selected
exchanges between the organization and the environment (Thompsen, 1967). However, *regulating environmental exchanges* are also needed so that the organizations receives the needed resources for conversion and survival. To aid in the planning and regulation relationship Clark & Krone (1972) proposed *open systems planning*. In open systems planning the organizational leaders map dynamic realities in environment, current organizational deployment to those realities, future desires for engagement with those realities, and plan restructuring.

The primary issue has been achieving cooperative/joint influence process. In contingency and exchange theory, the system responded to the "demands" of the environment. Particularly in turbulent environments, we also create this relationship. It is not a simple matter of demands, but a synergistic/symbiotic relationship. There has historically been a tendency to seal ourselves off from the environment, when the environment is either placid or simply reactive.

Several principles have developed to guide the design of the work system for joint optimization. We will then look at several principles regarding the intervention itself.

**Principles of Design**

While many different principles have been developed over the years, they can be summarized in the following five fundamental principles of
design: redundancy of functions, requisite variety, minimum critical specification, variance control, and boundary location.

*Redundancy of Function:* Fred Emery (1958) suggested this as the primary principle for the design of open systems so they have room to maneuver and adapt to changing environmental conditions. One way of reliably responding to the environment is for there to be a redundancy of specific parts in the system. This allows for back-up in case of failure. This is essentially a mechanistic response requiring a hierarchy for the coordination of the specialized parts. The more organic approach is for a redundancy of functions within each system component, allowing each component to adapt to changing environmental situation. Multi-skilling is another way of stating this flexibility in response capability.

*Requisite Variety:* This is W. Ross Ashby's (1960) concept that external variety must be matched with internal variety. He also makes the point that no complex adaptive system can succeed in achieving a steady state in a reasonable period of time unless the process can occur sub-system by sub-system, each sub-system being relatively independent of the others.

A variation of both of these was stated by Cherns as the Multifunctional Principle: "Organizations need to adapt to their environments; elements of organizations need to adapt to their environments of which the most important are usually other organizational elements." Cherns makes an important distinction, that the adaptability of parts is also required in the
internal environment of the organization. These two principles are very central and derived from the notion that internal and external balance requires similarity between the system (organism) and its environment. These principles are fundamental tenets of contingency theory.

**Minimum Critical Specification:** The principle of minimum critical specification is that no more should be specified than is critical for system functioning. Weick identified this approach to specification as having a proper balance between tightly coupled and loosely coupled organizing (1979). If the work system is too rigid it cannot respond to changes in the environment. Cherns states this as, "no more should be specified (tasks, roles, etc.) than is absolutely essential." One of the basic social values is for the maintenance of a clear area of discretion for actors in the organization, so that a flexible response can occur. In addition, following Simon's recognition of the limits of cognitive complexity in his concept of bounded rationality, it is important to recognize that too many explicit demands can overload the system, creating a placid and reactive response to environmental changes.

**Variance Control:** A fourth set of design principles applies primarily to the technical system and the core conversion process. We desire to create a smooth flow for internal operations of an organization so that it may be productive and continue to function. We seek to smooth out the bumps in the technological system. Central to the design of the technical system is the identification and control of variances. As mentioned
earlier, Emery saw the technical system as mediating boundary exchange, and therefore boundaries and variances are inextricably linked. Pasmore expanded the principle of variance control. Variances are "unexpected deviations from standard operating procedures, plans or normal routines" (Pasmore, 1988). The primary principle: "Variances should be controlled at their source." Further specified by Pasmore:

Feedback systems should be as complex as the variances which need to be controlled.

The impact of variances should be isolated in order to reduce the likelihood of total system failure.

Technical expertise should be directed to the variances with the greatest potential for systems disruption.

Pasmore offers the following principles that help the smooth and appropriate flow of the core conversion process:

Technological flexibility should match product variability

Technology should be appropriate to the task

Inputs should be monitored as carefully as outputs.

Core absorbs support.

The effectiveness of the whole is more important than the effectiveness of the parts.

For me the most suggestive and interesting design principle is core absorbs support. This is one of the few that appear to directly tie with the social design principles suggested by Trist as supporting optimal compatibility. What is striking about this list is that it largely focuses on the development of a smooth flow, through refinement of the technical system.
**Boundary Location:** The appropriate location and maintenance of the boundaries are important in systems theory for the integrity of the system. This shaping of the organizational boundaries also attempts to provide an organizational form in which flow can occur. The boundaries should be placed so that a free flow of resources within the unit can occur. Cherns identifies these two principles:

*Boundary Location:* boundaries should not be drawn so as to impede the sharing of information, knowledge, and learning.

*Information Flow:* "...the principle of boundary location counsels against... the interruption of information or the insertion of information loops by misplaced organizational boundaries.

Pasmore contributes the connection between variance control and boundaries:

Boundaries between units should be drawn to facilitate variance control

A primary value in STS was to create unit boundaries where teams were responsible for *whole processes.* They checked their own work and thus *variances* or errors were controlled at the source and not passed on to disrupt the assembly line or the work flow.

**The Issue of Power**

STS requires a shift in political power to the work group, so that decisions can be made more autonomously, from a control based to a *commitment based organization* (Walton, 1985).
The idea is that organizational performance will be improved if people chose what tasks there are to perform, how to do those tasks, and how to organize themselves. The tactic of involving people from the work setting in the process of redesigning it implies an understanding that no outside observer can know the real issues in the workplace better than the workers. They understand the culture and the social relations among themselves; they understand the problems they must cope with when there are changes in the relationships with the environment. Further, the theme of industrial democracy runs through this aspect of the socio-technical approach; it is believed that people have the right to influence the structure of their working life. p.23

The most difficult issue perhaps in all of design is power. Cherns offers the following principle:

*Power and Authority*: Those who need equipment, materials, or other resources to carry out their responsibilities should have access to them and authority to command them. In return, they accept responsibility for them and for their prudent and economical use.

Perhaps the most difficult issues have to do with power and authority. *The issue of power is perhaps the most difficult to resolve.* These issues include the selection or formulation of organizational goals, the use of resources (organizational and environmental), boundary and configural control/establishment, and the focusing of attention in the system.

The development and proliferation of STS have been checked by the requirement for organizational leaders to share power with operational teams. Rice ran into this block in the very first replications in India, where the group based work system did not spread any further than the
original site at Calico Looms. The recognition and trust in group-based work systems have opened up and grown a great deal in the last decade. This trust appears to be assisted by the success of team-based efforts in Japan and the importation of TQM to American in the form or Quality Circles. Herbst (1976) has offered a couple of alternative forms to hierarchy including networked organizations. Still, the primary issue of the hierarchy and individual professionalism seems to check further development of team concepts in the "middle" of organizational hierarchies.

Principles and Process of Implementation
As noted earlier, the approach of STS is based on action research where there is active experimentation in the organization. One learns best by taking action in the environment and seeing the result. An operational experiment is conducted in the organization which is selected as a site with the greatest chance of working with the greatest benefit to the organization. Later, if successful, this experiment can be replicated in the larger system.

Overall perhaps is the principle of Compatibility: "the way in which the design is done should be compatible with the design's objective"(Cherns, 1987, p.154). From the basic stance of liberation, it is important that openness be present as much as possible to allow for self-design in the organization. If the design is conducted by a few experts, the probability of socio-technical fit is lessened. It is important for the nature of the change to have integrity and be what it says it is. The effect of method
cannot be isolated from results under field conditions; it may be able to be controlled in laboratory experimental designs. Displaying this open stance to design are the following corollaries from Cherns:

**Support Congruence:** Start with as little baggage as possible, adopt a constraint free design mode, and build in the unavoidable constraints later.

**Transitional Organization:** We need to see the design team and its process as a vehicle of transition. Its design process embodies the new values.

**Incompletion or the Forth Bridge Principle:** Redesign is not the task of a special design team; it is the function of appropriate criteria and the principles of design.

What is striking in the ideas and principles of implementation, is that they are based on operational experiments. I think the notion of compatibility or self-similarity is very interesting. One of Emery's and Pava's values, *self-redesign*, is very important. We need to be willing participants in the process of our intentional redesign. However, it is also true that we have a very poor record of being able to construct "utopias" in organizations. We can note where things work well, but it is rather difficult to justify that these are the direct result of intentional structural change. They are as much as anything, based on our awareness and acceptance of "how things are."

The reviews of the implementation process has been rather mixed in terms of effectiveness. A number of the features of organizations have perhaps been most effective in the design of "green field sites."
Redesigns often run into the intractability of organization conservatism to reject intentionally demanded change. To the extent which we accept the "openness" of the relationship and still its inevitability, change can occur. An underlying trait of all of the design principles is to create an environment which is a "green field" for it inhabitants, where refreshed and productive processes can creatively adapt and respond to their internal and external environments.

An Overview of the Redesign Process

The process of an STS organizational analysis starts with the establishment of a steering committee, which conducts initial open systems planning to identify the boundaries of the target system and the major stakeholders. From this analysis the steering committee creates a commission for a design committee, whom they chose from a cross section of the organization. Typically there will be a team of four to eight people from the various areas within the target system. This design team will work conduct environmental, social and technical analyses of a period of three months to a year. They would have frequent meetings with the steering committee, often having at least one member serving on both the design team and steering committee.

The environmental analysis can follow an open systems planning model or a search conference design. We have used the open systems design model in which the design team members identify and interview the key stake holders of the system. In these interviews they ask the
stakeholders about the current state of their relationship, and anticipate the future needs in the relationship, so this information can be included in the design phase of the process.

The social analysis assesses the state of relationships of the people in the system through the use of interviews or instruments. Some of the tools used in social system inquiry have been surveys like Hackman and Oldham's Job Design Survey or Pasmore's STS Assessment survey, along with interviews by the design team with a sufficient number of representatives from the target system.

The technical analysis will often consist of outlining the steps in the core process of the system, and identifying the variances and how the variances are controlled. The primary tools have been a variance matrix which on one dimension lists the sequence of the work and lists the variances on the other, examining the interrelationship of variances and the subsequent work they affect. From this analysis a variance control table can be constructed which identifies how the variances are to be controlled. This might suggest new unit boundaries or new groupings of tasks and team formations.

From the data provided by the analyses, the design team then creates a design that addresses the environmental, social and technical issues. Technical and social system changes are then developed to control variances as close as possible to their source and thereby prevent them
from adversely affecting later steps in the core process of the organization.

Once the new design is approved and implemented, the situation is monitored and mutual adjustments are made as needed. Finally, after sufficient experience with the new work system, the experiment may be replicated on a larger scale in the organization.

NONROUTINE WORK

A Historical Review of Nonroutine Work
The STS approach has been employed in a wide variety of work settings since its inception. Inquiries have been conducted in factories, school systems and offices since its inception. However, because it could be most clearly applied to assembly line work with the greatest possibility of success, applications to nonroutine work have had less influence in the resulting principles of design.

Early work by Jaques (1949) at Glacier Metal Works was primarily a social analysis involving the roles throughout the hierarchy. Emery (1976) later identified what he called a "deep slice" project that also involved a multi-functional team composed of members from several levels of the hierarchy. A.K. Rice (1958) used role analysis in his work with Calico Looms in India. Trist advocated using role analysis for understanding
both large primary work systems, and for less routine aspects of work (1981).

The distinction between routine and nonroutine work is taken from Charles Perrow (1967). Perrow viewed a continuum where routine work is analyzable and has few exceptions and non-routine work is not as easily analyzed and has more exceptions. The more mechanically repetitious the work, the more routine it is. It is fairly simple then to prescribe the system, and through measurement, one can identify the exceptions (variances) and seek to eliminate them. Non-routine work requires more expertise to handle the exceptions through a more flexible and ambiguous core process.

Part of the interest in non-routine work is that it allows analysis of different kinds of work systems that are not sequentially organized. Non-sequential work is characteristic of the top of organizational hierarchies and the up-stream areas of research and development. However, many organizations may have a fundamental character of their work system as always handling exceptions and being perhaps composed of professionals and therefore being difficult to formally analyze. Further, there are strong indications that the nature of society and its technologies may itself be largely nonsequential, and so a great deal of the equivocality reduction in organizations may not be understood through its linearization.
Pasmore and Gurley (1989) make the following distinctions between routine and non-routine work:

<table>
<thead>
<tr>
<th>Nature of Work</th>
<th>Routine</th>
<th>Nonroutine</th>
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<tbody>
<tr>
<td></td>
<td>defined</td>
<td>undefined</td>
</tr>
<tr>
<td></td>
<td>repetitive</td>
<td>non repetitive</td>
</tr>
<tr>
<td></td>
<td>one right way</td>
<td>many right ways</td>
</tr>
<tr>
<td></td>
<td>clear, shared goals</td>
<td>multiple, competing goals</td>
</tr>
<tr>
<td></td>
<td>information readily available</td>
<td>information difficult to obtain</td>
</tr>
<tr>
<td></td>
<td>forecasting helpful</td>
<td>forecasting difficult</td>
</tr>
</tbody>
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<table>
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<tr>
<th>Nature and Measures of Success</th>
<th>Routine</th>
<th>Nonroutine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>efficiency</td>
<td>effectiveness</td>
</tr>
<tr>
<td></td>
<td>technical perfection</td>
<td>human perfection</td>
</tr>
<tr>
<td></td>
<td>productivity</td>
<td>productivity unmeasurable</td>
</tr>
<tr>
<td></td>
<td>measurable</td>
<td>knowledge technology</td>
</tr>
<tr>
<td></td>
<td>physical technology</td>
<td>non-standard information</td>
</tr>
<tr>
<td></td>
<td>standard information</td>
<td>completion-oriented</td>
</tr>
<tr>
<td></td>
<td>detail-oriented</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of Decision Making</th>
<th>Routine</th>
<th>Nonroutine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>rules applicable</td>
<td>rules inhibiting</td>
</tr>
<tr>
<td></td>
<td>experience counts</td>
<td>experience may be irrelevant</td>
</tr>
<tr>
<td></td>
<td>authority-based</td>
<td>consensus based</td>
</tr>
<tr>
<td></td>
<td>complete operational specs</td>
<td>incomplete operational specs</td>
</tr>
<tr>
<td></td>
<td>authority by position</td>
<td>authority by virtue of expertise</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of Context</th>
<th>Routine</th>
<th>Nonroutine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>short time horizon</td>
<td>longtime horizon</td>
</tr>
<tr>
<td></td>
<td>stable environment</td>
<td>unstable environment</td>
</tr>
<tr>
<td></td>
<td>predefined outcomes</td>
<td>emergent outcomes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Nature of Variances</th>
<th>Routine</th>
<th>Nonroutine</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>obvious</td>
<td>hidden</td>
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</table>

A wide variety of organizational theorists have described a shift in the nature of work systems in organizations that correspond to the shift from routine to non-routine work. Thompson (1967) saw this shift in
technology from serial interdependency (long linked technology) to pooled interdependency. Burns and Stalker (1961) noted the shift from mechanistic to organic forms of organization.

March & Simon (1958) made a similar distinction between programmed and unprogrammed tasks. Programmed tasks involve some kind of unvarying procedure. They tend to be linear, showing a clear conversion process from inputs to outputs. Unprogrammed or nonlinear tasks are not as linear, often involving improvisational methods for their accomplishment because they are not highly structured and the inputs and outputs are highly equivocal. New product development, strategy formulation, and investment decisions are often unprogrammed and nonlinear.

The terms nonlinear and nonroutine are sometimes used interchangably. From the perspective of traditional STS variance analysis, there is little difference between the terms in work systems where routine work implies linearity. However, the term nonlinear does have a number of other connotations for complex systems theorists (Prigogine, 1968), that may not be suggested by the term nonroutine. One is that the cybernetic aspects of systems, such as goal orientation and feed-back, are simple causal structures in linear perspective and become more difficult to analyze when that simple linearity cannot be assumed.
Pava (1986) cites three conditions that underlie the non-linear nature of work:

1) multiple, concurrent conversion processes
2) nonsequential, nonlinear conversion flow
3) individualistic professionalism, vocational separatism

Many managerial tasks (Mintzberg, 1975) are not very linear in nature, composed of many different tasks and topics such as hiring, personnel reviews, planning, presentation, etc. Multiple, concurrent conversion processes flow into each other. In factories, the concurrent conversion processes eventually converge on the manufacture of a few definable projects. Pava says, "The complexity generated by multiple, concurrent processes is compounded because the nature of input and output in nonlinear conversion is often imprecise" (1983b, p.128). The success of a new advertising campaign or its origin is hard to determine or vague. New projects or products often seem to appear "out of nowhere" (unplanned) and only in retrospect gain recognition as a new project or product.

The example of new discoveries is also characterized by its nonsequential conversion flow. For example, Mintzberg (1985) describes the development of business strategies as a result from many small decisions eventually being codified as, or called, a strategy. Pava says that, "Nonlinear work systems require disjointed, zigzagged processes of task completion, not an elegant model or fixed procedure."(1986,p204) This

Thirdly, many professionals in organizations undergo extensive training in their specialty and gain an a high degree of substantive authority. The traditional assumptions of STS regarding multi-skilling in the work team approach do not fit these situations. Traditional assumptions and concerns about deskilling of workers are diametrically opposite to the conditions found in research and development organizations, which often have too much variety in working life.

Altogether Pava says that these conditions invalidate key assumptions supporting conventional STS design: definable inputs and outputs, sequential flow of conversion, cascading one-way variances, and pooled group identity with transferable skills. Therefore traditional analysis does not explain a great deal of the variation found in nonlinear work systems, nor aid these organizations in resolving their key issues.

Purser and Pasmore (1992) extend the concept of the technical system to include the creation and use of knowledge. Technology becomes more intimately connected with thinking where knowledge is "our collection of facts, models, concepts, ideas and inuitions that shape our decisions." They further explain,"knowledge work is any activity that helps to
remove uncertainty from a relevant decision or course of action." "The purpose of knowledge work is to enhance the certainty of knowledge; to bring into the realm of the known that which is currently unknown or only partially understood; and then to apply the new understanding to the development of products or the solutions to problems that are related to organizational success" (p.41).

The primary rationale for deliberation analysis is that what makes work nonroutine is that knowledge involves discovery. Managerial and research work involve a great deal of discovery. While factories are concerned with the rapid production/conversion of standardized products following goals, the creation of goals and product ideas involves discovery. Routine methods of variance analysis do not explain this discovery process, because much of the process is hidden, interactional and emergent. Therefore, deliberation analysis is an additional tool that can be used to understand more of the behavior in organizations. It is challenging because it inquires into processes which we are not as used to making explicit as more physical production processes.

Deliberation Analysis: An Experimental Approach

In this section I would like to outline our thinking before we entered the organization building on the work of Pava and the early work of my colleagues at CWRU. Cal Pava, a student of Trist's (1983), offered some interesting ideas concerning non-routine work, by choosing to look at the deliberations that occur in the organization. The reasoning is that
because non-routine work is largely knowledge work, we would benefit by following the "thinking" of the organizations. According to Pava, the technical conversion process in non-routine work systems is propelled by a multiple and concurrent stream of equivocality reducing events, which he refers to as "deliberations." Pava describes deliberations as

"reflective and communicative behaviors concerning a particular topic. They are patterns of exchange and communication in which people engage with themselves or others to reduce the equivocality of a problematic issue. These exchanges are necessary for dealing with complex or uncertain issues that cannot be solved with a specific rule or algorithm. As technical artifacts of cognition and exchange, they have two salient aspects: topics and forums. (1983b)

It is a quite appealing method, identifying the topics which discretionary coalitions discuss in forums. "Topics are problematic issues facing an enterprise on which people reflect and communicate." Not everyone will have the same role in the resolution of specific topics. Some people may be responsible for the final decision and others may simply need to be consulted, either providing or requiring information from the forum. Forums are procedures and "locations" that direct the interface of the participants. Forums may range from highly structured annual budgeting procedures, to ad hoc meetings in hallways or phone conversations.

Deliberation terminology is an extension of traditional STS terminology. Topics are equivalent to the tasks of the organization. Discretionary coalitions are equivalent to the social groups. And the forums are the
process or technology used by the groups to resolve those topics. However, analysis is situational in nature. By necessity, this is a rather general methodology for inquiry, for deliberations occur at meetings, in hallway conversations, through paper or electronic transactions, and within people's heads. The definitions of topics, forums, and discretionary coalitions are suggestive, and still somewhat equivocally defined. But for our purposes, they are very helpful clues for analysis as will be seen later in the analysis section of this dissertation.

In our application, deliberation analysis helps to identify and analyze the critical events and key choice points in the product development process. Purser elaborates on Pava's method:

deliberations are defined as forms of social interactions in which knowledge is exchanged to define or solve a problem, make a decision, or implement a solution during the product development process. Pava offers further clarification, specifying that a deliberation is identifiable by the existence of an equivocal topic, which is explored or addressed in some particular type of forum, involving a particular group of interested parties. With these sets of criteria, deliberations represent the socio-cognitive operations of the nonlinear technical conversion process. By using deliberations as the unit of analysis, it was possible to retrospectively analyze the quality of major deliberations in order to identify the sources and incidence of variances and delays in the product development process (1990, p.170).

My primary data was "real-time" which made this retrospective analysis difficult. Some retrospective data was however available through the work of Kathy Gurley. In real-time, the "story" of the deliberation had not yet been created, but was largely seen as emergent and without clear
expectations. In retrospect we create the necessary explicit knowledge. In the terms of our central metaphor of the road and the stream, the road is often only apparent in retrospect. We rely on often vague and general initial externalizations or hypotheses which we build upon over time.

The analysis proceeds in a similar step-wise fashion to routine work analysis; however, instead of identifying a linear, sequential conversion process, one identifies all of the major deliberations that occur in the target system. These are identified by topics such as personnel selection, budgeting, project planning, etc. One then identifies the people who may be associated with these topics, and considers how they may be involved with the resolution of the topic. Role analysis, a traditional method used by Rice and Trist, has become more situational in this application. The socio-technical fit is a comparison of the orientation of people and their fit with various forums. Are the right people, in the right place, at the right time with the right information? Are we discussing the right topic in the right way with the right people?

**Variances**

Building on Pava, work by Bill Pasmore and Kathy Gurley has been very informative, particularly in specifying a list of *variances*. In this context, variances are "gaps" in deliberative processes. The notion of variances is extended into the deliberation process. One of the more interesting observations was that the variances were more often what was missing or lacking than they were specific errors in content. I think that this is
indicative of the post-modern organizational conditions and the nature of knowledge work.

At Ampap, variances were often called "outages" or "dropping the ball." Viewed from the perspective of incremental rationality, they are errors to be corrected. However they can also be seen as opportunities for creation. As mentioned earlier this same distinction is to view "problems" as opportunities rather than indicators that something is "wrong."

Pasmore & Gurley (1989) found the following variances in their studies:

LACK OF KNOWLEDGE:
Inadequate Information Provided In Marketing's Request. When Marketing or other liaison groups define customer's needs, the request frequently has to be translated into technical requirements. At times critical pieces of information are missing. Without this information the product development group starts work based on their best guess of the customer's needs. Early development work as well as time often is lost due to misdirection.

FAILURE TO UTILIZE KNOWLEDGE:
Build And Test Too Many Designs. Because of the increased pressure for faster product introductions, R&D groups are finding themselves operating in a mode of building and testing a broad range of product concepts and selecting the best option from the test results. Time is not taken up front in the project to incorporate knowledge from previous projects. Data bases that are hard to access or difficult to use contribute to this mode of operating.

LACK OF COOPERATION:
Limitations Of Standardized Procedures. Since R&D interfaces with a constantly changing environment, i.e., technology, customers' needs, new knowledge, etc., the approach to product development is continually being modified. Support groups such
as testing facilities are often seen as a barrier to getting the job done because of their standardized procedures. Without sufficient cooperation and information sharing between functions, time and resources can be wasted in running inaccurate or inappropriate procedures.

MISSING PARTIES IN DISCUSSIONS AT KEY POINTS:
Final Product Design Decision. One of the key choice points in the product development cycle is the selection of the final features of the product design. When the decision is made by the product development group, the choice is based predominately on the technical performance of the product. The manufacturability of the product is not taken into consideration. Later when the product is transferred to the plant, problems can occur when the product cannot be manufactured within quality or cost standards.

WRONG PARTIES IN KEY DECISIONS:
Allocation Of Resources. A critical balance for most R&D organizations is the amount of resources invested in long-term technology development versus short-term product improvements. In an environment of scarce resources, negotiations over priorities can occur weekly and even daily. These negotiations are affected both by the parties present and the strength of their positions. The urgency of short-term projects which involve potential loss of business if deadlines are missed can unduly influence key decisions.

DISCUSSIONS AT KEY CHOICE POINTS NOT HELD:
Inadequate Progress Not Detected. In almost all non-routine work, progress on a project is difficult to judge. Knowing when a breakthrough or success is just around the corner is impossible to determine. Projects can be allowed to continue because those involved are overly optimistic about the outcomes. Difficult project reviews with critical input and help from individuals outside the project are often postponed, resulting in project overruns and missed deadlines.

LACK OF GOAL CLARITY:
Changing Targets Due To New Information. Customers' needs or wants change over time. Marketing or customer service groups are very aware of the need to stay in tune with these changes. A desire to anticipate the customers' needs can be risky and create
confusion for the product development group, especially when predictions are later proven wrong.

TIME FRAME TOO SHORT:  
Unrealistic Timing. Because customer service groups interface with the customers frequently, they often find themselves agreeing to time schedules or other commitments without consulting the product development organization. Commitments and deadlines are often unrealistic within the resources available, resulting in dissatisfied customers when commitments are only partially met.

PROCEDURES UNCLEAR OR NONEXISTENT:  
Quality Standards. In organizations where projects flow from one department to another, procedures that monitor quality at these hand-off points are frequently lacking. It becomes the accepted mode of operating to expect the next department to catch and correct what are perceived as minor errors. Little attention is paid to complaints from departments downstream because there are no formal channels to legitimize the feedback.

TOO MUCH BUREAUCRATIC STRUCTURE:  
Insufficient Process. An analysis done in one R&D organization showed that most engineers were spending 35 to 40% of their time expediting paper-work required to move projects through the system. Time-consuming procedures such as multiple approvals, duplicate and triplicate copies, follow-up phone calls, looking for information, checking status of projects, etc., can become a significant portion of where professionals spend their time.

Purser (1990) summarizes this list of variances into three root variances: lack of knowledge, lack of knowledge sharing, and failure to utilize knowledge. One key underlying term is knowledge and another is that they are primarily a list of gaps or lack of (something). To a large extent this is an identification of something that is not there. They call to awareness something that we might wish to create. They are anomalies and draw our attention to something that does not directly connect. The
gaps are system issues which challenge us to create something, an invitation for creation of the socio-technical system.

**Delays**

A primary result of variances is delays in the timing (Purser, 1990). A primary concern in new product development is *delays*. Delays often indicate disconnections in the organization, and are evidence of underlying unresolved issues.

Time is perhaps the primary variable of current concern, as evidenced by the interest in shortening product development cycle times. We want to have better control of our time, to create greater predictability and dependability. We wish to increase responsiveness to the market or environment and to decrease costs. Delays as a type of variance in the deliberative process introduce time as an element of STS, which had not been explicitly highlighted before.

We seek organizations that are appropriate, and carry little extra baggage. In bureaucracies which are isolated from the environment, this responsiveness was not a strongly held value, but as environmental dependency has increased, we seek shorter periods of isolation. We like to create greater dependability in our relationships with the environment and so want to control the timing of our product introductions. Mintzberg, Raisinghani and Thoret (1976) found six major disturbances that resulted in delayed development efforts: interrupts (external), timing delays and speed-ups (internal), scheduling
delays (extended queues), feed-back delays (eg. test results), comprehension cycle delays (lack of knowledge), and failure recycle delay (no solution found). In a study of strategic decisions, Hickson (1986) found that the most frequent delays were the result of unsolved problems and influential political resistance.

Issues of timing illustrate the intimate connections between people and technology. Delays are often caused by our feelings and perceptions, certainty or uncertainty about a given situation. They often indicate when a social distancing may be present (Argyris, 1976). When we feel removed from another person or process, isolated or ignored, this can result in failures to act, seen as delays. Delays are therefore often signs that social distances exist, which may require a different social configuration. Delays are an inherent issue in technology creation, because the technology-producting activity is one of creating relative isolation with attendant in-group/out-group dynamics.

At the same time, delays are often required for the synchronization of organizational processes, and simply for people to catch their breath and become oriented. Still, the value in many organizations is to simply shorten time requirements which produce the appearance of efficiency, but may in the long run adversely affect effectiveness.

Core Transformation Process
A corollary to mapping the core transformation process of the organization, in the case of Purser's organization, was the goal
convergence cycle. A great deal of the attention in his study at Polaroid had to do with the identification and discussion about the goal convergence cycle. It was considered the primary conversion process of the organization. However, goal convergence often does not occur in one simple movement, but through several iterations. One of the engineers on his design team developed an interesting diagram of this as an iterative process. The process consisted of goal setting, an exploration of alternative solutions or technologies, a selection of one alternative, and the implementation of that alternative which led back to another round of goal setting until an overall satisfactory solution was reached, resulting in a new product. The overall convergence process actually progressed faster in the long run if more divergence was allowed in each segment because a stronger sense for the reformulation of goals resulted from this digression with its opportunity for reconfiguring the engineer's basic assumptions.

Gurley's project with a pharmaceutical division of Ampap also found a major conflict in the core transformation process paradigms (Gurley, 1994). The conflict was that the professional physicians and Ph.D. researchers with a primarily academic orientation wanted to approach their work as first understanding the disease process and then looking for solutions. This was often the dominant academic model for R&D in other major pharmaceutical companies. However, Ampap, which was relatively new to the market, attributed its success (at least the executives did) to its more opportunistic style of finding interesting immediate
relationships between the symptoms, medications and sites, even if they did not know exactly how it worked with the disease process.

Understanding these core transformation processes appears to be central to STS in more non-routine work systems. A very interesting relationship is between the core process paradigm and the professional paradigms. While it appears that specialists are needed in areas of unique skill areas, each "specialist" also needs to maintain a generalist orientation. This requires the engineer to be aware of the customer and consumer environment. Both cognitive maps (explicit knowledge) and "intuitive" or tacit knowledge through direct experience (implicit knowledge) are necessary. This process involves the building and testing of internal and external worlds, hence, my interest in the two worlds of Heidegger.

**Decision Heuristics**

Tenkasi (1994) approached the knowledge work from the perspective of decision heuristics. His interest was to understand the process of cognitive simplification. From the perspective of incremental rationality, heuristics have been identified as biases or perceptual errors (Bazerman, 1986). However, in a more open framework they simply identify the nature of "bounded rationality" due to the limits of cognitive complexity (March & Simon, 1958). This process involves the inductive process of the cognized environment (cognizing self or group) receiving informational input from the operational environment, and
the deductive process of testing the resulting model in that operational environment. There also appear to be periods of complexification as well as simplicication. The reception of information from the environment often requires tactics of simplification because of the rich set of cues in the environment. Model building itself involes a period of complexification so that an adequate reduction model may be parsimonious with the observed conditions of the operational environment.

Scale and Nature of Intervention

Originally organizational redesign required a full-time team of people over an extended period of time, perhaps two to three years (Pasmore and Gurley, 1989). Increasingly, however, such attempts to be comprehensive have been difficult to achieve. Not only have operational experiments involved only sub-units of the company, they also appear to operate situationally as well. Therefore short, intensive off-site planning efforts are often the result. There are a couple of reasons for this. The turbulent environment has created conditions of constant change both outside and inside the organization. Lewin's model of unfreezing culture, changing it, and then refreezing may not very accurately reflect the possibilities for active cultural change. Change is a very natural process that is continually occuring, particularly with rapid technological change. Second, fundamental change in corporate cultures is extremely difficult to accomplish (Svyantek & DeShon, 1991). Cultures have an amazing tenacity, and it is difficult to predict or control
the nature of that change without a great deal of political pressure. In light of the rapid social and technical change occurring in organizations, small efforts are perhaps even more advised than in periods of large system change.

Conclusion
The key point I would like to draw from this review of sociotechnical systems literature is that many of the principles upon which it is based, appear to still be helpful as we seek to understand nonroutine work. However, the underlying assumptions of the relationship between people, technology, and the environment; and the nature of systems needs to be reconsidered. While tacitly recognizing the turbulent nature of organizational life, the methods of analysis still mostly assume a mechanistic and relatively static organizational structure and process.

A central issue in knowledge work is the extent to which systems are veridical. To what extent can we place a one-to-one correspondence between our experience and our representation of that experience in a systems model? The challenge is that while acknowledging the openness of systems, the concept of systems themselves contains the danger of closure. The nongenerative basis of STS for nonroutine systems lies in the lack of opening systems approach to the fundamental implicit issues of human tool making and its relationship to the environment. Systems approaches have often assumed that one could map the environment in one to one correspondence, however, I suspect that the
environment by its nature is mysterious and not directly knowable. We can however direct our attention to saleient aspects of the environment, without presuming to have a complete map. The fundamental danger seen by Heidegger (1977) in our creation of technology through enframing, has occurred within STS. We have become captives of our own constructs. The open systems perspective needs "fresh air."

Pava's (1983) shift in focus towards deliberations appears to be helpful, freeing STS analysis from the confines of linear-sequential procedures. His recognition of the challenge of professional individualism is a key insight, for groups in organizations are often as instable as their procedures. The work of Pasmore (1988, 1991, 1994) in understanding the dimensions of variances is also quite helpful, for organizational systems are driven by the issues that emerge from these gaps. However, the resolution of variances is not at all straight forward. I think that the focus of deliberation analysis can be powerfully directed at the fundamental core transformation process of the organization as indicated in the research by Purser (1990) and then Gurley (unpublished). Together these recent efforts point toward a more fundamental level of process than groups or individual's as we seek to better understand our environmental stream, so that the road and the stream may exist in greater appropriateness.
CHAPTER 3: METHODOLOGY

This is an exploratory field study of an action research project. I entered the organization as a consultant following the road of sociotechnical system inquiry into non-routine work. From this premise I observed the organizing activity in the organization in an attempt to not only assist the organization but also to further develop the underlying understanding of sociotechnical method of organizational inquiry.

One of the basic premises of Lewin's field theory is that the empirical reality of human experience and behavior requires observation in real-life settings and phenomenological analysis. This is often called naturalistic observation (Cartwright, 1959).

The specific approach to naturalistic observation might described as quasi-ethnographic, because I was an active participant in the organization (Morgan, 1993). Because of the active participation in the organization, I was not able to produce the "thick description" on which pure ethnography is based (Geertz, 1973). One of the objectives of my tenure was to produce usable reflection, and this expectation of utility often made the descriptive quality of the interviews more rough.

The obstensive method was presented in the previous chapter following Pava's method of deliberation analysis, with one major difference. I was studying a project as it occurred and not studying deliberations retrospectively. While intended to be a co-inquiry, the field study was predominantly participant observation except for a series of theory
building meetings during the last couple months of my tenure with the organization.

The strength of my method was the opportunity to live with the program team for over three months, attending all of the meetings in the organization that time would allow. The most informative observations however came in hallway and other off-line conversations with organizational members. This the naturalistic inquiry was an immersion in the organizational stream of activity. These conversations are highlighted in the three analysis chapters.

I repeatedly tried to check my observations with the organization, by feeding back observations with the "breakthrough team" and the steering committee. Most of my observations were confirmed, and others were met with silence. In addition, many informal interviews helped me to understand the life world of the organizational members.

My coding method started with the recognition of anomalies. Some events, conversations and issues stood out more than others because they differed from either my expectations or the expectations of the organizational members. Thus I directed my attention to where the stream intruded on the road, where the road did not fit the course of the stream. The building of the anomalies was indirect. My model is a creative response to the stream and not necessarily a direct reaction. A direct correspondence between the data and a code is not entirely
desirable, but rather compatibility between the road and the stream. The result is perhaps describing a different type of road that may better fit the stream, so that our expectations can be more compatible with the reality of the stream.

The majority of my analysis occurred after I left the field. In order to improve the generalizability of the analysis, I created a dialogue between my observations and several sources of literature. One of my primary interests was in extending STS theory to non-routine work, and so several areas of literature are examined in each of the analysis chapters to extend the fundamental perspectives offered by STS. The organizational literature of project driven organizations and the management of innovation are highlighted in chapter 4 where entry and initial scan of the organization is addressed. Literature from the humanities' exploration of post-modern conditions is used to extend the view of social aspects of the primary work system, and literature from the natural sciences of complex systems is used to extend the view of the technical aspects of the core technology. These discussions conclude with the integration of these influences in a social science model in which James Hans and Stein Broten provide the central concepts used in the model of the meta-lex of deliberations. This meta-lex is seen to be the core transformation process and coordination method in the organization.

The result of this inquiry is speculative and evocative in nature, generally satisfying the requirement of process theory to provide
sufficient explanation for the observed phenomena, but not seeking to provide a necessary explanation (Mohr, 1990). Several explanations are offered in this dissertation, but other interpretations could also be offered as valid.

Initial Methodological Assumptions

The opportunity and initial conceptual framework for the organizational inquiry at AMPAP was the action research/STS approach of *deliberation analysis*. We conducted an *operational experiment* at Ampap using Cal Pava's concepts regarding deliberations. A great deal was learned in attempting to apply his concepts along with our own conceptual tools, to understand the deliberative process of new product development and implementation at Ampap. However, because the "experiment" was using conceptual tools which were both new to us and lacked rigor, and because I was conducting a live project, I viewed the project as an ethnographic study to discover how the organization worked. This followed the open approach of Trist & Bamforth's (1953) observations of coal mines in England and Burns & Stalker's (1963) observations of Scottish industry.

When one reads the early work of Lewin or Tavistock, there was a strong clinical influence in their work, generally becoming known as action research. Sociotechnical systems theory is concerned with the appropriateness of the fit between the people and technology, and between this sociotechnical system and their external environment. It is both an approach to organizational analysis and a set of principles for
organization redesign to improve the fit. At its core is the action research cycle of action and reflection. I sought to discover the experience of these concepts in the form and content of the culture at Ampap.

I was also profoundly affected by my immediately preceding experience, first with an STS redesign at Steelco, and second with Nihonel, a Japanese electronics firm where I conducted research on research for the six months prior to my tenure at AMPAP. I was moved by the following statement by the manager of the patent office at Nihonel.

The greatest discoveries come after a scientist goes over seas and returns. This has almost nothing to do with the technical aspects of his work, but with his change of perspective.

Manager of the Patent Office at Nihonel

The residual effect of this crossing over between cultures was the source of many of my major questions and insights into the culture at AMPAP. "Flashbacks" from my experience at Nihonel cropped up periodically in this inquiry as they were called forth in my experience at AMPAP. The source of questions was partly from specific features in the organizational comparison, but more profoundly my change in perception culturally, for I was a company employee and was expected to behave like all other employees. There was a lot to learn. One of the greatest distinctions for me from my experience in Japan came from the fact that I could not speak much Japanese. Yet, I could understand a great deal by living alongside my fellow company employees. One result is that I needed to somehow experience what their foreign words were pointing to. Only by
sensing the experience, could I associate the words. I carried this sense of fundamental learning as I came to the equally foreign world of Ampap.

My experience at Nihonel required a change in very primary perceptions of self, work, religion, etc. My experience in Japan reinforced the need to open my sense making beyond my preconceived notions and rely more on direct experience. In process philosophy there is the principle of ambiguity, which suggests that language is and needs to be ambiguous for the creative response of life to emerge (Whitehead, 1929; Levine, 1985). The Japanese corollary is the story of a Zen monk, who in pointing to the moon asked his student, "What do you see, my finger or the moon?".

Another implication of the limits of language is that the organization often acts beyond its ability to conceptualize or theorize. Organizational members operate from a tacit level of awareness, which appears linguistically ambiguous. It is much more than a cognitive process. There is being to socio-technical organization. It was difficult at both Nihonel and Ampap to understand the imbeddedness of the organizational culture. Neither organization was easy to understand.

Beyond my own changes of perception, the contrast in style between Nihonel and AMPAP was striking. Nihonel was much more organic and AMPAP more mechanical in their metaphors and views toward their organizational structure and process. My colleagues at Nihonel
called theirs a "wet" culture, and I suppose that the AMPAP culture was in fact "dry" in many respects. And, immediately preceding my experience at Nihonel, I spent six months helping to redesign an administrative sub-unit of a steel company I will refer to as 'Steelco.' To a certain extent, the Steelco experience will also appear because it was my primary previous experience with socio-technical redesign, but from a much more acknowledged position as "routine work" redesign. These prior experiences are inevitably carried with us into our current and future work.

**Story of the Inquiry**

My definition of success is the ability to experience repeated failure without getting discouraged.

Director of R&D Personnel at Ampap

In one sense, this is the story of a failed intervention. In the breakdown of this intervention, I learned a great deal about the organization and myself. While I could understand a bit and test it in the organization, the greater reflection as occurred subsequent to my one year tenure in the organization. What I learned was that in this organization, the stream was constantly breaking up the road of our intentions. The organizational reality was constantly defying our expectations. How can one thrive in this turbulence?

**Entry:** About a year before I formally entered the organization I gave a presentation with my advisor to a group of about forty managers and internal consultants at Ampap. My interest in particular had been in
organizational wisdom. Collectively we had attracted the attention of the Senior Group Vice President in charge of Research and Development. It was through his authority that we entered the company.

We were very excited to engage with extending this work with Ampap. The particular sponsor of our efforts was a Director, we will call "Mick", of Product Development for one of the divisions of Ampap focusing on several lines of consumer paper products. Mick was my main source of information in the first couple of meetings, and I talked with him periodically throughout my tenure in the organization.

Project Set-up: It was decided that we would have three parts to the STS project in the pidget division: a case study of a current project called Z2B, an examination of specific vertical deliberations at the division level, and perhaps eventually leading to a "work-flow analysis." The work flow analysis would allow for the redesign of the organization, and the former might lead to some action but was primarily aimed at demonstrating and developing the method and preparing for the work flow analysis. I would work with Sally (an Associate Director or "AD" in Product Development) and George (an AD in Engineering) on the case study. My charge was to live with the Z2B program for a few months and work with a small group (four to five people) to better understand the nature of deliberations in a current product initiative which we could use as an intensive case study on behalf of the larger organization.
and study. The Z2B program was to develop the next upgrade for the Zephyr brand of pidget in the next two years. This was a huge undertaking incorporating all aspects of the product development, production and distribution.

Near the end of March, I attended a three-day seminar of Short Cycle Management given by another outside consultant at the suggestion of the steering committee. It was fascinating opportunity to hear the forty-five people involved with the Z2B program talk about their experience and expectation for the project.

The next day about seven of the program team members met and redesigned the team structure. There were two basic levels of personnel in the Z2B program, the program team, responsible for directing and coordinating all the aspects the program including manufacturing and distribution, and the project team which was responsible for the technical development of the product. The program team was more often called the Launch team, and the project team was more often called the Execution team. I got a call from Sally the next week saying that she had been reassigned and that there should be a three to four week delay in the project until the new leadership came on board. To say that this organization was complex and dynamic is an understatement. Everything appeared to be in flux.
Residence: I returned in May and worked full-time trying to organize the "breakthrough team" of five people including George. I attended most of the program team meetings, and some of the Zephyr business team (attended by the managers of people on the project) and project team meetings. From this vantage point I documented a major deliberation during the month of May, which was a request from Jerry (the division general manager) to speed up the twenty-two month program schedule by four months.

It took a while to become familiar with the language, projects and interlocking organizational issues. Vic, the project manager, handed me a dictionary of Ampapese, with over 650 specific terms used in their category of the company. This helped, but it still took a while to be able to talk with others at the meetings, particularly when I had my own set of jargon for STS. Gradually, I began phrasing things in their terms, so we talked about understanding how issues were worked (topics) and what was the organizational conversation (deliberations).

Participant Observation: During this time I interviewed all of the members of the program team and facilitated team building offsites for the project and program teams. These meetings were fascinating, and together with a series of spontaneous conversations, presented a very generative side to the organization. One of the more memorable meetings was with the director of process engineering, which started in
the hallway and went on for almost two hours on the nature of projects and their time horizons.

Theory Building Sessions: In August George and I planned for and held the first deliberation day with a reconstituted breakthrough team. Deliberation day was the term I used for our theory building sessions. We agreed to meet again after a month and produce some more specific recommendations. This we did on October 9th. We met again for a half day on October 29th to recap the work we had done so far and prepare some recommendations for the steering committee. Due to scheduling difficulties, we didn't meet with the steering committee to present our recommendations until December 11th. The inquiry team's recommendations were for the most part rejected by the steering committee.

Subsequent Reflection

Most of the thinking in this dissertation has come from a long period of subsequent reflection, seeking to put together the pieces of a very difficult puzzle. The analysis of the deliberations and the organization has evolved over a number of years. I first went through all my notes and complied most of them in a large collection organized by date, and later general topics. After initially constructing a framework for the general process of the deliberations, this model evolved eventually into the distinction of the Road and the Stream.
Fundamental question of methodology for this field study is; how can one discern implicit order? This question is not foreign to any field of human relations. Norms are often implied and can only be observed when they are broken (Coser, 1975). So, I have learned a great deal from the variances, gaps, "outages," and failures both in my inquiry and in the organization I observed. The task of my analysis has been to seek meaning behind the breakdown.

Perhaps most often however, implied process is hypothesized or speculated. "Discovered" in this sense does not mean that it necessarily "exists" as such, because it has not perhaps been explicit. Phenomenology of Husserl was exceptional in the field of philosophy because it based its speculation on experienced phenomena, and was said to have rigorous method (Luckmann, 1978). Hermeneutics has also developed methods of textual analysis in the attempt to understand the meaning of texts (Thachankery, 1994). Symbolic Interaction attempted to develop building blocks of human interaction through grounded theory development (Coach & Hinz, 1975). Generally these efforts have not been terribly successful in coming up with fundamental laws of human interaction. There does appear to be a gap between the inductive and deductive processes of research and theory building. This gap is bridged by speculation, which could also be seen as the creative act of toolbuilding. As in theories of perception, we fill in the gaps of our perception to create the momentary illusion of a seemless whole.
While chaos theory in the natural sciences has been successful in creating phenomena that are near chaos, they have been much less successful in detecting the implicate order or *strange attractor* of naturally occurring phenomena (Scott, 1994). The strange attractor is the term developed by chaos theorists to describe the implied central organized process around which there is apparent chaos. However, perhaps because implied phenomena has been a necessary aspect of social science theory and the humanities, theorists who have used the metaphor of chaos theory have speculated on the implicit structure in human systems of interaction. For instance, Drazin and Sandelands (1992) identify three levels of structure in autogenesis (a form of self-organizing systems theory.) *Observed structure* is "comprised of the categories and terms that apply to the perceptions social interaction as collectives by observers." *Elemental structure* "consists of interactions between individual actors." And, *deep structure* "consists of rules that generate and govern individual behavior and interactions." (p.236). Similar levels have been suggested by Giddens (1981), Geertz (1973), and DiMaggio (1986). As a participant in the systems with his own projects, several levels of phenomena were observed. Following the notion of 'holographic organization' or 'self-similarity', the patterns sought should be found in my personal experience of my project, my participation with the project team in their unfolding development and interaction with the environment, and from observation of the broader 'multi-project' organizational environment.
I lived in the organization attempting to follow the deliberations by topics. This was rather difficult to do in real time as the topics split, merged and transformed. It was a stream of conversations. The underlying movement achieved form through the local system of the project team interface with the environment of managers and consumers. I looked for what struck me as interesting anomalies in the system. These observations were reported back to both the project team and the managers through individual discussions and at the steering committee meetings. Finally they were discussed in our 'theory building sessions.'

Subsequent to my tenure in the organization, a generalized model of the metalogue of the project cycle emerged. The observed structure was the project cycle of interaction where the project team would respond to issues raised from previous efforts and the gap between current performance of the product development systems and the perception of the consumer. This interaction is primarily reported in Chapter 4 regarding the entry and initial scan of the system at Ampap.

Later, I identified the elemental structure as the metalogue of deliberations, the nature of dialogue or conversation what accompanied the project cycle. This level can be seen in Chapters 5 and 6 in the discussion of deliberations and the organizational conversation.
Finally, one can speculate about the deep structure of the organization as being an ontology of the project cycle. The deep structure appears to require a creative response which resembles poetic descriptions with the stories such as the 'horse and rider crossing a stream.' This deep structure involves the fundamental connection of the individual with the stream of activity at the most fundamental level of concept and intent. In this sense one can only express their experience of the stream in some type of road metaphor through a sense of presencing. The expression itself may evoke the ontological sense of being and connection with the ground of Being. The organizational stories in chapter 6 point to the deep structure however they also carry elements of the previous levels of observation and element. The metaleguage of deliberations also points toward this deep structure.

Analysis
Organizational ethnography and qualitative methods appear to have increasing interest in observers of organizational behavior (Czarniawska-Joerges, 1994; Schwartzman, 1993; Gummesson, 1991; Sachmann, 1991; Fettermen, 1989). This could be seen as an effort to better understand the generative discoveries of early organizational theorists, like Burns & Stalker (1961), Woodward (1965), and Lawrence & Loarch (1967), who relied primarily on observation in their discoveries of organizational forms.

My model was built on the correspondence of the organizational process I witnessed and similar processes in literature. For instance, Sonja
Sackmann made some very interesting observations in her ethnographic studies of complex organizations (1986). She saw two type of metaphors used in organizations; *engineering* metaphors and *philosophizing* metaphors. These correspond directly with the two worlds of the road and the stream; the immediate cognitive, instrumental rationality, and the more ambiguous aesthetic or intuitive awareness.

**Unit of Analysis**

The unit of analysis is *conversations* that constitute deliberations. My intent is to not only describe the conversations, but also to attempt to create from them levers for action and understanding. This differs from the intent of most ethnographic studies to simply describe. I want to both identify and create technology, as integrating and coordinating methods/mechanisms.

However, at a deeper level the unit of analysis became the *process cycle* that was implicitly present holographically in the organization. The notion of cycle was initially suggested by the organizations interest in the project cycle. The notion of cycle brought to mind other interests in cycles, first from Lewin's cycle of steps in action research (1949). Not surprisingly this correlated, due to their joint root in phenomenology, with the cycle of the social creation of reality proposed by Berger and Luckmann (1967). There is an interplay between local systems and the environment which piece by piece creates our reality in the stream of events and the mysteriousness of the broader world. This
is through the cyclical movement of externalization, objectification and internalization. This cyclic form was also further reinforced in the correlary processes of Kanter (1988) and Kolb (1984). Kolb's learning cycle had proven to be a very powerful explanation of the underlying experience of organizational members as a learning environment (Carlsson & Keane, 1989).

Professional individualism is a present and powerful cultural trait and practice. The way one deals with individualism is not to attempt to negate it because we see it as sub optimizing social organization, but, to "push the bottom out of it," (to use Bultman's phrase, 1955) to deconstruct it (Derrida, 1987). However this deconstruction is in fact a preparation to receive the stream by removing false concretization. When we question the assumptions of professional individualism, we test our constructs and their representation of our experience. What is the core process paradigm of our profession that guides our understanding and action?

The root of my analysis theory is phenomenology, however, I wish to extend it to an ontological level. We are predominantly captured by our perceptions of the world, but occasionally there are points of connection which inform close correlation between the road and the stream. This realization and practice come together in the most basic activities of our profession.
Validity

This inquiry follows the action research approach of Morgan, in that the validity of the resulting observation and theory will be in its "resonance" with organizational member (1993). The modicum of sensemaking that took place during my tenure in the organization, and the resulting metaphor presented, confirm the underlying direction of the analysis. However, this dissertation represents a new text for the organizational response which has not been entirely confirmed.

The intent of this piece is present one possible explanation for the interaction between the road and the stream of organizational life. Of course, it is not the only explanation possible, but must be evaluated for its evocative nature. To what extent does it evoke an understanding either at Ampap or other product development organizations? It is a process theory, which according to Mohr, simply states the sufficient conditions necessary to explain the observed behavior (1990). It does not seek to be a variance theory which must not only meet the conditions of sufficiency, but also claim to be a necessary explanation. It is one of the tenets of socio-technical systems theory that organizations are many ways of accomplishing a given tasks, and many possible organizational responses to an equivocal environment. I feel it is therefore appropriate to not claim that all the features identified in this dissertation are necessary, nor the only explanation.
Additionally, because this framework seeks to construct a speculative philosophical link with organizational life, it is hoped that it will apply to other organizations of similar situations and challenges, and, as with my prior experiences in a Japanese corporation, aid in the development of perceptual shifts possible as one crosses over to other organizational systems.

Because of the time-bounded nature of this observation and the time-dependent nature of organizational life, the specific features of Ampap will change, but I expect that the underlying dynamic of road building will remain. This should be a reliable explanation of the underlying processes in organization building through technology. Likewise, every attempt has been made to use the concepts and events in the organization as validly as possible. The internal validity can be checked by the readers for whether the interlocking activities and concepts make sense to them. The external validity must be checked by member of Ampap, or other organizations which may be in similar situations and processes.

Methodological Issues
The search for fundamental, implicit or deep structure is precarious. We can project this deep structure, but by its nature it appears that the structure cannot yet be clearly derived inductively from the situation (Stalker, 1976). It may not be not directly correlated one-to-one with surface structures in organizations. It is implied, yet its explicit
formulation and codification is subject to many interpretations as seen in the hermeneutics of textual interpretation. The actors in the organization had a number of interpretations of the living text of the organization. There were many interpretations of the environment. The environment by nature is largely equivocal in this sense. Still, the stream exists independent of our representation. Issues arise in the organization and only retrospectively become topics. However, we do know that there are implications from the stream, and there is a great danger if we mistake the road for the stream. Our creative responses sometimes "work" and sometimes do not. The process in the organization is one of theorizing creation and testing. Our success depends largely on our ability to internalize the environment and creatively synthesize a response that would have a high likelihood of environmental acceptance. In this sense, this is a risky inquiry.
CHAPTER 4: ENTRY & INITIAL SCAN

In this chapter I wish to introduce the issues and themes of the organization, and thus provide a setting for analysis of the primary work system and its relationship with the environment.

"If It Is Not A Project, What Is It?"

I had lunch with Shelly, the Organizational Effectiveness person for PD, to talk with her about the Pidget Category and our entry into it. We reflected that often what people cited as the best project experiences are not viewed as being good by the organization. The project often feels "best" when it seals itself off from the organization; however, team members forget how people on the outside of their project feel. This seems to be an "inevitable" part of the dilemma of wanting faster PD cycle times if you look at the sequence of actions. First, because in a rush there are many parallel processes, communication and verification of knowledge become less clearly organized and rationalized. It is a messy business. This means that test data may not be clearly available and all the answers are not in. The knowledge that is available will be from expert's hunches and judgments. Second, this means that the localized knowledge cannot be as easily coordinated across projects and commonly rationalized. We feel out of control at the top unless managers can compare and judge insight from their subordinates and others in the organization with "data-based" decisions. Third, this makes it difficult to give direction from above, because managers have given away that

96
discretion. An alternative is to focus on a few key numbers or measures, and that can be a rather crass or arbitrary measure which promotes doing things by the numbers and appearances rather than "doing things right."

Our own experience really reflects the difficulty of getting the PD organization to 'sit still' for a study. One of the major concerns from our current projects is how to form and implement recommendations. My advisor said that we couldn't expect organizational change with the project-oriented studies we are currently orienting toward. I also felt that we could not expect change unless we could engage people in the organization to a co-inquiry. This takes time and commitment on the part of the organization, yet the organizational members seem to operate hyperactively, rarely stopping for reflection and codifying their brainstormed and loosely connected efforts. Privately at this time I felt that unless we could get commitment from the organization to put in their time in the study, it probably was not worth any of our time, or theirs. My rationalization after talking with Bill was that perhaps their commitment will grow as they become interested, and we could learn something even if we do not accomplish organizational change.

Shelly highlighted this experience with the organizational question of, "If it isn't a project, what is it?" So far in the meetings I have observed, it has been suggested that a few of the parts of projects could be done outside the project context. The response seems to be that it won't get done if it is not part of a project. This would perhaps explain the tenacity
of the hierarchy's retention of functional control of salaries and promotions. Again, the language of "projects" captures people's attention, and any efforts outside major projects run the risk of not getting resources and therefore not being completed.

The concept of "the project" is central to the organization at Ampap. The term project is very interesting for it is both "a plan" and "an undertaking requiring concerted effort" that is directed outward (AHD, 1994). The several meanings of the term work in concert here. It is directed through a goal or purpose. The project is related to technology in that they involve the Greek word, telos, which Heidegger sees both as an projection as an ideal or aim, but also the enframing, the embodiment of one's intent or effort (1977). It is through the project that we gain being with the world and participate in the creation of our environment, the stream.

LISTENING TO THE ORGANIZATIONAL CONVERSATION

The organizational conversations I was a part of illustrated a great many of the issues presented in the literature.

Organizational Structure

Don't call this place a campus, or they will think we don't do any work around here.

Mick, Director of Product Development

Still, the primary site of my inquiry appeared to be a tranquil "campus" of buildings on a hill overlooking a wooded river valley. Two of these
building were the homes of the technical community for paper products product and process development, inhabited by a few hundred engineers of various interests and backgrounds. The paper products category has three main functional subgroups of individuals that I came to know more intimately: Product Development, Product Engineering & Manufacturing, and Commercial. The Product Development department (PD) was concerned with coming up with final product drawings and material specifications of the new pidget. PD was located in the West brick building, along one long, low lit corridor. One person to an office.

The Product Engineering & Manufacturing department (PEM) had four main sub-departments. PEM was located in a four story square box with a shiny black finish. Its internal walls were flexibly design, but never reconfigured. Engineering figured out how to make these new pidgets. Manufacturing had fewer people present in the building but represented thousands of people in the plants. Their overriding interest was in how one could practically make billions of the new consumer-widgets reliably. The Reliability subgroup technically is part of manufacturing, but follows up new plant installations with most minor efficiency improvements, from which a surprising amount of additional revenue comes. They are the fine tuners of the technical system. The fourth part of PEM, Materials, coordinates the interactions of the organization with their suppliers of materials (mostly plastics and cellulose) and equipment. This leads to an auxiliary group, ABC, which is actually
another company formed from a number of vendors to serve Ampap in their design of new machinery for their converter lines.

The third main department in the pidget organization of the Category is Commercial. They are responsible for "driving the business." They manage the image of the product lines, and do the marketing, advertising and sales. They are located downtown in at one of the main headquarters buildings.

PEM management have largely come from manufacturing, and one of the main problems they have with the accelerated schedules is that the product definition or designs keep changing. This frustrates them particularly when it comes to the fabrication of machinery. They want to start with frozen specifications. This is particularly difficult for ABC, a vendor company which does the final design work. Even though they are on CAD/CAM systems, they still largely operate like a pencil and blue print method, where they often have to start all over again even with minor design specification changes. The director of product development also felt that there was a big gap between PD and PEM. Part of the reason for this is that while personnel changes in PEM have overlapping tenures so that the new person can learn from the former person, changes in PD are almost immediate with a very quick hand off. It has only been a couple of years since the 1,400 personnel in the central engineering function were split into their separate customer categories.
There are only a couple hundred engineers left that report through the engineering function.

On another note, it seems very difficult for me to tell the difference between PD and PEM folk, because their jobs largely overlap out at the test facility and pilot plant. Mick felt that they had recently made improvements in coordinating between the two departments.

The "real work" occurred at four primary sites in which scaled up from hand-made products through increasingly larger equipment and risk resulting in the creation of the full-scale manufacturing lines.

![Diagram showing product development scaleup sites]

**Figure 2: Product Development Scaleup Sites**

I visited the test facility and the pilot plant. The engineers start with the development of unit operations at the test facility, gradually putting more unit operations together until they have an almost complete converter line at the pilot plant that is identical to those that will be in the plants. Because of the push for time, they were forced to try to
develop the process technologies to be included into the product latest program. This meant that components of the unit operations could not be taken "off the shelf" bringing a great deal of uncertainty to project schedules. Ampap conducted extensive product testing particularly before the programs moved from one site to the next larger site. There were over 43 types of consumer tests done to the product in all.

It was also interesting to note that there had been lot of development in the organization's use of issue lists, promoted by a visiting director who was the process manager for the Product Delivery Model. With these lists the teams would keep track of special issues that needed to be addressed by the team and prioritized by three levels of importance. In an update meeting for their advertising agency, I learned a lot of interesting aspects of the business. The Z2B project was still developing the concept of the project. While it appeared that this should have taken place earlier according to the project flow sheet, they did not know which features would finally be in the product until recently, and it is still somewhat up in the air. It was also interesting that none of the retail stores made any money from selling this product; they were in such demand that they were considered lead items which could be sold at their break-even point. This was the first time that I heard that the Z2B team 'had to' include the Phases concept in their product. It's inclusion had been resisted for several weeks and was on their competing in-house brand X. Part of the difficulty in this distinction was that although the
two competing brands were to share all their major technologies, they still had to be distinguishable. This appeared to be very difficult task.

We Need A Concept

We need to have a clear concept before we invest in a project.
Senior VP for R&D

Our initial entry to the organization came through the Senior VP for R&D at Ampap. We had presented some of our ideas from the Sociotechnical systems perspective to a group of managers and organizational effectiveness staff. Later in the day we met with the VP. His main concern was how they could develop a clear concept early in the project. It was the job of Product Development, the functional group under his authority, to develop the product concepts with the commercial side of the business early in the process. This concept would then be handed off to the Product Engineering & Manufacturing functions to turn into a viable mass-produced product for the consumer markets. One of the apparent difficulties was that the product concept would sometimes only become apparent late in the life of the program, if at all. We reflected that it would be helpful to develop a feeling of it being 'real' and not just speculative or hypothetical in this early work.

Interests of the Steering Committee

How can we improve the connection between Product Development and Product Engineering & Manufacturing?  
Mick, Director of Product Development
Our first meeting with people in the category came at a meeting room at their technical center. There were nine people in attendance for a half-day meeting with my advisor, a fellow student, and me. Most of the members of our future steering team were in attendance including the director (Mick) and two associate directors from Product Development staff. Two directors from the Product Engineering & Manufacturing organization were present representing engineering and manufacturing. The manager for total quality with the paper category was there as well as the internal Organizational Effectiveness (OE) person for product development. They first presented some of their interests and concerns with developing the work system in the category.

Interests in the Inquiry

All of the people attending had been with the company for several years and had tried many different approaches toward organizational effectiveness. *They were in the process of reducing the time necessary to develop a new product introduction from thirty-six months to twenty-two months, but felt that to really realize this reduction in time would require new innovations in how people interacted in the company. In particular, the interest was in improving the interaction between Product Development and Product Engineering & Manufacturing.* This was evident in that representatives from both of these groups were present. Early involvement of process engineering in product development was emphasized, and Mick, Jerry and Dave had been actively building stronger relationships in the short time of Mick's tenure in his current
position. They felt good about their progress to date, but felt that they needed to become better at the interchange for them to realize their goals of reduced development and implementation times. In their discussion, they described themselves was clearly a "high achievement" company that was interested in perfecting an already good history of successful development.

**Organizational Process Issues**

I became aware of two primary process issues: attracting the right people to meetings, and getting their attention on one conversation or organizational process model. People came and went as the day went on, but in retrospect it was amazing that we could get that many people in the organization to attend the same meeting more or less full time. This was not to be a common occurrence. Originally, we had planned on presenting a fair amount of information regarding STS analysis; however, we instead followed Mick's stream of consciousness and interest. This was also to become a familiar pattern. My advisor did manage to briefly describe our STS approach and the importance of the social, technical and environmental analyses.

**The Main Deliberations**

The main deliberations the managers saw going on regarded the Boy/Girl concept in which the absorbent material was placed differently according to sex of the child, a new technical feature to prevent leakage from the pidget, and a general discussion of category strategy. It was
noted that regarding the first deliberation they felt that R&D was not
together on this and the innovation was largely driven by people from
the commercial side of the business. The General Manager had
unilaterally decided not to include the second in their previous projects
even though everyone else in the organization felt that it should be
done. And regarding the third, they felt that particularly because the GM
(and Director of PD) was relatively new to his position, there was a great
deal of work to be done with category strategy and at present there was
not a lot of clarity in the organization around it. There were major new
people in the organization and the category was also undergoing many
other changes at that time. The relationships at the upper levels of the
category were still developing. There were over 5,000 people in the
category, mostly in the plants, but there were several hundred involved
in product and process engineering. It was suggested that we wanted to
focus our attention on the technical community.

Planning the Inquiry
It was agreed that we needed to further define the scope of the project.
Members of the company would work from their end to define their
needs and interests, as well as pull together more information about
their current efforts in developing their work processes. Shelly and Cal
would coordinate the development of this material. My fellow
consultants and I would write a short document describing the analyses,
an initial design for the steering committee, and our needs/expectations
regarding publishing needs.
We next met on March 2nd for two hours. At this meeting we were to clarify the scope and resources needed for the project, and a go/no-go decision process. A draft project design had been developed by the director in charge of the Product Launch Process using information we had provided to him, that would perhaps carry on for the next year. It would involve the development of a design team that would conduct environmental, social and technical analyses through the following summer, with the formulation of redesign proposals in the following fall and implementation occurring around the start of the next year.

It was decided that we would have three parts to the STS project in the Diaper category: a case study of Z2B, an examination of specific deliberations at the category level, and a historical evaluation of several past product development efforts, perhaps leading to a work-flow analysis. The last would allow for the redesign of the organization, and the first two might lead to some action but were primarily aimed at demonstrating the method and preparing for the work flow analysis. The content of the third study was the broadest in scope of the three and seemed to evolve the most from a small analysis of historical projects to involve almost twice as much effort in combined time and resources of the first two. Two Associate Directors (ADs) were currently in charge of the Z2B project for PD and PEM. The director from PD in charge of the pilot plant (SPL) would be the AD contact for the work flow analysis. The Z2B project was chosen for a couple of reasons. There were only a
few large and active projects going on in the category at any given time, and the steering committee felt that the interface between PD and PEM was most evident in Z2B. The main project for the other brand of pidget (X), X2B, was further along in development, and another initiative, 3Y-1, was still largely in the planning stage. PD’s primary direction of projects was more up stream and smaller in scope. Z2B was only recently being pulled together as the next big product initiative for the brand involving PEM.

**Project Contradictions**

The first main contradiction was the availability of people’s time. (This would continue to be the major stumbling block for the Z2B case study.) We had also discussed the need for the development of a design team for my part of the study with the Z2B project requiring three to five days of orientation, training and planning up front. My advisor, in a letter to Mick summarizing our proposal, stated that we hoped that we could have a training off-site for members of the design team (yet to be nominated), and the steering committee in the near future. In the OE consultant’s distributed meeting notes, she mentioned her difficulty in scheduling the next meeting of the steering committee: "Calendar matching is a study in itself! The above were the only two commonly available times in the next couple of months.” We agreed to meet again in three weeks.
The second main contradiction became apparent at the next meeting on March 23rd, when we took six hours to review the project proposal and develop the next steps. Attendance at this meeting, as expected, saw people come and go, was primarily people from PD. Here I was briefly introduced to a section head in PD (just below the AD level), who headed up the Z2B project with George, the AD from PEM.

In further discussing the Z2B project, we wondered how the team would react to an inquiry by a sub-team that would act as a "design team." The Director of PEM Engineering suggested that the study could potentially help the team in real time, because they needed some breakthroughs if they were to accomplish their currently committed goals. The project schedule had been compressed beyond the point at which they could plan from experience and it felt very risky, depending on discovering new ways of operating as a project. George had put together an informal team to help develop these breakthroughs and improve their decision-making, and the third contradiction was that our STS design team would be seen as an extension of this current effort. From the steering team's perspective, our study wanted to look wherever PD and PEM interface; however, my role was to be an action researcher primarily working with the Z2B project as a case study for the rest of the organization and not primarily as a facilitator. Facilitation could come from in-house OD consultants, which at that time I assumed would be the internal OE consultant's role because the steering committee said PD was currently in the lead on the Z2B project.
Mixed Sanction of Project

There were a great number of insights at this meeting concerning the organization and the role of a real-time study of Z2B. Mick said it as a way to strengthen the functional areas of the company and improve their communication. The AD from PD was concerned that this might be an impossible task for the STS study: "Do we already know and do these things?" Chris (the director in charge of the PDM) responded by saying that it is important we put what we do down in writing so they are available for decision. Mick commented that we need to develop a different "gospel" (from the oral one we have), and that the way the organization currently operates has a great deal of resiliency. "The hierarchy can slap it (a proposal from a project team) down and they will come back with the same thing." Chris said there was value in developing the dialogue between the GM and the project organization. Often in the company there is an "inherent frustration of doing work and having it slapped down with NO! and often no rationale." "How can the team know more about what the GM is prepared for?" "What is worth doing that we are doing and what is less worth doing?"

Reflection on Entry

One aspect of our entry is retrospectively apparent. As Michael Crozier noted in his study of French plants, the greatest source of power was the control of uncertainty (1964). The functions exerted power over the project organization through control of ambiguity. PD appeared to
control the uncertainty (or perhaps ambiguity) by not wanting to go along with whatever plans were created by PEM, and Commercial wished to control the entire organization by withholding approval for product features. Thus the concept and process of the organization were withheld from specificity by PD or more powerfully, commercial.

It was proving to be a quite elusive organization. Just as it took a couple of years to gain access to the system, it was also going to be difficult to engage directly in a change effort here. Mick’s stance appeared contradictory, being passionately interested in improving the deliberation processes, but also denying the creation of a simple or coherent process. The conversation was given to passionate declarations, particularly by the directors, and cautious commitments by the ADs.

I think we failed to realize how difficult it was to address these issues, and the "protective defenses" that come up to prevent the hegemony of the analyzability and non-exceptional nature of routine operations on the discretion of either the hierarchy or product development. It is very difficult to enter into this dialogue. Where do we begin?

**Wanting to Be a Pipeline**

How can we become a pipeline so that his program can flow smoothly and deliver the product on time? All the interruptions from these functional silos are killing us.

Paul, Senior Engineer in PEM
Chris suggested that I attend a three-day seminar of Short Cycle Management which the entire Z2B program staff was to attend the next week. It was given by an outside consultant who has given forms of this seminar all over the company. About forty-five people who were working on Z2B attended. The session was held in a huge auditorium at the main R&D campus. Paul, a senior engineer and technical leader of the project, hosted the event and appeared to be the main organizational sponsor. I met George for the first time in the back of the hall before the seminar started, but it appeared that he knew little about me or the STS project. I introduced myself as we went around the huge "horseshoe" of tables in the auditorium only as a consultant from CWRU who was doing "research on research" and would be around Ampap for a while.

The external consultant's reason why SCM isn't done more often is that, "We don't value simplicity." Instead, we want "Leading edge, state of the art, world class, neat shit." I had a number of interesting conversations with people during the breaks. A number of them were contract engineers (meaning they were only temporarily hired by Ampap for design tasks) or people who were working on the team part time. In my conversations there was clearly a movemental overtone to some of the responses sounding like "we got religion." People were anxious to "get on with the project." The notion of reducing time, complexity and confusion was very appealing.
There was a lot of frustration voiced concerning the uncertainty and ambiguity of the current project and its organization. A couple of the Product Development people did have some difficulty with the critical comments Heard made about the AMPAP culture. He had been around the company for several years with different categories and appeared to feel he knew a great deal about the company culture. Sally, the section head from PD, commented that, "He makes it sound like we don't do anything right (and that's not true)." The seminar clearly came from the perspective of gearing up for manufacturing and its desire for eliminating variability in processes.

The consultant presented a plethora of propositions:
"You have committees, not teams."; "You have to move from bucket brigades between functional silos to a pipeline."; "Once you have mapped a process, you begin to make the right decisions."; "You need to know what differences make a difference to customers."; "You need to smooth out the variability in your production capability."; "You need to control or eliminate all sources of variability within your standards."; "You need to linearize the work flow, establishing a rhythm to the work."; "Discernible patterns are needed. If they are too irregular, the supplier will get screwed up."; and "Design your system with physical limits that control your rate."

Many of these comments made a great deal of sense to people, particularly the engineers involved with equipment design. They were
looking for greater certainty and wished to work from definite and relatively stable product specifications. These comments particularly suited the execution phase of a project. However, it was clearly more difficult for the people from product design to make use of major parts of the presentation, and they questioned the use of manufacturing principles in product development. The PD people did feel that they confused themselves a lot.

Near the end of the seminar the consultant asked those present to brainstorm a list of action steps they could take for improvement. They came up with a very long list which expressed a desire for isolating the team of people in a "pipeline," buffered from the influence of the "functional silos." They wanted to locate all the team members in the same place and define the process of decision-making, principles and mission of the team. They wanted a clear map of the organization, and to promote a broad understanding of each other's issues. Rather than be specialists, they saw it as important to represent every function on the team. The interesting aspect of this was that this was largely an event by PEM, and PD felt criticized and were far less enthusiastic to "linearize, define, and confine the process." There is danger in getting religion, and well as strength. This danger is not unlike that seen by Heidegger in techne. They, PEM, were creating a new framework.
Creating a Hierarchy of Teams

We have had all kinds of team development. It has come out of our historical success with teams in manufacturing over many years. And, we want to promote the cooperative spirit of teams.

George, Associate Director in PEM

A Sub-team was developed to follow-up on the action steps from this brainstorm and was composed of the current program leadership including: four people from PEM, one person from PD, two people from Commercial and one person from Financial.

Obviously, many of these issues and solutions were generated in the context of the external consultant's ideas about SCM; however they also were my first glimpses of the issues in the Z2B project organization from people outside our steering committee. I was struck by the dizzying numbers of terms and concepts thrown out in this meeting. A lot of the terms came from various forms of ideas in the "Total Quality Movement" that had been applied to manufacturing. This, I later found out, was the "normal state" of ideas, which was more often a rich gestalt of many notions that only become codified on rare occasions but mostly remained tacit and unaddressed. Later people would talk about the need to apply the SCM principles, but were hard pressed to specify what those principles were. As a counterpoint to my previous meetings with the directors, there was all the appearance of conversation without understanding or questioning what the person was saying. It appeared to be a "conspiracy of silence." There was not enough time to engage in
very fundamental discussion of their process, and the discussion was more discursive and utilitarian in nature. A few key words, usually those currently in vogue, dimly pointed to an unspecified underlying set of assumptions.

One of the assumptions in this emphasis on SCM was a belief that development time needed to be cut, but there was little emphasis on developing the necessary preceding dialogue and fundamental agreements which allows Japanese companies to "spin-off" new products fast from a strong base. Part of the difficulty is that the project structure the project team members are talking about primarily exists only during a part of the project cycle. They clearly are calling for the isolation of the project team in a "pipeline": located in the same place; cutting out non-value added activities; structure input, i.e., build a house of quality chart; simplify the product, process and organizational structure; introduce efficiency improvements; and make simple and direct connections with the power of the GM. It is interesting that there is little focus on dialogue with the management hierarchy at this point or at incorporating their perspectives in the project structure and process. Instead, issues perhaps involving the hierarchy were to: appoint a project leader, align functional leadership with project leadership, define customers, develop a decision-making process, develop a clear mission and objective statement for the project, base the reward system with the project organization rather than the functional organization, have everybody functionally and administratively report to the project leader
rather than to their function, request the resources from the GM to complete our project with realistic goals.

The team appeared to be straddling between the tasks of coalition building and ideal realization, heavily gravitating toward the latter. They really wanted to isolate themselves and get on with the 'task' of executing the project. Because of the shifting nature of personnel and the incompleteness of category or brand strategy, the hierarchy they felt were making the project team's job a tough one, by wanting to keep fundamental questions and structure open to revision. The metalogue was clearly a discursive one, where they saw themselves needing to take the lead in the dialogue with the various customers of the project which included the management hierarchy, plants, and less clearly the consumer. The next step they planned was to pull the project leadership together at an off-site and organize the team structure.

Many of the fruits of dialogue and recursive activity are apparent in this list of action steps. The establishment of physical constraints, the establishment of a rhythm of communication with the customer, and the clarification of communication points were desired so the team could proceed largely unfettered by input from the myriad of sources in the organization. Short cycle had to be the right thing. There were many assertions and few questions. This was a time for action. For the engineers, it was the management that was getting in their way of being productive. The engineers seemed to know "the right direction," but
people in more non-routine areas did not clearly see a path; therefore, we must tell them which way we need to go. It was as though PD and the hierarchy were causing a naturally convergent group to be divergent.

The Z2B team leadership clearly saw the ball in their court was to organize themselves, and the hierarchy did not want to get in their way, by commitment to our project. "These things have a way of working themselves out." The team was committed to address the discursive dialogue that needed to go on for the project among themselves and get back to the hierarchy for approval. It was not clear in these discussions that the perspectives of management and the project team were present in each other's self-organizing systems. "In the beginning was a void." And they were good at avoidance. It was dangerous.

**Are You a Function or a Product?**

We are caught between rock and a hard place. If you do well on the project, it doesn't help your career because your career is controlled by your functional department. If you promote the interests of your function, the project suffers.

Vick, Project Manager in PEM

I had some fascinating discussions with members of the Execution team following their meeting. A number of people pulled me aside after meetings to "fill me in" on how things work or don't work there. This was apparently linked to the organizational norm to only transmit good news up the organization. There was a great deal of passion
(exasperation) around their decision-making process. A person from equipment purchasing had a hard time ordering equipment because he couldn't tell when a decision was made, if a decision was made, or what the decision was. It seemed to depend on who you talked to...the buck apparently didn't stop. Vick, who was the Z2B project manager, also had a lot to say about the organization. While he was moving back to the plant, in order to be promoted, he proved to be very helpful, taking time to tell me about the organization. His first comment was that the reward structure was not aligned with the project organization. Hence, he couldn't get promoted in his position as project manager, even though the person taking his place was at the senior grade Vick was being promoted to. It didn't make sense to change horses at this critical point in the project. They had just spent a great deal of time in discursive dialogue around the project, and now there would be a new project manager without the tacit knowledge of the project and the people associated with it.

Doing well in projects was most often not brought back to one's function which was responsible for one's rewards. Vick said, "You can kill yourself doing a good job (on the projects), because you may optimize the project and not your function's interest." The transfer of people in the organization appeared to be almost random without much consideration for the coherence or continuity of the project. They were shuffled like chips on a game board. A second point was that it was perceived that the functional AD level had the most conflict and was the most "political."
A third point was the there were conflicting goals for the brand and category. It was unclear how the two brands were to work together for the benefit of the category. At present they were often at odds and in competition with each other while still sharing resources. One could choose to work toward the category efforts to standardize the technology between the two brands, as one of the senior process engineers did. Or, one could interpret your commission more immediately with one's functional boss as aligning with the need to get out the next Zephyr upgrade. This topic and others of category strategy was currently under debate and development at the higher levels of the organization.

**Breakdown and the Breakthrough Team**

We need several breakthroughs on this project. I think people want to work with you on the 'breakthrough team' but they really don't have the time.

George, Associate Director in PEM

It seems that we have enough time for rework (doing the task over again), but never enough time to do it right the first time.

Genny, PEM Mfg

Rep

About a week later, we convened our first study team meeting. George had helped me prepare for the meeting by telling me what he thought needed to be covered and what his questions were concerning the conduct of the study. He also started the meeting by explaining his interest in the study and a little bit of the project to them. They were very pleasant people with a good sense of humor. Paul's was a particularly dry sense and a bit skeptical but hopeful about change efforts in the company. He had been involved in other change efforts in the
technical community, and he and his colleagues were largely frustrated in trying to implement changes. He and Genny appeared to be very astute observers of the system.

I presented the study as a case study on behalf of a larger effort in the technical community, and said that our initial interest was in documenting the process of the project as it unfolds. There was also a more immediate interest in helping the process of Z2B. The payback would be in helping the organization to increase its ability to learn and develop. I proposed four activities that the study team might do: to keep individual journals of project activities, to have an issue conference on e-mail through which we could discuss project issues as they arose through the journals, to conduct weekly two-hour theory building sessions, and also to then feed the results of this inquiry back to the organization periodically to assist the decision making in the Z2B project. Overall these sounded like reasonable activities to them. But of course time was a problem for them.

The first response was a question of whether there was the right PD representation for the core technology development. Ginny said that she could represent this part of the project. She was already representing a lot of people in a lot of meetings, for she was primarily an interface person who came from manufacturing but now reported to George. Bob and Allen were our representatives from PD, but they said they were only on the Z2B project 20-30% of their time. Bob seemed particularly
reluctant to put in time on our study and he questioned the need for the journals and the issue conferences.

They suggested that the journals could be dictated on cassette tape and transcribed by the respective secretaries. There was a question as to who would see the journals, and I answered that they would be confidential and no one but myself would see the specific content. They could share them with each other if they wanted to. Betty could ask that an e-mail conference be set up on the system. We could meet on Fridays for lunch, which would save time and ensure that people could find time in their schedules. And lastly, they suggested that they were the projects, so formal feedback sessions to the Z2B project would not be necessary. In addition, though, they wanted to make sure that this process would benefit them by generating recommendations for the organization to take action on, specifically addressing Jim and Mick. This would mean that the project would need to carry its own weight and needed to result in time savings to the project so they could afford the time to put into it. It was clear that a follow-up meeting between the team and Mick and Jim was desired so they could share their expectations and assure the team members that they thought that it would be worth doing. I handed out a fair amount of material covering the STS methodology and Mick's thoughts on organizational learning. We agreed to meet again in a couple of weeks to spend some time developing the study.
As an initial reflection, I was concerned that the study was slowly changing into something different from what we consultants or the steering team had envisioned. In order for the study to be worth while, it had to have more immediate payback than just a case study on behalf of the overall organization. This was needed to secure the limited time that we could get from the team to devote to the project. It was also becoming too expert-oriented a project, where I observe what is going on with the project particularly in their meetings without the co-inquiry of an action research project.

At this time it was becoming clear to both Kelly, my fellow consultant, and me that there appeared to be a lot of high level intervention in product decisions, sometimes contrary to everyone else in the organization. The president and a senior vice-president had just made a decision to implement jumbo packs irrespective of the research results. These interventions seemed to come outside the formal project review process and often late in the product development process, requiring a great deal of scrambling by the organization to recover. Another characteristic of the organization was also very clear to both Kelly and me: there were many frequent personnel changes in this organization, causing more disruption.

In further reflection, taping the journals and having them be transcribed by the secretaries was perhaps a bad choice because the secretaries would
see them. I had proposed that the study team members write them out on their computers, but this was nixed for time.

I interviewed the Breakthrough team members and asked them four questions: 1) What is your response to what you’ve seen so far from the breakthrough project? 2) What parts of the Z2B project's process do we need to know more about? What are the variances and their sources? What are the “black boxes” in the process? How can we approach this process if we are to achieve winning goals? 3) What do you want out of the breakthrough project? and 4) How can we focus our inquiry to accomplish this? What kind of structure can we put around our work? What objectives are worth your while?

I first talked with Mark, the project manager of Z2B. He had just come onto the program about a month ago from one of the plants, and found a very demanding job. He saw a great need to try to manage the chaos and confusion in this environment. The key was to try to become simpler. He saw the basic process as still being simple; it is just that people make it complex, in part by "pontificating concepts." He used a four-level model for organizational effectiveness; one works from structure to understand skills, then roles and finally mentality. It was the way of thinking that confused people. The structure was only on the surface of the organization and didn't contribute as much to the development of trust as the other levels. As far as he was concerned, the Product Launch model still followed the four classic steps of engineering design; scope definition, design basis, design, and construction. The greatest clarity
seemed to come from program leaders who came from manufacturing. It appeared that the up-front unstructured activity did not interest or impress him.

For Allen the greatest difficulty was in the constant change in personnel. Every time a new director or AD came into the program, he or she reorganizes and this is confusing and leads to a lack of focus overall. This was also true of the Breakthrough project. It is a symptom of an over-reactive system. Even though we promote from within, the upper levels understand how people respond to this change. The many tools the engineers create like Quality Functional Deployment models go by the wayside when they need to do something quickly and there always seems to be a crisis. The tools can be useful but they don't have time to use them. Actually, there is never time to use them right, but there always seems to be time to do them over. With regard to the question about what he wants out of the Breakthrough project, he felt that he didn't need to meet with people all the time and rehash old stuff. There are too many teams and committees. Why was there an execution (integration) team? He felt that the two technical teams could talk directly to each other. The system is too sophisticated. The issues get worked informally outside meetings anyway. He gets so many phone calls and e-mail, and is in so many computer conferences that he has a hard time getting his work done. Regarding the last question on what they could do better, he felt that the whole Product Development department could function better if it got a lot smaller and had fewer
specialists. The Product Launch model makes sense, but people don’t use it. Instead they change everything often. He felt it would be helpful if they could flag the number of times they changed direction. "Hey you guys changed directions seventy-eight times." You lose a lot by changing people around, and you still end up with generalists after all the changes. Unless there is a gross problem with a person or project, he felt you should leave them on it. Because nothing is documented, they rely on memory, but only two or three people stay on the project from beginning to the end, requiring a lot of things to be reworked.

Bob was concerned with how the Breakthrough project was going to get to some end point beyond the activity. He wanted a concrete result. Regarding the second question about what needs to improve, he felt that the decision processes needed a lot of work. He would like them to be made and then move on. The gross sizes of most the work groups are too large and they don’t have a clear decision process. The team charters need to be understood in practical terms. Who needs to deal with what? He’s not sure how much value is added by the Business team. Regarding what he would like out of the Breakthrough study, he feels they need to capture the learning from previous projects into the system. The learning seminars are helpful, but personal biases get in the way. The Gonner model (admired by the people from PPEM) did not have the PD people reporting to him.
According to the current organizational chart, most of the Z2B program members from PEM engineering and manufacturing do in fact report to George, the program manager. The main difference had to do with the style of Gonner to be clearly in charge and to be a strong advocate of the project and officially assigned full time to one project. Gonner directly reported to the GM rather than to someone two levels further down. George and a number of his reports worked on more than one project.

He felt that more of the learning needed to come through the people who are doing the project rather than being funneled through the ADs. We needed to talk more directly. Even e-mail doesn't do it. It is also interesting that the hierarchical levels of people on this project are higher than they were in my former project. It seems that all issues have escalated the levels of the hierarchy, perhaps also with an inflated sense of importance. The implication seems to be that more power is the answer to the need for more resources and influence. He was concerned that the project have a direct and demonstrable outcome.

Ginny felt that there was a struggle to get organized. Someone needs to appoint leadership on Z2B. George chose to head up the project. And it seems that to PD, "this is a putsy little project, a place to stick things." The project's direction comes more by accident and turmoil than through authorization from the hierarchy. Regarding the parts of Z2B that we need to look at, she clearly felt that the decision-making process was shied away from. Also, there needs to be more learning time in the
system to come up with something more creative. There needs to be some training in both the head and "body" stuff. People learn differently and need more visual and hands on training. She also feels that PEM is limited by the designs they are given by PD based on a small amount of consumer data which leaves little latitude for process development. "You can get in trouble if you ask questions, and they will say you are not being supportive." The schedule ends up driving PD to compromise the data they get. "The issues don't get worked all the way through manufacturing very well. Commercial comes up with some neat ideas, which PD says may be possible and then the process people say OK, but wait manufacturing can't do it. Somehow the interface needs to improve."

What she would like to get out of the breakthrough study would be "to raise the nitty-gritty issues to the hierarchy" so they can change them for future programs. This program will probably be the martyr, and may not directly benefit. The Product Launch model seems to be a helpful tool. It is easier to talk from a common piece of paper. But some of this global standardization that is driven by the top of the company seems to assume that consumers are the same worldwide, while they probably are not. The issue of what we need to focus on is how to affect the larger system.
The Product Delivery Model

We are the first category in the company to attempt to apply this model. We have a lot to learn. My task is to manage this process and help develop the model into a workable method.

Cal, Process Manager of the PDM

The category was also developing the "Product Delivery Model," which was created by a team of successful researchers and project leaders on behalf of the entire company a year or two earlier. This model specified a number of decision gates which could provide the formal basis for organizational agreement and commitment to the project as it developed from its initial formulation to the commitment of capital and finally would produce products and successfully sell them in the market place. The Product Delivery Model was therefore an attempt to specify the entire process of product development, production, and implementation including market introduction. Through an assessment of past

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Figure 3: The Product Delivery Model

company projects, it was evident that there was a great push to do everything at once on these projects, and the model was an attempt to realistically achieve agreement in all relevant areas of the company at
several major decision points in the expansion of the project as additional resources were committed to the project.

This was one of the first categories to attempt to apply this model to their projects or programs. Cal had been assigned by the Category General Manager to be the process owner of the Product Delivery Model. He became interested in the possibility of our inquiry aiding in the development and implementation of the model and therefore became an active sponsor of our effort. Bob Jasper, a director for R&D personnel, also had a great deal of interest in the development of this model, as well as, in our work with STS and became our primary sponsor and funder.

This general model has been more common in the last five years (Wheelwright, 1994). In a presentation by Kodak at the Product Development Management Association meeting, the company attributed the coordinating efforts of their iterative program to increased market success through shorter cycle times, increased flexibility, and better integration of product and consumer use (1991).

The process involves a number of gates between project stages. At these gates a degree of data must be presented to commit the organization to higher capital outlays and exposure risk in the consumer market.
ORGANIZATIONAL LITERATURE

Project Driven Organization & Issue Driven Projects

This rise in demands for innovation has elicited a more project driven organization requiring multifunctional teams and a blurring of lines between functional departments. AMPAP was largely a project driven organization, based on a basically matrix design of product group and function. However, they relied heavily on a functional organization, in which the nature of the functions gradually changed.

The overt structure of the organization appeared to be a project/function matrix. I discussed an article by Larson and Gobeli (1988) with the project manager. Different projects had taken on different structures depending on their specific contexts and the background of the project manager. Z2B was perhaps the most functionally oriented of recent programs, but ultimately, the project was the primary category of justifying and concentrating resources in the organization.

Mintzberg (1983) identifies five primary types of organizational configurations: simple structure, machine bureaucracy, professional bureaucracy, divisionalized form, and adhocracy. He calls project-based organizations "adhocracies," because their primary mission is to innovate and they are often in complex and dynamic external environments. He describes its organization: "The experts are grouped in functional units for housekeeping purposes—for hiring, professional communication, and the like—but then they are deployed in project work
teams to carry out their basic work of innovation" (p. 609). "Adhocracy is an organic structure that relies for coordination on mutual adjustment among its highly specialized experts, which it encourages by the extensive use of the liaison devises - integrating managers, standing committees, and above all task forces and matrix structure" (p. 302). "Most of the managers do not manage in the usual sense— that is give orders by direct supervision. Instead, they spend a good deal of their time acting in a liaison and negotiating capacity, coordinating the work literally among the different teams and between them and the functional units" (p. 609).

Mintzberg notes that the Adhocracy is the only configuration that is both organic and relatively decentralized, and in addition, the most highly politicized form of organization because of the ambiguity of hierarchical authority. He states that in these organizations, "Even dedicated members of the Adhocracies periodically exhibit ...low tolerance for its fluidity, confusion, and ambiguity" (p. 618). This reflects Burns and Stalker's observations about people in organic structures: "In these situations, all managers some of the time, yearn for more definition and structure" (1961, p. 122-23).

Reese in his study of the human side of project-based organizations in the 1960's found ten potential human problems of project forms of organization:
1) The knowledge that the work upon which their jobs depend is getting close to its eventual phase-out causes anxieties and feelings of frustration on the part of members of the organization.

2) The members of the organization don't feel that they really know who their boss is; they don't know for sure what one individual they should try to please and impress in order to get raises and promotions.

3) The temporary nature of the organization often necessitates 'make work' assignments for its displaced members after the organization has been disbanded, until productive jobs can be found for them. Sometimes the 'make work' assignments last so long that the individuals lose initiative.

4) Members of the organization who are displaced because of the phasing out of the work upon which they are engaged may have to wait a long time before they get another assignment at as high a level of responsibility.

5) Individuals who have experienced a series of transfers from one organization to another as a result of contracts phasing out and other contracts being started may feel a low sense of loyalty to the organization of which they are temporarily members.

6) Confusion and ambiguity are common conditions because the jobs in the organization are not clearly defined, authority relationships are obscure, and lines of communication are loose and unorganized.

7) The personal development of individuals is random and unplanned because they are seldom under one manager long enough for him or her to feel responsible for assuring that they get the training and experience they need in order to mature.

8) The work environment is one of intense competition with other organizations for resources, recognition; and rewards. The result is often conflict between the members of the competing organizations.

9) Below the managerial level in the organization the members tend to become highly specialized in specific skills. The consequence is that these individuals become increasingly narrow
in their perspectives and attitudes, and limited in their potential for growth.

10) The form of the organization tends to foster an increase in the number of management levels. The result is that non-managerial members are isolated from the higher managers and feel left out of the decisions that filter down to them.

Many of these potential problems were relevant within the project organization I witnessed. However, the members of the project felt that the power of the functional organization (product development, process engineering, manufacturing, advertising, etc.) was stronger than the project organization in this company. The effort was to create functional homes to cover the gap between projects and provide a clearer career ladder. Most of the project members said they wanted to be in a largely project-based organization. Even so, the anxiety of (1) came not just at the end of the project but throughout the project as members rotated on and off the project largely as a result of the requirements of their functional organizations for promotion. Regarding (2), they often felt that the work they did on the project really was not considered in the reward system, particularly if they worked on multiple projects. The drive to use the expertise of the members made it so that obvious “make work” projects were fairly rare. On the contrary, the human cost was that their skills were divided among so many projects that the people themselves felt they were without a home base. People’s affiliations and relationships usually don’t shift as fast as the economical use of their skills can. In an exception to this, project managers and above often did have temporary assignments (4 & 5) until appropriate work was found
for them. Confusion and ambiguity (6) were the most evident perhaps of all of these potential problems. Most often, it was difficult to know who could make a decision, if a decision was made, or what the decision was. Personnel decisions (7) made "technical sense" perhaps, but a number of the members I talked to felt that personnel assignments overall felt arbitrary and were often discontinuous with either the personal career development or the continuity of the project. In this environment, there was often intense competition for attention and resources (8) for there were multiple bases of power often based only on influence rather than on position. There were a great number of managerial levels in this organization (10), which often added to the isolation of information about decisions. Together these observations about project organizations appear to be largely true of the organization I experienced. This is not to say that the organization was not successful in its business, because it was highly successful. It is to point to areas that heightened anxiety and ontological insecurity, and provided a poor basis for trust. It is this human side of enterprise, that in the long run can take its toll as the organization pushes harder to achieve and respond to the management's call to develop more and better products, at a faster rate. This process can 'exhaust' the people involved, burning them out, when most are very enthusiastic about making better products and improving the quality of the process.

Mintzberg goes on to say that the, "Adhocracy is simply not an efficient structure. Although it is ideally suited for the one-of-a-kind project, the
Adhocracy is not competent at doing ordinary things. ... The root of its inefficiency is the Adhocracy's high cost of communication. People talk a lot in these structures; that is how they combine their knowledge to develop new ideas" (p.618). Indeed, product development organizations seem to spend an incredible amount of time integrating and coordinating their work. The difficulty is in being able to tell if they are spending too much or not enough time. Getting a handle on 'white collar work' of this sort has become an increasingly common difficulty as products become more information based. At Ampap, these structural issues were compounded by the fact that the engineers not only had to integrate the nonroutine issues with the mainline business, but also quickly scale up their new products to production lines.

To a large extent the gaps have increased to fill the whole organization. There are few permanent lines of responsibility, communication or "causality." The organizational members live in the gap between projects, tugged by their functional connections. One seems to be placed forever off-balance. I suspect that perhaps this is training for taking on the process paradigm of the organization.

It is interesting to note that in general, the variances to deliberations in the organization are predominantly prefaced by "the lack of..." They are like the disconnections in the brain, and between the brain and the body, etc. The term at AMPAP was "outage." It was a constant effort to try to connect various tasks in the work system, and to develop continuity in careers.
Management of Innovation

This environment characterized by structural ambiguity is also helpful for fostering innovation. It is very interesting that Tarnas (1991) noted that ambiguity was one of the primary post-modern conditions. Kanter describes innovation in organizations as,

likely to flourish where conditions allow flexibility, quick action and intensive care, coalition formation, and connectedness. It is most likely to grow in organizations that have integrative structures and cultures emphasizing diversity, multiple structural linkages both inside and outside the organization, intersecting territories, collective pride and faith in people’s talents, collaboration and team work. The organizations producing more innovation have more complex structures that link people in ways and encourage them to “do what needs to be done” within strategically guided limits, rather than confining themselves to the letter of their job. Such organizations are also better connected with key external resources and operate in a favorable institutional environment.(1988, p. 172)

This appears to be a rather apt description of the development environment at Ampap. In fact their problems emerge due to this complex and dense interactive environment. Of particular interest is the involvement by management in the project. The issues of the innovation process at Ampap appear to be somewhat similar to the generic stages or rather tasks proposed by Kanter. She draws on distinctions made by Van de Ven (1986), “that stage models do not adequately capture the give and take of innovation, and they risk artificially segmenting the process.” This appears to be a particularly
interesting and important distinction to make in the highly integrated and concurrent environment at Ampap.

Kanter identifies four main tasks to be accomplished in the innovation process that follow a sequential process of idea generation, coalition building, ideal realization, and transfer and diffusion.

Idea Generation
(great complexity)
1) Close connection w/ need sources
2) "Kaleidoscopic thinking": cross fertilization
3) Structural Integration: Intersecting Territories
4) Broad Jobs
5) Organizational Expectations for Innovation
6) Integration vs. Isolation

Coalition Building
(open communication)
1) Power Tools
2) Coalition Structure
3) Communication Density
4) Network Density

Ideal Realization
(structural isolation)
1) Physical Separation
2) Boundary Management
3) Continuity
4) Flexibility
5) Balancing Autonomy and Accountability

Transfer & Defusion
(fertile fields)
1) Strategic Alignment and structural Linkages
2) Interface Structures: Active Agents and Communication Channels
3) The Institutional Environment
In idea generation tasks, "Innovation is triggered by recognition of a new opportunity...The first key problem in the management of innovation, then, is how to get people to pay attention—how to trigger the action thresholds of individuals to appreciate and pay attention to new ideas, needs, and opportunities"(p.173). The second task "involves coalition building, acquiring power by selling the project to powerful allies"(p.184). The third task "involves assembling a working team to "complete" the idea by turning it into a concrete and tangible object (physical or intellectual) that can be transferred to others"(p.190). The final task of innovation production is to "transfer (the product and process) to those who will exploit the innovation or embed it in ongoing organizational practice"(p.198).

Overall, Kanter's research advocates "that the generation of ideas that activates innovation is facilitated by organizational complexity"(p. 183). It is interesting that complexity is one of the post-modern conditions mentioned by Tarnas (1991). In addition, dense and highly interactive communication is seen to be desirable in all but the ideal realization task. In this task, she sees the need for structural isolation. For accomplishing this task, she also advocates boundary management, continuity, flexibility (freedom to adapt), and an appropriate amount of management involvement. It is particularly interesting to note that with regard to the last stage of transfer and diffusion, "If an innovation development project is structurally well-integrated as it comes to completion, rather than segmented and isolated from the rest of the
organization, then it does not require the power of centralized authority to ensure its effective transfer" (p.200). The interaction between the project team and their environment is seen to be critical in the earlier stages of innovation process. This interaction would include not only the end user but also sponsors in the organizational hierarchy, requiring a "selling job." This attribute would seem to complement the third major post modern condition noted by Tarnas, pluralism. If the early dialogues in the project are well-managed and the organization develops sufficient support for the project, the team can then become more isolated in the necessary task of acting on the project.

The presentation of Kanter's four tasks are within a project cycle which starts at a general level and moves to a more specific level of the project, again emerging to the general level of the organizational environment. This can be seen as following the hermeneutic circle of moving from whole to parts and then back to the whole again. The needs of the organization are examined and a project is "spun-off" to be completed in detail, re-emerging for integration with the broader organization and external environments.

There has been a great deal of research in innovation. Rogers (1983) reports that over 3000 studies of innovation had been conducted by 1983, and interest has grown significantly from that time. In addition to Kanter and Rogers, there have been several noteworthy reviews of the literature by Daft (1982), Kimberly (1980), Robert (1988) and Utterback
(1974), and others. Finding that most of the studies had been quantitative in nature, largely neglecting the process of innovation and the political process of innovation, Frost and Egri go on to say, "Thus far, the rational approach to the study of innovation has resulted in a fragmented proliferation of models--each a frozen slice of time and replete with operational conflicts, contradictions and exceptions. These models of innovation depict an incomplete representation of reality which bears only tangential reference to the energy and forces of human agents involved" (1991, p.235). Echoing the sentiments of many people at Ampap, Quinn described the innovation process as "controlled chaos" (1985).

In describing this environment more out of a realm of possibility, Pelz and Andrews (1968) saw the tension as one of challenge and security. Pelz summarized their findings as with the first part of the phrase offering security and the second, challenge;

1) Challenge- Researchers spend time on a variety of activities.

2) Intellectually independent,
   but interacts vigorously with colleagues.

3) Accomplished one main project early in career,
   and have several skills or broader interest.

4) Had moderate coordination and isolation of work environment,
   yet stimulated from a variety of internal and external sources
   and facing important problems faced by organization.

5) They strongly influenced key decisionmakers,
   and many people influenced the selection of their goals.
6) Had personal support, but differed in technical style and strategy from colleagues.

7) Specialization increased to medium level, and still interested in broad pioneering.

8) In older groups, they preferred each other as collaborators, yet were still intellectually combative.

What is striking from their work, among many interesting findings, is that often the scientists would seek isolation and convergence as security, but found challenge in collaborating with others in more divergent activities. Dialogue and communication is the challenge of this work. The independent isolation was a place of solace rather than functioning as challenge. This we will later see in our discussion of the metalogue of the project process. It is often the protection from ambiguity and the need to be open to influence with/from others. It was the mark of successful researchers to maintain this environment of social challenge.

Following up Mintzberg and Kanter’s observation of the political nature of the management of innovation, we will briefly look at the nature of organizational politics. It is particularly salient because of the challenge politics brings to the work of scientists in Pelz and Andrews study of research organizations. Frost and Egri proposed that it was the interaction between the surface and deep political structures that seemed to create a lot of the conflict. This was a largely neglected area of innovation research.
The most compelling aspect of this multi-facetedness is that one aspect of power and politics that seems to take place on the SURFACE of organizational life, in the day-to-day contests and struggles for collaboration. Surface power politics typically deal with attempts by one or more parties to exploit (bend, resist, implement) the rules of the situation they are in to their own advantage. The other aspect of power takes place in the DEEP STRUCTURE of organizations influencing, usually in hard to detect ways, not only how the rules of a situation are played but the very way the rules are framed in the first place. Such deep structure power has its origins in earlier struggles, movements and maneuvers in day-to-day situations that settle, for a time, the way things come to be perceived, valued and acted out. These social, political and historical roots of current frames and actions are often forgotten or never realized by most contemporary actors. If noted at all, they are seen as "the way things are." or as rationally derived prescriptions for behaving in organizations (236).

Frost and Egri saw this interaction as taking three different forms: "First, some surface political games can get used to fend off the deep structure through either passive resistance, secrecy or confrontation." Feldman also saw secrecy at the heart of the political nature of the innovation process in an engineering firm (1988). "Second, other surface games work because they tap into deep structure by gaining support of powerful interest groups." And, "Thirdly, surface politics can influence and/or change the deep structure through the present day framing of perspectives by the selection of decision premises, agendas and criteria which in turn impact on the construction of the future deep structure" (p.242). They suggest that incremental innovations were more numerous in organizations because they were less likely to engage the organizational "immune system" against change (Pinchot, 1985). They proposed that what was needed to improve this overall situation of
resistance and minimize the dysfunctional side effects of organizational politics was to engage in organizational learning. Again, they pointed to the need to address the deep structure of the organization by working with the myths, and "recapture the original source energy of organizations and communities to guide organizational innovation towards a new expanded and integrative agenda...through the recommitment to a revitalized myth which is more rewarding and beneficial to all concerned" (p.240). Due to the nature of the political system, they saw this collaborative method, following Lundberg (1989), Mc Whinney and Bastista (1988), as being more promising than the more confrontational approach of Argyris and Schon (1978) or Bateson (1972).

**Coordinating Methods and Integrating Mechanisms**

The primary perspective of the integrating mechanisms is deliberations. In more routine environments these were procedures. But the coordinating methods need to shift as one encounters turbulence, just as a pilot needs to take over the controls of a plane in a storm. Kotter (1986) perhaps best describes this concept of integrating devices. The basic need for integrating devices is the interdependence of subunits in a company. He identifies five factors that increase the difficulty of achieving integration among subunits: complexity, differentiation, poor informal relationships, and size and distance. He identifies eleven commonly used integrating devices:

- management hierarchy-
- staff-
Within the paper product category at Ampap, all of these devices were used to some extent. It is meetings, committees and task forces that are our focus in the analysis of deliberations. The primary procedure that was applied was the Product Delivery Model, which sought to put all of the organizational functions under one model. PEM had undergone a great deal of integration, placing process engineering and manufacturing under one functional department. There were several ways in which these were used to divide PD from PEM at at the main R&D campus through separate organizations, career paths, buildings. PD and PEM came together, however, at the experimental production sites. Perhaps the greatest differentiation occurred through the reward systems, where each person’s rewards and career development occurred within his or her functional department. There was a great distance between PD and PEM, which was reinforced through their use of integrating devices.
The Project Cycle As Coordinating Method

As we began this chapter, the project was the primary organizing heuristic for the organization. Given current interest in reducing the time it takes to get a new product to market and the method of prototyping products in rapid scale up, projects were talked about in terms of the project cycle, such as in Short Cycle Management. By project cycle I am merely pointing to the development of projects to act on organizational interest and develop products or tools for the organization. The rough cycle could be seen as four phases: orienting, organizing, enacting and releasing.

THE PROJECT CYCLE

[Diagram showing the project cycle]

Figure 4: The Project Cycle
In the orienting phase some interest emerged either from examining the discrepancy between current organizational performance and its desired performance, or from another gap. Most projects appear in the midst of a gap of some sort, usually with some technological possibility filling a desirable consumer or product trait (feature or benefit). This fits the task Kanter identified as fertile fields. The possibilities for inclusion in the local system reside in the environment, and a part of this task is to discern what is interesting in the midst of this field, what has the greatest potential fit between the gap of the existing product and the potential products in the world of the stakeholders including the customers and organizational members.

The local system is then organized to address this potential creation through the effort of a project. The resources are organized often with the aid of project planning methods, and a coalition is built to define and support the specific project activities. One of the primary issues at this phase is the degree to which all of the pertinent requirements and resources are brought into the project. The project is then enacted and the various elements are combined to find convergence in a product/process that can thrive in the environment and reach acceptance by the stakeholders. This often requires a structural isolation so that the often contradictory elements and demands of the product may reach a satisfactory solution. After the process has converged the project and its products are released. The product and process can be transferred or defused into the environment. The joint issues of the environment
are the degree to which the product can be and is released by the project environment. It is common that project team member may follow the project into the environment. It may take several iterations of testing the fit between this creation and the environment to fill the gap identified earlier. Also, if the expectations and intentions of the environmental stakeholder are not met, the product/process may be rejected or require a great exertion of force before it is accepted by the environment.

CONCLUSIONS

This was my introduction to the organization. It was a project-driven organization, but retained strong characteristics of a matrix. The PDM and the Site orientations for the project had not been seen together, yet both existed to facilitate program development. There were many features of the organization which were not directly integrated into a single map of the organization. It was a place of many contradictions. The principles under consideration have been the identification of the target system, the creation of a design team, and achieving sanction with the hierarchy.

Self-similarity my project and the organizational project

Cherns said that there needs to be a congruence between how the redesign is conducted and the values of the end state. I would go further, to say that the conduct of the inquiry mirrors the nature of the
organization. The difficulties I faced in conducting the Breakthrough inquiry were very similar to ongoing issues in the organization.

**From organizational fortress to turbulent field**

The *turbulent field* means that the organization itself creates the environment, and through this reflexive activity, the environmental conditions cannot be easily anticipated. In terms of my central metaphor, the stream has invaded the road. It was only through strong exertion of power that the illusion of the fortress, of a solid road, could be maintained. When domination was relaxed, the organization internally experienced the environment.

**From isolate & identify to growing wholes**

The nature of consumer products and their "markets" has become more demanding all the time, or in the words of the program manager, "the bar has been raised." Ampap could not afford to make a mistake, either in terms of consumer desirability or safety. They were too prominent in the industry. The product requires evaluation and testing in as complete or holistic a fashion as possible as the scale-up process occurs. Any anomalies or unintended consequences observed can either avoid a difficulty or create a new concept to enhance the product's desirability in the marketplace.
Project Framing

The project is the main framing device in the organization for defining the task structure, including scheduling, budgeting and resource allocation. The project is also the primary integrating method in the organization. The project cycle is very familiar to this technical community composed almost entirely of engineers. The PDM itself bears a great deal of resemblance to the project cycle. This process orientation can help guide the organizational members and coordinate their actions through the unifying method most experienced in the training as engineers. The challenge, as seen in Reese and Pelz, is to expand the boundaries of the cycle to include the social interaction out of which the project emerges and into which the project is received.

From large batch to small iterations

Projects in large organizations tend to be large. This is perhaps one reason why large organizations have difficulty creating innovative products. It simply gets too complex. Instead, Ampap and others have shifted to short scale-up cycles, where a product is created through several iterations. This is also true of STS inquiries and redesigns themselves. Even through redesigns have been talked about as operational experiments, they had a tendency to become major projects for organizations and incorporate the entire organization in the redesign over several years' time.
Inclusion, influence and product acceptance

The most important point from Kanter's work is that if a voice is not included before the isolation of the project team, the resulting innovation may require the application of unilateral power to be "accepted." It is interesting how closely this follows task issues for group development of inclusion, influence, and intimacy, signifying a congruence between social and technical aspects of projects.
CHAPTER 5: THE CORE TECHNOLOGY & THE PROJECT CYCLE

In this chapter I will build a model of the core technology of the primary work system, as seen in the scheduling deliberation. It became apparent through many interactions and deliberations I witnessed in the organization, that there was a predominate movement in the dialogue between the program team and its environment. While there were many routine aspects to this conversation, the overall pattern was not always explicitly understood by the organizational members. This underlying implicit pattern to these conversations followed the general pattern of the project cycle as seen in the system development model of the engineering profession. I came to see the project cycle as the primary core technology at Ampap. This cycle was the primary means for the social construction of the organization through the externalization, objectification and internalization of projects (Berger & Luckmann, 1967). The organizational conversation following this project cycle had periods of preparation and testing, as in an inside and outside presentation. The sociologist Irving Goffman (1968) talked about this as backstage and front stage in his discussion of presentation of self.

The scheduling deliberation had been initiated two days before I came onsite and was my first exposure to the day-to-day workings of the Z2B program team. I will use this deliberation to provide an initial situational grounding for the more generalized model of deliberations found in the organization. One of the tenets in this dissertation follows
the notion of holographic organization, or the self-similarity of all phenomena in the organization.

**The Scheduling Deliberation**

**Week 1:**

At a special Z2B project review meeting, the Category General Manager (GM, Jon) made a request that the projected "Start of Ship" date for the Z2B project be moved up four months from 1/92 to 9/91. The reason for this was that he felt there would be too long a gap between the introduction of X2B and Z2B, allowing brand X to take too much business away from brand Z. They were concerned not only about the effect of Ampap's competition, but also about the interaction of their own competing brands Z and X. The Launch team said they would return with a plan on the 24th.

The outgoing project manager (Vick), the incoming project manager (Mark), and the scheduler (Gary) would be the primary organizers of the schedule, incorporating the input from all areas concerned. In all they generated over a dozen different possible scenarios for changing the schedule.

The following day this request was presented in the Functional Leadership Group meeting. The Functional Leadership Group was composed of Associate Directors from the various functions at Ampap, which could help coordinate and support the various programs and projects in the organization. Two major ideas were generated and
discussed. One suggestion was to shorten the time in production test facility and the other was to delay the introduction of a new "core" of the pidget. The later option resulted from a discussion of what we could drop from the project. In terms of new technology, the "core change" would not produce an advertizable advantage, while the "chassis" (the outside of the pidget) changes would improve the performance of the product. There was some discussion about whether they could reduce the time spent within the identified critical activity boxes, but this was not discussed very long, and the opinion of the group was that they needed to drop something from the project.

The critical activity boxes on the scheduling chart were largely "black boxes" of activities controlled by each professional and his or her functional leadership. For instance, a box might contain the task of drawing the design for a particular piece of machinery for the converter line. This detailed scheduling chart had been created over the past few months using a popular scheduling package on a personal computer. The charts held four levels of detail from the most general categories of concept, development, implementation and evaluation; to the specific activities of hundreds of people week by week for the life of the project.

These three people along with a representative from "commercial" (Bill) and others conferred with the areas responsible and generated new schedules and risk analyses between these meetings. They would seek to establish a tighter critical path by seeing which activities may be
accomplished concurrently, or in some way taken out of the critical path of the program.

At the Z2B Launch meeting the next day, there was some question about construction time assumptions of four weeks. This was the amount of time needed to install the new converter line at the plants. This possibility for time savings was dismissed. Also, it was apparently clear to the group that there was no time for a market test for Z2B, which would lengthen the process by an additional eight months. There had been a strong push at Ampap in recent years to try to base their decisions on empirical data from field tests. This had been presented and discussed at the previous program review with the Category Manager, Jon, but people were still questioning whether this was true, and if Jon understood and agreed with it. There was some discussion about the possibility of delaying the internal product change. It was, however, mentioned that there would have to be some core changes anyway.

The representative from the plants felt that the phasing of the internal core changes would be desirable for the training of people at the plants, because incremental change is easier than the introduction of a lot of changes to the converter lines. However, this phasing would increase the down time at the plants and construction costs. There were a number of additional difficulties suggested by the delay of the internal product changes.
Next, the group discussed how they could compress what they are doing, and it was suggested that they could change their pilot plant sequence to reduce change over time, and take one of the "product variations" out of the critical path. There was some discussion of combining the options and saving even more time, but this was too risky.

They also discussed, what is meant by a 9/91 deadline date? Did this mean 'Start of Shipment' (SOS) for all the product variations or only as they become available? It was suggested that the execution and process folks need to take a shot at reducing their time.

The following day at the Execution team meeting, both the options were discussed, and it was decided that each would represent only a short (six week) savings. The internal change option would still need a redesign of the line and incur redesign and fabrication costs. Again, there was some question as to what the "9/91" date meant: "Start of Product Shipment" to the stores, "Shipment by Product Variation as Available," or "Start of Advertising"?

Week 2

The following week the topic was discussed at the next Launch team meeting. The commercial representative reported that his manager had decided that a market test would definitely not be needed. This was a relief. In reviewing the schedule options it was reported that the core change option would not actually save any time, and that changes in the pilot plant sequencing were not producing notable savings. More
alternatives were generated for the later. Again, the question of 9/91 came up: could we just have some product varieties at two of the plants by that time? Was this 9/91 question just a "shell game?" How would this affect the Start of Advertising?

The following day a preparation session was held for the review meeting with the Directors of product development, engineering, and manufacturing. There was relief from "brand" in not having to have a market test, and the brand manager had agreed that 9/91 could be "By Product Variation as Available," but the group members were still uneasy about the later.

A problem with the finances arose. The "equipment write-off" had to go in the 91/92 budget year, but the equipment was needed in 90/91, particularly because of the accelerated schedule. This was a clear contradiction in decisions that would require some creative financing. The main issues the group members wanted to bring to the Category Manager were: there was a need for staffing on the chassis team (information only item), what would they allow for national funding without a "Certified Market Test" (CMT), the test plant to pilot plant criteria will not be met, and there were great risks in accelerating the schedule.

At a later meeting of Launch team members, the possibility was developed that they could "eliminate deadlines" at the plants and save
time. This was in keeping with the testing done at the pilot plant, and technicians could perhaps be trained on the Brand X lines. This was reframed to say, "We are doing lead lines in Brand X." A couple of communication questions arose: What dates do we share with the Category Manager?, and How could alternative information (from Brand X) be used to support funding requests?

Week 3
An update of Z2B was presented to the Brand Z Business team meeting the following week. The option of delaying one of the external product changes was suggested as an alternative. This perhaps came from the recently talked about difficulty in getting one of the production processes to track smoothly. Another problem emerged when they compressed the pilot plant process; this required them to order the national equipment before they were done with pilot plant engineering. This exposed them to a risk as high as $25MM, not to mention possibly delays for rework. Also, the lead lines needed to be added back into the plans because the Director of Manufacturing was not comfortable without them. In the base option, they would design but not order the equipment until Pilot Plant engineering was done. The Category Commercial Manager asked if there was something else we could do to speed along development, but the answer was that the we wouldn't have the materials ready soon enough for this to be of benefit. Use of a Brand X line at the pilot plant was ruled out completely. It had been discussed as an option by some.
George, the program manager, suggested that the team needed to postpone the meeting with the Category Manager because they couldn't suggest an option to improve the schedule. The Category Commercial Manager felt that we needed to share the information with Jon anyway and get his input.

At the immediately following Launch team meeting, the "crunch point" of ordering national equipment early was very clear. This was followed by a discussion of whether the team could go to Jon at this time with just information and not a plan for time reduction. They decided to go ahead with the meeting.

The options had been modified a bit, so the base plan was essentially the same as the one presented earlier to Jon, with the Start of Shipment being By Product Variation as Available and shifted to 11/91. It was pointed out that this was largely an "illusion." The Start of Advertising could be sped up by two months, partly due to having medium and large sizes available earlier. The second option was for reducing the testing in the Pilot Plant and had great machinery and manufacturing risk. The third option was a phased approach to product improvement by withholding one of the "external product changes" until later. Of course, by that time the program would probably have to include other new features.
The "fifth size" issue had become active in the past few meetings, but it was decided to keep this out of the discussion because it would confuse the main point they wanted to make. The "fifth size" was a jumbo pidget that had received attention and approval on brand X. Someone wanted to present the staffing issue to Jon; others objected to "working this issue" at the meeting.

The scheduled meeting with Jon was canceled by Jon for an undisclosed reason, but the "Launch" group met again to update George on the current status of the proposal. A production planning representative from Manufacturing presented an estimate of By-Product-Variation-As-Available roll out quantities, and highlighted the difficulty of accelerating the Construction of the new production lines. There appeared to be no viable options to speed up fabrication and construction. The risks involved with options 2 and 3 grew as more negative outcomes were noted. They had to order the riskiest equipment first, and there was no time for another major initiative between Z2B and the next major program, "Q." There was agreement that there was realistically only the first option.

A number of people expressed an interest in still trying to achieve 9/91 as a "winning goal," but others were doubtful that one could actually finish before one's committed time. A couple of people questioned whether there really was a need to accelerate the schedule, because Project X was running behind and the current Brand Z was holding its
own against Project X in product tests. Again, there was a request for consensus. It was agreed to recommend the base plan. George suggested that we build in early finish incentives for the "inner" project. Others commented that we had reached the limits of our knowledge and needed to move on.

Week 4
The next week there was a fairly short Launch team meeting where it was asked if a staffing problem would impact the schedule. It appeared that it would not. No other critical issues were mentioned.

The following day the Launch team met with the Directors from Product Development and Engineering to again review the presentation for Jon. Their questions were simply checking that their earlier concerns were addressed. Their experience with a previous project was that the risk of Option 2, cutting corners on implementation, was very real and great. The third option of dropping the product improvements was really a non-option because it would not improve sales. It was agreed, though, that it should be presented to Jon so he would know that base has been covered. The Product Development Director expressed the concern that they would have no market learning prior to introduction, and pushed to get an earlier access to a part of Brand X’s test market. They might be able to at least get a feel for market response to the new product even if it was not a full-scale market test.
The topic of the "5th size" was raised, and the Director of Product Development said they couldn't do anything about it until Christmas anyway because the X2B tests would not be done. He wanted to reframe the issue more positively, saying they have points in the future to address this question. George brought up the question of whether By Size As Available was OK for 9/91, and was reassured by our Commercial representative that Jon was OK with that.

Finally, the project review meeting with Jon was held. There was a fair amount of tension in the room when the meeting started. Jon listened quietly for a while. Then he began to probe whether there might not be some time reduction possible in the fabrication and construction phase. His questions were difficult to answer in his language. Attempts to answer were made at a very detailed level by the outgoing and incoming project managers. Then the Director of Engineering gave a "higher level" story which seemed to reassure Jon. The "5th size" issue was rather quickly dispensed with by the Director of Product Development, saying it hasn't been proven by Program X2B yet, so we will revisit the question later. The Associate Director for Brand Z product development tossed in the possibility of adding high compression to the project, and the Section Head assigned to Project Z said he had added it to the laundry list of possible additions to the program.

Jon wrote a follow-up memo to the members of the Project Z Launch team. In discussing the meeting and the memo at the Launch team
meeting the following Tuesday, some present noticed a difference in the tone of the two communications. The tone of the memo appeared to be both more positive (praise for an excellent job) and more negative (the "winning goals" needed to be considered "real goals"). There were different interpretations about Jon's suggestion for how to emphasize the winning goals. At first, it appeared that this might require a rewrite of the project charter; however, after some discussion it was decided that it would suffice to "talk" about the project using the winning goals.

Reflections on the Deliberation

I understand that this is a fairly common request in this organization. It can consume a great deal of organizational time and create many unintended outcomes. It is similar to other interjections from executives on projects. Overall, it appeared to be an effective response to a common request. It seemed that the right people were involved in the deliberation, and they brought the right information. However, it is quite possible that the request may have actually delayed the program instead of speeding it up. Is there a way to decrease its impact on the time of the organization, and therefore reduce the amount of work that has to be done?

Several things strike me about this deliberation. It was very easy to get lost in this flurry of activity and reflection. There were many different people and factors involved. While the topic was simply shortening the schedule, the related topics soon called into question very basic assumptions of the organization itself. Many new issues arose both as a
result of alternative courses of action, and independently other changes occurred either in the organization or the market place.

The strategic objectives of the company were dependent on the tactical results. It was difficult to gain direction from the hierarchy; instead they seemed to want certainty from the organization. The interdependence and concurrence of the various levels of decision-making was overwhelming at times.

It was striking that the goal presented by Jon was debated for the entire four weeks (and longer). There were many interpretations of what Jon meant by his rather brief statements either at meetings or in his memo. In fact, there was an attempt to reframe the issue with the creation of the "winning" goal or "inner project." It was clear that the GM was probing into the "backstage" activities of the program and it was difficult to mix with the "front stage" activities in negotiating budgets and schedules.

There were several cycles of activity present. The intermediate testing of their schedule solutions was interesting. The role of people was both brainstorming and reality testing the alternative possibilities. The possibilities were explored and converged by a small group of three to four people.

At the project review meetings themselves a couple of things stand out. Perhaps because of the big change in personnel on the project, the
"translation" of the request and response stands out. The team structure is new and brings in many new questions. However, the GM and many of the other organizational arrangements are new. I wonder how this discontinuity in personnel might contribute to make this request occur in the first place and consume as much time as it has. By this I mean that some of the underlying understanding between people is built up over a period of time. When new people come and others leave, there is usually a turbulent time in groups and organizations until subtlety and trust can be present.

Another thing that strikes me is why does this request occur in the first place? Was it Jon’s intent to create this amount of work? What kind of conditions might exist in which Jon would not need to push back at the project team? Could the process around scheduling be explained to Jon in a manner in which he would trust the decision to the Project Launch team? It was clear at the Project Review meeting that Jon was asking for a "high level" story about what goes on in the "fabrication and construction" phase, and wanted to get a "feeling" for what happens in the organization. This was difficult for the team to answer in his language.

The 3 level scheduling "map" was a helpful tool to generate some of this understanding. How could it be developed to convey more of a feeling for the activity that goes on in each of the "black boxes?" Might it be possible to include a simple story about the nature of the activities?
Currently, the simple second level charts focus on the critical segments of the process but not at the nature of their interdependency or concurrent processes. How accurately does the Product Launch model represent how things happen? There was some frustration with its linear representation and inability to illumine the activities within the black boxes.

It was also striking that a number of decisions, decision points and data may have to change if we are to shorten the product launch cycle. The depreciation order needed to be moved into an earlier year. The Certified Market Test could not be meaningfully accomplished. We have long lead times for ordering equipment and materials, which prevent us from moving up the expansion roll out. Simultaneous process development and engineering design and fabrication cause resistance because we are interjecting uncertainty into what has been a fairly certain environment. (Consequently it is not surprising that development times could not be shortened.) It is clear that just having earlier deadlines and spending more money won't get you there.

A question about the program process itself is, Why are so many new technologies required for a product that may not be that radically different from the previous Brand Z pidget? It appears that much of the time and expense is not related to product features, yet I didn't hear that in the meetings or presentations. Many of the line changes are to
increase standardization among the plants and position us for future efficiency.

One result of loading on process improvements beyond product feature requirements is that one gets a huge project with dismal financials. The payoff will presumably come mainly in future projects. What effect does that have for the organization's and individual's attention to the project? Why aren't these improvements discussed at the forums?

Several other deliberations can be seen within the scheduling deliberation regarding the size of the project and to what extent concurrent product and process engineering can occur. While the emphasis may have been on time, all other aspects of the program were also called into question. Later in this chapter, we will pick up the continuing deliberations regarding de-bundling and concurrent engineering.

**Variance**

Of the variances introduced by Pasmore and Gurley, several stand out in this deliberation. These were most often called "outages" in the language of Ampap.

**Lack of Knowledge:** Perhaps the most central variance was the "lack of knowledge." The team felt that they could only operate as far as they had experience, and they had already pushed that to the limit by cutting the
project from forty to twenty-six months. The additional four months was at one point described as trying to "get blood from a turnip."

Also, it was difficult to transfer the tacit knowledge among the actors if they did not have a common base of experience. The market tests, while important, caused further delays and only anecdotal, tacit knowledge was available.

Lack of Continuity- Key people were transferred from the project at a rather critical time, and new people added, creating more to learn and the raising of new issues. The change in personnel made the transfer of tacit knowledge difficult. While each functional representative had his or her area of primary expertise, each also was involved in each other's areas. Jon's lack of "feeling for" what was going on in these areas would gradually improve as he visited the pilot plant and the test facilities. Each new person on the program brought new perspective and issues with him or her such as the "fifth size" interest brought to the project by a new AD from PD who had just transferred to the Z program from the X program.

The focus groups were a great source of anecdotal information that both was used well and also created misunderstanding.

Lack of Cooperation- The difficulty of gaining cooperation was masked by the functional areas who refused to be squeezed by the program urgency
at the risk of not being able to complete their "black box" task on schedule.

Missing Parties: While not strongly evident in this short description of the deliberation, there were continual difficulties with various people missing at critical times in the process. As was typical of meetings at Ampap, there were so many meetings that often the people most critical to one meeting were at another meeting which was more critical for them. A representative from manufacturing had the information regarding the fabrication phase and was not present at the review with Jon. The Director in charge of the PDM had the most experience and contact with Jon, but was not present at the meetings nor was he consulted. He later said he wished the team had talked with him when they ran their alternatives by the other directors, because he felt he had a good understanding of Jon's interests and awareness.

Unclear Goals or Goal Incompatibility: What was meant by the 9/91 date? Often functional goals differed from the project goals. People are extrinsically rewarded primarily through their functions, and many of the functions did not apparently have a great deal at stake in the current project.

Too Many Inputs: It was a very complex decision environment with many ambiguous and uncertain factors involved. Tacit knowledge is very difficult to work with because it is an integration of judgments from
experience and intuition. Detailed knowledge can't be absorbed by a decision-maker.

**Delay of Meeting Due to Uncertainty of Outcome**  Some delay was caused by the lack of convergence on a realistic alternative. It is difficult to know what effect the ambiguity or uncertainty of the request and possible solutions brought to the project.

**New Process, but Certainty Asked For**  The program team tried to reframe the concept of goals, and thereby avoid a goal trap. Because of the intermingling of front stage and back stage presentation, it became difficult to shield goals with the traditional schedule padding. The notion of "winning goals" was offered as a concession to not being able to commit to a shorter timeline, but was rejected in the end. The concept did not make sense in the long run.

Perhaps these variances are not necessarily things that are wrong; they are simply gaps that can be identified in the deliberation process. In this sense they are challenges to be filled with a creative response.

**Orientations**

The project team did not welcome the scheduling request. However, they generally respected Jon and would take his word for the need for speeding up market introductions. As the Director of PD commented, "We are always asking for more, better, faster. That is our role. However, in this case, instead of asking how we can complete the
program at this earlier date, we should have asked what can we do by this earlier date."

The worlds of the project and the GM are vastly different. A translator was needed to bridge the gap between him and the project team. The project managers themselves were in the midst of a hand-off. The project team said they wanted direction, but most often they received more requests and questions.

The functions (as in the Functional Leadership Group) generated alternatives, but did not contribute to the breakdown of the black boxes, except for the representative from Commercial. The most resistant was perhaps the representative from PD, who wished to retain their independence.

The various orientations of the people present were both a gift and a liability. The project wanted a stronger concept or identity, and organizational support. Management brought constraints and questions, but also offered new options. But it is difficult to know the right questions, or to discover the right answers. Eventually, it became evident that the uncertainty was so great that there was only a grudgingly and moderately shortened schedule.
SELF-ORGANIZING PROJECTS & POST-MODERN CONDITIONS

The two related notions became apparent as I was working with Ampap. First, this situation bore a great deal of resemblance to descriptions of post-modern organizations and the experience of fragmentation and loss of sequentially to their life worlds. Secondly, this apparent chaos in their work and organization required a great deal of self-organizing. The teams members themselves were constantly changing their team structures, roles and reporting relationships. Self-organizing seemed perhaps to be their response to an indeterminate system, as they tried to fashion their associations in ways that would improve coherence, control, and dependability. I will therefore also describe further developments of the open systems model to account for complex and dynamic systems.

They were a very "smart" organization with an achievement orientation that sought to take advantage of every opportunity they could discern in the technology and environment. They imbibed in every new idea that presented itself in the literature or consulting market. They were trying a bit of everything. This applied particularly to the people from manufacturing, next to engineering, and least to product development, perhaps responding to the level of routine and concrete attributes of their work. There were very elaborate models for marketing tests, engineering standards, and production control. It was very difficult to offer much insight that they had not at one point considered. Many of the "simple solutions" faded away quickly under the demands to
"achieve" outstanding results. Almost everyone seemed to be trying so hard that collectively, the "thought space" was overcrowded with too many models. This made it difficult both for managing the environment and for conducting my inquiry into organizational life because it was difficult to focus their attention on one topic for very long.

In terms of sociotechnical systems inquiry, the social science and humanities literature in post-modern organization is most pertinent to the social phenomena, and the natural sciences literature in complex systems is most pertinent to the organization of the technical aspects of the primary work system. Both of these streams of inquiry will help us understand the non-routine aspects of their core technology, which might be called *post-modern engineering*. This term is interesting because engineering as an outgrowth of science had broken away from its contextual moorings, and the cry from the engineers was "just give me the specs and I'll design the machine." The engineers at Ampap were called to deal with the creation of the specifications and manage the organizational environment. So, it is in the spirit of creating a more complete map of the project cycle that we engage in model building in this chapter.

**Post-modernism**

Probing deeper at Ampap, I became interested in the question of what exactly contributed to the confusion expressed by the members of the organization, particularly expressed in feelings of despair and anxiety
about their ability to identify and control the development and execution of their project. It was not for a lack of rational tools that they sensed the chaos; it was the breakdown of rational methods while pushing themselves to produce the best products in the world. One of my most memorable interviews was with a project planner/scheduler, who noted that after they had completed several months of exhaustive and careful planning, interviewing everyone related to the new project, what was used could be carried on an 8 1/2 by 11 inch sheet of paper. The internal changes, developments, and discoveries they were making inside the company made it almost impossible to follow and update elaborate plans. What they had was a living system of people who knew who to talk to, and what to talk with them about. The result of planning was an initialization of a living source-technical knowledge system.

There seem to be many sources that contribute to this elusive quality of coherence in their complex and dynamic organization, that required them to spend incredible amounts of time coordinating and integrating both the project itself and the activities and requirements form the various functional organizations at Ampap. They had often tried to affect their corporate culture, but most often this was resisted, and the system fell back into a series of breakdowns with occasional but significant "home runs," a few breakthrough products that made their business.
Overall, my experience in the organization was also frustrating, finding the organization quite resistant to intentional cultural change efforts. The director of product development, who brought us into the company, stated on several occasions quite clearly, that he wanted evolutionary learning instead of revolutionary culture change. The cultural shift suggested by many of the engineers appeared to merely transfer power to the project organization under a new hierarchical authority where unity of command was possible. The director perceived that projects would make poor "homes" for people.

Contingency theory has noted the match between the environment and the internal organization. As Trist noted, in hyperturbulent environments the organization itself often becomes turbulent (1981). The fragmentation and ambiguity in systems are a response to an increasingly complex and ambiguous social world. The development of increasing powerful technological has given individuals vastly increased capacity to affect their environment. This has contributed to the development of autonomous individualism and greater social detachment. Fewer tasks have required physical labor along side of others. Technologically many authors have seen changes in the Western societies as a shift from a materially-based industrial age to a "knowledge-based" information age. One effect of information technology has been increasing decontextualization to local culture.
Harlan Cleveland (1985) identified six ways in which knowledge resources differed from physical resources. According to Cleveland information is: expandable—the more we have, the more we use, and the more useful it becomes; compressible—it can be concentrated, integrated, summarized, and miniaturized; substitutable—it replaces land, labor, & capital; transportable—remoteness is more choice than geography; diffusive—it tends to leak and cannot be kept a secret; and sharable—"information by nature cannot give rise to exchange transactions, only to sharing transactions" (p.176). The term for this new world in information systems terms is "virtual." The basis of technology is becoming more virtual, and personal and organizational boundaries are becoming more difficult to distinguish. Before the current opening of the former USSR, Cleveland predicted that totalitarian regimes could no longer maintain physical control under the conditions presented by information technology.

Interactions are occurring between former competitors in the automotive and electronics industries and others are now operating in multinational partnerships. Gradually, the hegemony of single world views is giving way to awareness of a plurality of perspectives. This is indeed confusing to many people. What this means in product development is that not only are they dealing with different perspectives in the organization like engineers and marketers, but increasingly communicating simultaneously upstream to scientists, and vertically in the organization to include top management.
At Ampap, the information technology has created greater demands for the standardization of manufacturing platforms across international boundaries, so a product may be made in Japan, the United States, or Europe and shipped to any of their world markets in response to immediate product demand. The complexity of strategic decision making has exploded as the options have increased, and the demands of time have impinged. Information technology has contributed to the complexity and dynamicity of the interaction between the core technology of the organization and its environment. While IT can aid in completing the routine tasks of working life, it appears to increase the ambiguity that is faced by the humans in these systems.

One of the implications is that there is an increasing professionalization in coordination and analysis positions in organizations. The "real" engineering work of equipment design was "farmed out" at Ampap several years ago to contract employees to increase organizational flexibility and lower overhead. The engineering function was dissolved, and the remaining engineers have become facilitators and coordinators of the design process.

As a result, organizational hierarchies have flattened, and it is difficult to see large differences in "time span of discretion" between the levels of the hierarchy (Jaques, 1988). The Director of Product Development was often out of the building, dealing with possible difficulties in the market.
Two years prior Ampap had lost a $5 billion dollar business within a week due to a small instance involving product liability with a handful of customers. The "press" was so potentially devastating to the rest of their company that the company had chosen to shut down that entire product line in fear of hurting their reputation. Instead of looking far out into the future, much of management's time is spent on very immediate matters in current projects as preparation for the future. They have been through this process before and potentially have the insight and experience to anticipate where the current decisions may lead.

If anything the distinction between levels of the hierarchy has had to do with issues of size. The increased authority has to do with the ability to hold these diverse and apparently contradictory organizational elements together until they become complementary. If this is done well, the organization can then have a long life. *Being* the organization is less a matter of projecting one's ego than of maintaining the integrity of organizational processes. The Product Delivery Model was developed and promoted by the most senior people in the organization as a primary process for coordinating the organization, and keeping the seemingly contradictory elements together until they result in a complementary product-market outcome.

One of the primary suggestions by Marvin Weisbord, a proponent of STS, is that one needs to get the whole system in a room for planning
(1989). This is an increasingly difficult task. Under conditions of autonomous individualism, it is perhaps an impossible task, and it drives the organization crazy. We need to find better ways of addressing the increasingly ambiguous aspects of our sociotechnical systems.

Our efforts to bring about system change, develop policy, etc. seem to increasingly find fruitfulness in organismic metaphors, while our mechanical positive/empiricist metaphors fail to produce an adequate description, and fail in their aim of predicting social behavior and thereby being able to control it (Morgan, 1994).

Just as the postmodern social situation is complex and ambiguous, so is the intellectual situation. Tarnas comments, "in its most general and widespread form, the post-modern mind may be viewed as an open-ended, indeterminate set of attitudes that has been shaped by a great diversity of intellectual and cultural currents; theses range from pragmatism, existentialism, Marxism, and psychoanalysis to feminism, hermeneutics, deconstruction, and post-empiricist philosophy of science, to cite only a few of the more prominent" (1991, p.395). A few of the more widely shared working principles that have emerged are: "There is an appreciation of the plasticity and constant change of reality and knowledge, a stress on the priority of concrete experience over fixed abstract principles, and a conviction that no single a priori thought system should govern belief or investigation" (p.395). This social and intellectual realization opens the possibility of constant expansion.
Tarnas continues, "One cannot regard reality as a removed spectator against a fixed object; rather, one is always and necessarily engaged in reality, thereby at once transforming it while being transformed by it.... The inherent human capacity for concept and symbol formation is recognized as a fundamental and necessary element in the human understanding, anticipation, and creation of reality" (p.396). From this perspective, the mind is fundamentally interpretive, and we cannot get out of this situation to an objective point of view. This is unnerving, coming from our historical belief in the promise of scientific "objectivism." We are forever bound to our "local knowledge," and the perspective from our local form of life (Geertz, 1983). Ambiguity pervades the system.

Tarnas goes on to pronounce, "The Western mind's overriding compulsion to impose some form of totalizing reason--theological, scientific, economic--on every aspect of life is accused of being not only self-deceptive but destructive" (p.400). Pushing this reasoning further,

Postmodernism in this sense is 'an antinomian movement that assumes a vast unmaking in the Western mind...deconstruction, decentering, disappearance, dissemination, demystification, discontinuity, difference, dispersion, etc. Such terms...express an epistemological obsession with fragments of fractures, and a corresponding ideological commitment to minorities, sex, and language. To think, to feel well, to act well, to read well, according to the episteme of unmaking, is to refuse the tyranny of wholes; totalization in any human endeavor is potentially totalitarian.... Properly speaking, therefore, there is no 'postmodern world view,' nor the possibility of one. The post modern paradigm is by its nature fundamentally subversive of all paradigms, for at its core is the awareness of reality as being at once
multiple, local and temporal, and without demonstrable foundation (p.401).

At the same time as the pluralism, complexity and ambiguity are heightened in (and perhaps by) the postmodern perspective, there also appears to be an emergence of religious sensibility, not necessarily organized religion. Tarnas states, "In growing numbers, individuals have felt not only compelled but free to work out for themselves their relationship to the ultimate conditions of human existence. Following suggestions implicit in Nietzsche, the 'death of God' has begun to be assimilated and reconceived as a positive religious experience of numinous, a larger sense of deity" (p.404). Tarnas sees a great deal of promise in the thinking of feminist analyses, through their dynamic tension of the deconstructive and the integrative. The ontological issues of organizational life crop up from here as well as earlier in the phenomenological perspectives of Heidegger and Berger & Luckmann. As Teilhard de Chardin noted, the foundations of civilization (and therefore organizations and society) have been shaken (1965).

Reports of the breakdown of monolithic views of society into multiple and local realities have come from many sources in literature. From a social theory perspective, Agger (1991) highlights the contributions of critical theory, post-structuralism, and post-modernism in pointing out the shortcomings of positivism. Probably the predominant critical theorist is Jurgen Habermas. One of the bases of this perspective is the dialectical imagination (Jay, 1973), inherited from Hegel, which provides
the ability to view the world in terms of its potential for being changed in the future as a synthesis, when the thesis meets the antithesis. Eventually, Habermas rejects the materialistic determinism of the Marxian heritage (1971), in favor of self-reflection and communication. Life changes in and through conversation and action. What is said at Ampap makes a great deal of difference.

Post-structuralism is a theory of knowledge and language. Agger says that, "For Derrida (1987), every definition 'deconstructs' itself—that is, it tends to unravel when one probes deeper in its foundational assumptions and literary gestures"(1991). Thus, Derrida has fostered a group of theorists in literary criticism that rejected textual objectivism, by insisting that every rhetorical gesture of the text contributes to its overall meaning. Seen as a critique of positivism, "deconstruction can help reveal the values and interests suppressed far beneath the surface of science"(p. 125). What is particularly meaningful in our discussion of postmodernist fragmentation is Derrida's notion that every text is undecidable in the sense that it conceals conflicts within it between different authorial voices, i.e., there is no one "objective" story but embedded stories by different authors in any social setting.

There was an anxiety connected with this discovery at Ampap. There was a huge vocabulary of over 650 specialized terms used at the company, but few terms for their social relationships, for things that connected them together. In a company that was formally espousing
explicitness of criteria, the most common terms such as "team" and "functional organization" were undecided. Other terms, such as "breakthrough," gained popularity because of a flurry of use, but in the end were rather short-lived phenomena. Even while they were alive, the terms were difficult to explain. When I questioned these terms, they often would breakdown under scrutiny. They sought a totalizing voice with ambivalence, desiring the voice but also rejecting those that emerged.

Agger cites Lyotard (1984) as the most explicit philosophical postmodernist. "His The Postmodern: A Report on Knowledge represents the core of postmodern thinking on central issues of modernity and post modernity. ...Lyotard rejects totalizing perspectives on history and society, what he calls grand narratives like Marxism that attempt to explain the world in terms of patterned interrelationships. ...He maintains that one cannot tell large stories about the world but only small stories from the heterogeneous 'subject positions' of individuals and plural social groups"(p.116). Foucault (1976, 1980) also insists that knowledge must be traced to different discourse/practices that frame the knowledge formulated from within them. You cannot measure the differences between people's positions. Agger suggests, "For example, there is no way to adjudicate the issue of who is more oppressed—women or people of color"(p.117). Similarly it was very difficult to precisely pinpoint the organizational members when they tried to partition the routine and nonroutine aspects of their projects. They said that they
knew 90% of what would be required for the Z2B program, but had a
great difficulty identifying the 10% that was unknown. It was difficult to
partition their reality when it wasn't strictly an engineering design
problem.

This partitioning of the world makes sense if the world is one thing
composed of many categories of isolated things. But if it is a dynamic
reality in time subject to many interpretations, partitioning creates a
dilemma, particularly when it comes to human identity and social
agreements. From the perspective of social constructionism, Gergen
(1991) has called the social experience of post modernity a "dilemma of
identity" with the "saturated self." He feels that in the complexity and
intended rationality of the modern period we reached a point we could
not find words to express our experience. He suggests, "The optimism
fueled by neo-enlightenment voices contributed to what many view as
the grand narrative of modernism. It is a story told by Western culture
to itself about its journey through time, a story that makes this journey
both intelligible and gratifying. The grand narrative is one of continuous
upward movement--improvement, conquest, achievement--toward
some goal. Science furnishes the guiding metaphor" (p.30).

Gergen goes on to note, through a series of vignettes, that the challenge
to the modern social identity is too many demands going in disparate
directions, resulting in "a populating of the self, reflecting the infusion of
partial identities through social saturation. And there is the onset of a
multiphenic condition, in which one begins to experience the vertigo of unlimited multiplicity" (p. 49). And, "Each of the selves we acquire from others can contribute to inner dialogues, private discussions we have with ourselves about all manner of persons, events, and issues." Mary Watkins talks about "invisible guests," Eric Klinger saw "social imagery," and Mary Gergen saw this phenomenon as "social ghosts." "Hazel Markus and Paula Nurius speak of possible selves, the multiple conceptions people harbor of what they might become, would like to become, or are afraid to become" (p.71).

Gergen goes as far as to say, "At this point the concept of the true and independent self—whether constituted by deep interior or a machine-like rationality—loses its descriptive and explanatory import. One is thus prepared to enter a third and final stage, in which self is replaced by reality of relatedness—or the transformation of 'you' and 'I' to 'Us.' "In this way meaning is born of interdependence. And because there is no self outside a system of meaning, it may be said that relations precede and are more fundamental than self. Without relationship there is no language with which to conceptualize the emotions, thoughts, or intentions of the self" (p. 157). Gergen then poses a challenge: "How can practices and institutions traditionally expressed individualistically be reconceptualized as forms of relatedness?" (p.243). He concludes that, "From the post-modern standpoint, ... leaders lose their credibility as 'superior knowers,' and guiding rationales prove empty. The very possibility of a single individual, or a small group, determining actions
of the whole is challenged, for this small minority can see the world in only a circumscribed way, and can contemplate but poorly the myriad forms of relationship in which their colleagues are engaged. Post modernism thus replaces the emphasis on the rational and superior leader with a sharing of realities across subcultures of the organization" (p.250). It was very difficult to determine precise roles in the product and process development process at Ampap. The project team complained that they could not find a decision-maker, and rarely heard a definitive directive. Each person on the team needed to represent not only their function, but integrate the roles of other functions if the project was to work.

From the subjectivist stance of social construction, one would have to re-envision the notion of identity without boundaries and 'push the bottom out of professional individualism, maintaining multiple fluid identities. The edifice of the individual, the atom of social universe, is deconstructed eventually into communities of relationships, the energy of the social universe. The concept of individualism and the drive for independence was strong in the organization, as well as the organizational value for teamwork. This was a difficult balancing act because both their professional role and their teams structure changed as the project proceeded.

One of the things the leader can do in the postmodern context is conduct inquiries. Different modes of inquiry have different social outcomes.
James Hans (1989) made a distinction between discursive and recursive questions, or modes of inquiry. Discursive questions are generally linear in that they seek answers that transcend the current conditions. We attempt to build ourselves a new set of conditions within a rational discourse. Recursive questions are nonlinear in that they return again to what was. They sit in the context of the situation and pay attention to particularity. The striving of transcendent and universal laws gives way to the perception of what is and not what "ought to be." It is a strange paradox that we often need to return to fundamental questions in order to make an advance. But even within the fundamental advance, we are still faced with recurrent questions of the human condition. Discursive inquiry relates to the road of our intentions, while the recursive inquiry mode is pertinent when we return to the stream. When we return to the stream, we become aware of our context, our mysterious and unnamed environment.

At Ampap there was a striving to make the "big home run," to make the new product that would go far beyond the competition. The discursive mode sought to surpass the current state of the market. This had occurred on several occasions, and many people attributed the size and success of Ampap to these discoveries. Still the majority of their organizational lives was spent "in the trenches" in making incremental changes to product lines and facing the see-saw competition with other brands of pidgets in the marketplace. These recursive questions are not necessarily glamorous. They are part of everyday life. Yet, paradoxically,
it is in the incremental development in relationship to the consumer environment that the Japanese have made the big breakthroughs.

Discursive inquiry often follows a rather mechanistic sense of repetition because it seeks to find universal truth and values. It loses its context and becomes ungrounded. Thus technological development can continue at an extremely fast pace and not recognize the environmental and human carnage that can be the unintended outcomes of its pursuit of its goal. While recursive inquiry recognizes that each time we return, it is a return with a difference. It is our revulsion against time that lies at the core of the discursive. It is a desire for immortality.

Hans (1989) links this fear of the recursive with the emphasis on individualism: "The autonomous self is incapable of seeing its progeny—be they children or the results of his work—as being healthy replication, the necessary recursivity that allows man to overcome his revolution against the past. Thus the autonomous self, an apparently ideal solution to our problems, ends up becoming not only sterile but also deadly"(p.30). That's why Nietzsche and Heidegger are threatening to us. They wish to reveal the edifice of Western civilization. They deal with the vicious cycle of reciprocation so they can deal with the virtuous cycle of reciprocation. Returning to the stream occurs but is often resisted.

Everyday life and ordinary surroundings have not been considered to be exciting and do not attract attention in the organization. Hans says, "The
recursive used the question to open up the terrain of the context of the query while the discursive employs the question to transcend the context of it" (p. 38). The limits of discursive explanations were reached in a number of areas in modern western society at about the same time. Despite our interest in transcending the earth, we find ourselves fundamentally having to deal with the same issues of life.

Instead of expecting an answer at the end of the questioning that will provide us with a quotient of value, Heidegger shows us how the value is worked out in the questioning, and how the wrong value is attached to the question when we expect it to end in an answer. We are asked to turn our questions around in order to see what they reveal about us, and then ask if we really value the "us" we see behind the questions, our way of asking them, and our expectations about answers and values in general.

Regarding the nature of questions, Hans goes on to say, "A discursive question is inherently self limiting, and hence closed, both because it has a specific end in view and because the answer is usually embodied in the question itself....For the recursive question, on the other hand, openness is what gives it its force, the agreement to follow it where it will go without the expectation of a specific answer at the end of an inquiry. This openness, however, is based on establishing other limits. Most generally, the recursive assumes the limit of human finitude—questions
do not lead man outside of himself, nor is their goal the transcendence of the human" (p. 42).

Project teams may follow the discursive drive to limit the contextualization of the project and perhaps universalize it in the perfect solution. The role of the hierarchy may be to maintain a recursive perspective of the project, regarding the finitude of the context. The end of the recursive questioning is also to "learn better how to ask questions, to discover which questions most need to be asked, and to discern how to follow the rhythms of the queries that present themselves" (p. 54). The project team's recursive questions have to do with the focus of the project itself, but perhaps not in relationship with the broader organizational system and the history of projects in that system. The senior managers at Ampap often felt repetitive in their project review meetings; as the Director of Product Development said, "We always ask for the same thing: more, better, faster."

It is difficult to break out of the illusion that the discursive alone is needed. Much remains hidden when only the discursive mode is used. We convince ourselves of our ability to ultimately perfect ourselves. Often we need to forget what widgets are, and even all the things we have created in the world, so that more of our experience can follow the stream of experience without autonomous intention. What we create needs to take on a life of its own to grow outside the narrow confines of our intention and limited attention. Just as an author may let the
characters of a book take on a life of their own, projects do indeed take on a life of their own. The end of a project often cannot be anticipated. The greatest concepts at Ampap often emerged in the middle or even at the end of the project. They rarely were apparent in the planning stage of the project.

"If an institution has taken on a life of its own, it is probably being more effective in some ways than when it was seemingly under our control. What we have discovered... is that the world does not so much resemble a structure as it does a system" (p.96).

As with authors finding that their novels take on a life of their own, "This could be seen as a form of bondage rather than simple discipline, but it makes greater sense to see it as a form of discipline, for it has great benefits for the writer." "The characters come to know more about character than the novelist does, so he must now learn from them" (p.99). Hans continues, "Perhaps there are so few significant writers because hardly any of them are willing to accept the inevitability of this moment and all it involves, in which case part of the value of the writer's work is that it shows us how we must accept the inevitability and in turn shows us the results of embracing it" (p.100). The projects at Ampap often would take on a life of their own. It was difficult to keep the managers informed on the project direction and development, because the turbulence in the organization and the indicative direction for the project made deduction difficult as well as keeping one's promises.
The Z2B project gained more and more functions and cost as the project proceeded. The debundling discussion grew up out of nowhere, once it gained saliency in the organizational context. The scheduling deliberation consumed a great deal of time, beyond the expectations of the GM who thought he was asking a simple question.

A fundamental shift occurs when one poses a question from a discursive mode or a recursive mode of inquiry. "Far from being a mode in which one decides at the onset what the limits are and then refuses to probe them, the recursive question inevitably moves to the limit, moves from a particular context to the limit of the orientation that is present within it. In this, the chief difference from the discursive question is that it is more interested in what opens up on the way to the limit than it is in what lies beyond it in as much as it concedes from the onset that what lies beyond is by definition outside its purview." (p.122).

A profound awareness of the project cycle and cycle of inquiry is that how each step or project is "returned" or received will have an impact on the next round of inquiry. The result of planning was a planning organization. This was accepted. The result of meetings was a tacit contact and knowledge and not the minutes. As a result of management-project inquiry this sets up the next round of questions. Knowledge in this sense is the process of organizational conversation. If the manner was discursive, the knowledge would be primarily transcendent and therefore accumulative. My intention when I went
into Ampap was to develop accumulative knowledge and isolated reflection. What I discovered was a much more active process of engagement, often without a specific goal or result.

"A question that is designed to open up new terrain has a different value system than one that is designed to stake out one's turf, for example, for the second kind of question is really not a question at all. Instead, it is a mode of assertion designed to establish prominence." (p.156).

In our polarization of politics in autonomous individualism, we often see the choice as Lee Iacocca stated as Chrysler's company motto, "You have to lead, follow, or get out of the way." It is interesting how the participation in a cooperative dance seems unrealistic. Hans further comments,

Yet in spite of our despair at the void, it is increasingly difficult to hear what the existentialists have called an authentic voice. It is hard to find a questioner who so attentively listens to his questions in the way that Nietzsche or Heidegger did....If we are to begin to see the postmodern era in other terms, in terms of the possibilities it presents us, we need to focus on the point of intersection of Nietzsche, Heidegger and Freud, and that point comes together in thought of the eternal return, Heidegger's thought of the difference of difference, and Freud's thought of the death instinct...these moments of negation were presented as moments of openness which need to be faced, confronted (pushing the bottom out of it.) And this requires the right questions....The reintroductiion of the recursive in their thought comes when they turn to these dilemmas and refuse to ignore them; the moment of difference comes when they refuse to return to the repetition compulsion of the discursive that would allow them to avoid arriving where their thought has taken them"(p.201).
The place of the authentic voice is often in the gap between our expectations, our intentions, and our concepts, and in the stream of events that occurs inevitably through time. Speaking from the awareness of this discrepancy creates the possibility of participating in a dance of co-creation, and not despair because that dance does not already exist.

In summary, the fragmentation experienced at Ampap was a profound sense of loss, particularly the loss of unity of command. This is both threatening and releasing in its effect. The organizational hierarchy was still partially operative, but only partially effective. The program or project level was where the organization came together, and therefore, it was difficult for the buck to stop except where the organizational efforts were tested in the broader environment. The social issue was that isolated individualism was an outgrowth of the scientific and technological tradition of modernism. The postmodern challenge was to "push to bottom out of," or deconstruct the individual who had become so "saturated with things" that there was a grave threat of being frozen by the existential angst of the time imperative. As a theme of this dissertation, part of what lies beneath the individual is a more general process in which the individual participates in events and occasions.

A single totalization is a signal of domination, and another implication of this ontological shift in post-modern conditions is that there are many
local realities. There can be no single perspective or reality in a complex and dynamic organization, only perhaps some agreement on the fundamental process for working together. This working agreement regarding the task and dialogue in the organization is contextualized and imbedded in many realities, and is in that sense hermeneutic.

**Self-Organizing Systems**

The experience of chaos is explored not only in the humanities, but also in the natural sciences. Perhaps the most profound development of this perspective came from the chemist Ilya Prigogine in his efforts to understand complexity in physico-chemical systems (1976). He won a Nobel Prize for his work on dissipative structures. The basic notion is that complex and dynamic systems, such as weather or complex organic interactions, often appear to be chaotic, meaning there is no discernible pattern. There appears to be constant innovation. However, at a more implicit level one can perhaps find order. In systems which are near-chaos, these systems maintain stability by shedding entropy into the environment, i.e., waste products. One way of seeing these patterns is to find a way of placing this interaction into phase space, i.e., to account for time in the interaction. An observation of a near-chaotic phenomena can be confusing and constantly changing because we are looking for a single categorical state. If one can see the shifts in phases or changing states, then one can see the general pattern of as a sequence of phases. The basic process of metabolism that maintains the ever-changing human organism is one example. This phase space is called a "strange
attractor" because it is a pattern that maintains itself even though the systems may appear different on the surface.

Svyantek and Deshon (1991) found that chaos theory may shed some light on why cultural change efforts often don't work. They saw that, "Surface elements related to them (cultures) could be changed slightly as long as the changes did not violate beliefs held at a deep level. Attempts at deep level change were strongly, and successfully, resisted by actors within the organization." The basic idea underlying chaos theory is that for complex systems (like product development organizations), the exact prediction of events and causal relationships is impossible on a micro level but possible on a macro-level. It is difficult to exactly predict what any particular individual is going to do, but the deeper structure and heritage of the organization are largely predictable and very difficult to change.

Many complex systems have "attractors" which define the system on a macro-level (Gleick, 1987). Drawing on work with biological systems theory from Eldredge (1986), organisms can be seen as being composed of two major interdependent, but independent sub-systems. "The economic sub-system interacts as a cohesive whole in economic competition for resources in the environment with other organisms of the same niche. The function of the informational subsystem is to pass on its structure directly through reproduction." These systems are hierarchically arranged where the informational sub-systems set the
boundary conditions of the economic sub-system. The informational sub-system is also composed of two sub-systems: the adaptive (AI) and the configural (CI) information systems. The AI system is more malleable and helps the organism compete for environmental resources, by staying in flux. The CI system, on the other hand, is genetic, and fundamental changes in this system would dramatically alter the organism. Operating at a more basic level, the CI system sets the possible ranges of behavior and adaptation for a species. An example is between the species of dog (CI) and the breed of the dog (AI), the later of which adapts to selective pressures from the environment. Any system that is self-replicating is seen to have both an AI and a CI system (Svyantek and Deshon, 1991).

When applied to organizational systems, the informational system can be represented by organizational culture. The AI sub-system corresponds to organizational practices that vary and flexibly adapt to economic opportunity, such as the surface changes in the political system mentioned earlier. The CI system, on the other hand, represents many of the cultural beliefs, norms or perceptions that are more fundamental to the organization. If the Configural system changes, the organization fundamentally changes, similarly to the deep structures of the political system. It is proposed, therefore, that changes in the AI system can incrementally improve the economic return for a company; however, more fundamental change would more likely account for quantum changes because they set the boundary conditions of the economic. It is
important to note, though, that the CI system does not specifically
determine the economic return for companies. This means that changes
in CI system of culture may not change the RONI of a company. The CI
system will only change under extreme environmental pressure and at
great cost. The authors suggest that it is unlikely that change efforts
would succeed in changing the CI system, so they recommend aiming for
more adaptive changes rather than fundamental changes in culture.

My own conclusions differ from those of the authors. The message I
find in their analogy is that fundamental changes require the change in
perceptual distinctions by the members of the organization. Changes to
the adaptive information system they suggest do not fundamentally
impact the organization, so why become solely preoccupied by them?
The implied search is for ways to begin to address issues at this
fundamental level so that second-order change may take place. One
observation is that often we try to change culture by trying to
dogmatically impose a new ideology. If there is insufficient power or
leverage by the change agent, the organization runs into resistance and
the organization spends a great deal of energy trying to "force" this
change in ideology. The search is for ways of constructing a new world
that is authentic to the possibility of their being. This is more
"naturally" done by enabling their own inquiry into the nature of their
relationships to each other and their work perhaps. Historically, this
type of change has occurred indirectly through the creation of new
stories, rituals and ceremonies. The assumptions and organizational
arrangements can then be challenged and changed if desired. But direct assaults are often not effective. These changes most likely occur more frequently under crisis situations, and as Vial (1989) observed, we do seem to be in times of "permanent white water." Most of the organizational members at Ampap said they wanted to change; the only problem is that they can't agree in what direction.

When asked to describe their culture one member of Amapa said, "We definitely have one. But it is difficult to say precisely what it is. It is kind of like the statements people used to say about conformity in the days of the hippies, that their lack of conformity was itself, conformity. I suppose there is a common culture here at Ampap in the sense that we are all looking for new ways of doing things. We have a lot of consultants come through here, and we pick their brains for a day or two, and have our own take aways."

To try to better understand the conformity of non-conformity, one needs to look at a more implicit process that in the explicit norms and conventions of mass society. Maturana and Varela, two Chilean biologists, coined the term "autopoiesis" as a referencing or a self-replicating system in trying to understand eye sight in frogs. The basic notion is that organisms are self-sealing systems. They seek closure. The have no direct knowledge of their environment but instead rely on internal response to the environment. A frog will react to certain visual and other clues to catch a fly. The frog does not have any definitive
information that a moving speck is indeed a fly and could easily be fooled by signs that look like a fly. In this sense the system of the frog is self-organizing. There are clues from the environment, but it is the frog responding to complete his/her system.

Maturana defines an autopoietic systems as "a unity as a closed network of productions of components that recursively, through their interactions, realize the network that produces them and constitute its boundaries by realizing the surfaces of cleavage that separate it as a composite unity in the space in which they exist" (Maturana, in Zelany, 1981, p.30). What this means in simpler but less structured language is that in our previous example of the frog and fly, the fly causes a breakdown or interruption in the frog's environmental system; this is identified and integrated by the frog, literally by eating the fly, and sustaining the frog as a system. Winograd and Flores further specify this relationship; "Maturana...states that our ability to function as observers is generated from our functioning as structure-determined systems, shaped by structural coupling. Every organism is engaged in a pattern of activity that is triggered by changes in its medium, and that has the potential to change the structure of the organism (and hence change its future behavior)" (p.71). In this sense, individuals are autopoietic systems in a medium of the social system. He views human systems as linguistically centered; interaction comes through love, or the biological preference for recurrent interaction.
Winograd and Flores draw upon Heidegger's notion of Being to extend Maturana and Varela's notion of autopoiesis; "Heidegger and Maturana, in their own ways, point to the importance or readiness-to-hand (structural coupling) and the ways in which object and properties come into existence when there is an un-readiness or breakdown in that coupling" (p.72).

For Heidegger, we act in ready-to-hand mode until we encounter a discrepancy in the environment from our expectations. In this unready-to-hand mode, we attempt to sort it out, to "problem solve." Once the problem is solved, one may enter a present-to-hand mode in which one presences awareness of the solution. While we may fear unreadiness, it is the precursor to our building and presencing in the world.

In the social construction perspective, we change through interaction with the environment by the process of externalization, objectification and internalization.

The predominant perspective I wish to draw from in complex systems is the Norwegian, Stein Braten. Braten (1990) extends the notion of self-referential systems to human systems, building on the work of Maturana with living systems, and extending through Luhmann's development of social systems. The fundamental distinction concerning self-referential systems is that there is closure on the systems. This is not the same as a closed system, which has no relationship with the external
environment, only that there is a movement towards closure to the
system. This involves first making a distinction from and then a re-
entry back into a larger system. He makes the following statement about
this distinction in human systems: "A universe comes into being when I
make a distinction with you (as my Actual or Virtual Other)" (p.2). The
universe that is created is the possibility of dialogue.

He summarizes these three perspectives on closure as an aspect of self-
organizing systems:

1. Organizational closure (autopoiesis) of living systems.
2. Communicative and functional closure of social systems.
3. Dialogue and complementary autonomy in human systems
   (p.1).

Drawing on the earlier definition autopoiesis by Maturana, Braten
elaborates, "this indicates a self-producing system which maintains its
original identity through its network production of components which
through their interactions regenerate the network that produces them. It
may undergo changes and be perturbated by independent structural
events. But as long as this is not a de-structive event it continues to
subordinate all changes in its "structural drift" to the maintenance of its
own organization"(p.5).

Luhmann (1985) advances Maturana's physical system metaphor to the
realm of human consciousness, or meaning-processing systems. This is
a significant shift in abstraction. Persons reproduce themselves through
consciousness, and social systems reproduce themselves through communication. Luhmann states, "Consciousness is only possible as an event transcending the closure of consciousness: as a synthesis of more than the contents of only one consciousness" (1984, p.143). He clearly differs from Maturana by bringing the notion of autopoiesis into the mental system. This means that for Maturana the individual maintains only an objective sense of social consciousness. In this sense the legal system can be an autopoietic system demonstrating functional autonomy for Luhmann, defining itself and being closed with respect to legal norms (but open with respect to other functions like the economic) (Braten, 1990). This is a bit functionalist in its perspective.

Given this bridge of the concept of autopoiesis to the social realm, Braten extends this notion by postulating that the basis for an autopoietic individual by necessity is dialogical, because the monadic paradigm may be self-validating. He states, "Meaning is seen to arise in the dialogue of perspectives between individuals within the reality which they create and in which they exist. That is, there is a primary dialogical circle that makes even the individual act of creation an intersubjective event within the meanings horizon of the lifeworld in which the individual exists with other individuals and in virtue of which there is communication between them." Formally, this could be stated, "Everything said by an observer is said by one participant to another, and is not said unless attended by the other - as a virtual other who completes the circle in the observer, or as an actual other in the meaning
horizon of the observer - community.... Hence, consciousness in the individuals is assumed to arise from the difference of perspectives in the individual, that is in the process whereby I think with You as my virtual or actual other. Communication in the community is assumed to arise from differences in the community, that is, through the process whereby We disagree with You" (p.12).

By extension, "In this sense, every 'monologue is a realized dialogue" (1973, p.68) The discussion becomes monologue if one loses the perspective of the other, and another complementary perspective must be present for a dialogue to occur. In monologue there is limited awareness, what Pask (1981) has called "the sentence of a monad." This monologue can occur when there are demands for consistency and closure, or consensus and conformity. Janis identified the negative consequences of this clearly in the notion of "group think"(Janis, 1971). But monologues can also be quite beneficial, as in a company coming to an agreement on what product to produce. Each of these is a condition which Braten terms a model monopoly, if one of the parties passivates "their potential for consciousness and creativity."

Formally stated the overall notion is, " While dialogical communication is an event involving the complementary autonomy of two perspectives, it may collapse and turn monological through their submitting to a single perspective: such closing prevents creativity and consciousness which require that more than one perspective be active" (p.13)
Regarding the nature of dialogue Srivastva and Barrett comment, "We are engaged in true dialogue whenever we are willing to have our thought interrupted by the other, to be changed by the other. Mutuality and reciprocity occur in a dialogical exchange: Each sees the other as an active center of awareness capable of offering a rich perspective. Dialogue does not translate into surrendering one's point of view in favor of the other's. When a person's position is constantly under revision or when she is always empathetic, she cannot engage in true dialogue, because she can contribute nothing to the other." They go on to say, "One can have a dialogical encounter with an influential other even when the other is not present. It is possible to have an ongoing dialogue with an influential other whose voice in our heads persuades us towards some emotion or action. Often we realize another's contribution long after an exchange occurred"(1989, pp.292-293). So when we encounter the actual other, there is a mutuality and mystery of engaging with someone who is not ourselves and over whom we have little control. Therefore the outcome of dialogue is not predictable, but only influenced by our concern for mutuality and understanding ourselves in relation to the other.

Braten suggests that a dialogue can be reactivated by:
1. de-defining the domain
2. invoking rival knowledge sources
3. breaking off interaction for a while and taking a boundary position or attempting to take a meta-position

4. being aware of the tendencies towards consistency and conformity

Braten defines virtual other as, "the immediate presence of another perspective of a non-specific participant, B$, who is active in A's internal dialogue with B$, and who may be replaced by B, as a specific actual other, when A and B are in conversation"(p.18).

There is a very interesting complementarity between the "virtual other" and concepts mentioned earlier by Gergen. He called our saturated selves known by various names; "social ghosts," "invisible guests," etc. "Notions of the symbolized other or the "generalized other" (Mead, 1934) are notions of mediate forms, generated in the socialization process through interaction made possible by the primary dialogical constitution that already include the virtual other" (Braten, p.17)

One of the problems discussed by Teubner and Wilke is, "Is it possible to aim at a societal state of 'regulated autonomy,' which recognizes the self-dynamics of the various sub-systems, while at the same time constraining them?" Willke (1985) sees a way to facilitate societal guidance through reflexive law: "the point is to find those 'transreferential operations' or 'interface devices'...which make it possible for the intervening as well as for the guided system to shift between self-referencing and other referencing...At the level of modern
societies, law can operate as a medium of guidance—and thus the legal system be a mediator of political intervention into societal sub-systems—only if the law is in a position to facilitate transreferential operations between partially autonomous actors and so promote reflexion as a mode of controlled coevolution."

By not discussing what occurred in projects and developing shared understandings, perhaps when we return, we return from "different places." The need to process what has occurred is important to continued significance of a system. To return with a difference a distinction needs to be made, i.e. a synthesis from the dialectic we are or represent.

In summary, the contributions from complex systems theory reinforces the role of the intrusion by the environmental breakdown in the reality of the local system. A second point is that the strange attractor is a common process that operates cyclically through time at an implicate level. At Ampap a central strange attractor is the project cycle, as an implicit process of organizing that provides coordination at an implicit level. Another intriguing idea offered by self-organizing systems theory is the notion of bifurcation, which, in my conceptualization, follows the presentation of a text or concept. The effect of releasing a project product into the organizational environment presents the possibility of not only many interpretations, but many uses and potential outcomes, few of which can be predicted by the experience with the local system in which
the product was created. It can be anticipated, however, by the quality of internalization of that environment into the project organizing itself.

**Intersection Of Post-Modern And Self Organizing Perspectives**

What the post-modern situation adds to the concept of self-organizing is that breakdowns are the source of development in self-organizing systems of discovery and change. Attention then needs to be placed on the recursive nature of our dialogue. What happens when we self-replicate? The answer may not be predictable; in fact it is our ability to "capitalize" on discontinuity that becomes our strength. Leadership in this sense perhaps might concentrate on what the difference is and forming that in terms of a distinction. The challenge that gets posed in self-organizing systems is extremely important. In understanding the nature of good distinctions, perhaps phrased as questions, we become more aware of the response of the system to the inquiry rather than focusing on what the answer is. Did they get it? What is the role of management in this short-cycle interest? Perhaps it is in understanding what people understand by what they say.

**METALOGUE: DELIBERATIONS AND THE PROJECT CYCLE**

From the examination of deliberations in the organization, I found that a helpful way of examining them is to look at each of them as a **project cycle** of activity and reflection. Combining the notions of Hans and Braten within the ontological frame of the project cycle, the project cycle could be viewed as a self-organizing system composed of a metologue
between a local system and its environment. It is dialogical in both the simple sense that there is an conversation accompanying the action in the project cycle. However, the non-linguistic aspects of the interaction between the local system and the environment bring a much broader sense to the term dialogue, just as discourse is not always a linguistic process in post-modern theory (Johnson, 1995), and text is not just written words in hermeneutics (Joseph, 1993).

I saw four basic types of conversations or phases of the process of deliberation: orienting/testing, organizing, enacting, releasing. The first are open forums usually involving dialogue between system participants and their environmental "stakeholders." These forums were typically project review meetings, customer focus groups, or meetings with outside vendors/ suppliers. They are most often focused on the assessment of the "match" between the products of some intensive effort and the receptivity/reactivity/response of the environment. This is an assessment of organizational appropriateness through the results of the core transformation process. These forums often result in the identification of general gaps in the system, and suggest generic solutions or desired qualities of the resulting system. These forums create conditions of openness for response from the primary work system. They set the stage for organizing.

The second type of forums organize specific responses to the orientational interfaces with the environment. Again, they are
primarily dialogues focused on the creation of a new system. Resources are gathered, and the conditions of satisfaction are established for this cycle of the product development process. These forums typically follow a specific event in the environment. They involve a fairly broad range of actors in the core system. Some of the primary forums I saw were hallway meetings and team meetings that translated the environmental "demands" into an organizational response. This is a very "political" period of brainstorming and consultation. The group issues of inclusion and influence are present. The execution team off-site was one of the clearest examples of this "gateway" function, as all the ingredients for the next product synthesis are gathered and initial system boundaries and constraints are established.

The third type of forums is isolated and "productive" processes of system convergence in the enactment of the new system response. The issue of identity is primarily present: who are we? Because this is task-related, this issue is often ignored in traditional group process. This is the "cooking" or "metabolizing" function in the organization. In this phase, the pieces of the puzzle are fit into a new picture. In deliberations, the distinction between organizing and enactment is not always clear. This is most typically seen in the scheduling deliberation where alternatives were searched out and pieced together. They are typified as resulting in a convergent monologue, a single act or product.
The fourth type of forums is acts of *release*, seen often as organizational story telling. The primary forum I saw for this was the AD Board organizational learning meetings. This was also present at the agency update presentations. They are typified by familiar stories about projects. They are interpretations or assigning of meaning to episodic system creation. What happened and what are its implications for the organizational relationship with the environment? What is the intended effect on the environment? These statements are largely "pre-emptive," occurring before the actual encounter and dialogue with environmental actors, giving a particular spin to the story of what occurred in the isolation of the act of system creation. As a "gateway" forum, a hand-off occurs between the local system and the environment.

Applying the concepts from Hans and Broten, the first form of this metadialogue is the *recursive dialogue* and corresponds to the orienting phase of the cycle (see diagram). The management and project team each have a "virtual other" in their system that periodically needs to be refreshed so that questions of assumptions and organizational arrangements are called into question. It is through dialogue with the actual and virtual other that the confines of their own "closed" or inherently self-sealing system open to adapt to the external environment, producing a transcendent that surpasses that which previously existed. Under these conditions, breakdowns can be dealt with in two ways. Through the support and possibility of the other we can get out of the "hall of mirrors" dialogically, and we can recognize the
nature of the breakdown in relation to our historical conversation about such breakdowns. There is a possibility of recognizing both the recursive nature of the patterns and the possibility of creating new patterns by achieving closure through the unity with the other. Return with a difference...

**THE METALOGUE OF DELIBERATION**

![Diagram of the Metalogue of Deliberation]

Figure 5: The Metalogue of Deliberation

Other alternatives are that the subsystems could engage in a *discursive dialogue* which seeks change transcendent from the past and not reframed in continuity. There would be no story connecting the realizations of the past to the current state. The system under these conditions tends to fall back to earlier states because of undisclosed and unexamined perceptual distinctions. This method is a common way of
problem solving which arrives at answers but has no sense of its own history or that it may be reliving previous cycles of processes. People do not return and are always in a state of unrealization, hoping that the situation will someday change. But their fear of confronting what they now see as old problems can bite them in the butt.

Recursive monologues cannot return with a difference but are continually caught within their own set of perceptual distinctions. When the two parties do meet, there is often perpetual misunderstanding, firing age-old distinctions that rarely change. They have a strong historical sense of being different from each other, that becomes reified as part of their ontology without hope of transcending to a new relationship.

Discursive monologues could be carried on by the systems in working out a particular problem, but have a tendency of merely projecting without self-awareness, therefore retaining all qualities of their perceptual distinctions. There is no sense of history nor refreshing of the virtual other. The ontological frame is largely frozen, remaining alone and afraid of the past within a self-sealing story. There is a sense of progress which can end up appearing futile when the eventual breakdowns occur.
Some of the primary shifts between modes in the model are:

1) The shift from dialogue to monologue means that the virtual other is incorporated within the self-organizing sub-system.

2) The shift from monologue to dialogue means that the virtual other is "refreshed" by the actual other.

3) The shift from the recursive to the discursive means that the recursive questions have been illuminated, internalized and have found completion (at least sufficiently).

4) The shift from the discursive to the recursive means that the discursive has run to the end of its phase and re-established contact with the original assumptions.

Reconsidering the Scheduling Deliberation

The general movement of the scheduling deliberation saw the core technology of the execution team interacting with the broader environment of the category hierarchy. There were several interactions in which the execution team took suggestions from the interface with various environmental actors and isolated themselves to create alternative scenarios. They entered into dialogue with the program team, the functional leadership team, and the functional directors before re-engaging with the category general manager.

The team felt that they needed to firm up the project and were anxious to get started, as time was "a wastin." Their tendency was toward discursive monologue. They had felt that they sufficiently knew what management
and the customer wanted. Actually, they were not sure of this, but the pressure of time required them to proceed if they were to meet the schedule, for that was one of the first tests of project performance, along with being under budget. They earlier had expressed the desire to be "in the pipeline" as suggested early on in the seminar for short cycle management. In this mode, they could be isolated from interruptions and proceed with the development of the product process, design of the processing equipment and the trial and error of constructing increasingly "production type" lines from unit operations in their pilot plant. At the review meetings they largely presented their plans and hoped the General Manager would agree. A great deal of backstage activity had taken place, through their meetings with the directors and others in anticipation of his response to what they could present.

Still at their project review meetings, the conversation was more of a recursive monologue than a discursive dialogue. The team said what they wanted to do, in response to the manager's earlier request, and the GM asked some questions of clarification. The project team members did not engage the GM with questions, even concerning clarification of what he meant by what he said. After the meeting, each individual took away a different version of what happened and later constructed the most plausible story in keeping with what he or she wanted to do. A lot of the difficulty here, is that many people on the project were new to it, and prior agreements were not really known by them. The GM, being new, was somewhat of an unknown quantity for the team, and did not have a
long track record of relationship with the Division and, being from advertising, did not have a strong grasp yet of the technological side of the business. Subsequent to this and during this exchange, the directors and other people involved with the effort in the technical community invited senior managers including the GM for pilot and test plant visits, brought samples of the test products to the meetings and shared data from consumer focus groups.

However, Jon and other managers were not yet satisfied with the planning of the project and were continuing with the discursive dialogue about shortening the schedule. This seemed to be the proper time for this type of discussion; however, with the current press for time, it may have been counter productive. Perhaps he wanted to check the team's planning to see if they could move more quickly. But there were a number of other unresolved issues in the discursive dialogue. They talked about only one issue at a time, scheduling this time. Little reference was made to other business parameters such as capital cost, global standardization of technology, clarity of product performance data, human resource availability, what the exact goals of the project were for consumer preference in the market, etc. Of course, one cannot wait until everything is clear before one begin's work.

Behind this was, however, an unfinished recursive dialogue. The company was unclear that the strategic need was for this project, as well as the relationship between product brands. There were many undecided
issues in the company's strategies at this point. In particular, as was mentioned as a issue of discursive dialogue, the team was unclear about what was expected of them in terms of product performance, because they were trying to reduce product development time, yet this impact on the quality of improvement was unclear. To the extent that the business strategies were not stated clearly, or were contradictory, the project team members were in a bind. In addition, the various commissions for the functional organizations and their attendant strategies met at the level of the team, and there was a forum (the functional leadership group) which was still not high enough in the organization to clearly resolve their contradictions. Each function was demanding that their requirements be met, but at this level of the organization, there was not clear power enough to clearly resolve them. The director level group had not gelled yet to this level of discussion. However, the directors were clear that they needed to resolve these issues among themselves. Among these issues were unclear product design specifications (too many alternatives presented by product development), a pressure to develop or innovate new process methods in a "short cycle mode" without attendant funding of long-term technology development, demands from manufacturing that the processes be fully developed before plant introduction, and pressure from the sales force that there not be too many SKUs on the shelf.

There were a bewildering number of variables and influences present in this environment, that required a simultaneous integration of strategy as
well as the development of a socio-technical process. Adding to this confusion was the ambiguous "felt pressure" from an individual's memory of previous successful or failed projects. They were clear that they needed to make a big difference in the product, and this could not be a simple upgrade or they might risk poor performance with the consumer in the market place. Even more mystifying was what the market interactions were like. Was this product really needed in such a short time frame? It was not clear from history how the quality and timing of product interactions related to market share.

In the end, the team and individuals responded quite well under the circumstances. I suspect that the inquiry from the GM was largely an educational or knowledge exercise. He was new, and this was one of the costs of changing personnel related to a project. He did not know enough about the project to be able to engage in the recursive questions in this organization. The high performance orientation of the organization combined with its "maverick" self-image added to the situation in which recursive dialogue was not engaged in. However, it is the "circumstances" that might have a chance of improving, and many of the actions of the team and other organizational members helped in this. They tried to share their experience of the organization with the GM. The directors reviewed the team presentation prior to their meeting with the GM. Unfortunately, the director (Carl) who best knew the GM was not asked to review the material, perhaps because he had a different staff assignment he was currently working on and was not in a
line position at the time. The team members and project manager had done meticulous planning before this exchange and were in a good position to compile new alternatives.

What was not, however, present was a recursive dialogue that could free up the necessary assumptions and organizational arrangements for the team to be able to return with a difference as a result of their inquiry. This happened later when a similar request was made by the CEO of the company. His statement was clearly a command, a discursive monologue (I want to see these results!), to which the whole division had to engage in a reevaluation of their organizational arrangements and re-negotiate their assumptions. This time a great deal of activity resulted, with the previously neglected director (Karl) taking the lead with the program manager to facilitate the conversation in the organization. This kind of pressure really did not solve the longer term problem, because their response was in a discursive dialogue, reorganizing the pieces of their project execution. It did relieve some of the assumed constraints, but fundamental discussion of the basic assumptions was not really addressed. However, as was true in the Nihonel example, sometimes recursive dialogues are settled through non-verbal, non-cognitive means.

Further Implications

Some of the implications of the shifts between these modes are:
1) If a project starts in monologue, the dialogue is delayed until a later phase.

2) Previous forms of metalogue may reappear at any point in the cycle if they have not found completion in a previous phase.

3) Any or all forms of metalogue may appear simultaneously in the project environment and perhaps still satisfy the cycle.

4) The metalogue is primary to the cultural system and is accessed through perceptual distinctions, implied theories of organizing, or pre-assumptions.

5) The recursive forms of metalogue are often the most difficult to conduct because of existing command and control structures. The discursive monologue is the easiest to conduct because of rewards for discursive expertise.

Extending this view of the metalogue:

1) In the recursive dialogue the self and the actual other directly interact so that the people who are to undertake the project can appreciate each other’s general orientation to the project and its purpose in light of organizational or customer needs. To the extent that the perspectives of the actual other are incorporated into the virtual other, this phase reaches completion.

2) The dialogue then shifts to addressing the discursive nature of the project, assembling the people and knowledge, engaging in planning and building the sociotechnical system of the project. The specific constraints and objectives of the project are discussed with management and other
customers. To the extent that project expectations are rehearsed and found form in the development of a viable sociotechnical system, capable of sustaining itself in isolation, this phase finds completion.

PHASE TOPICS OF SYSTEM DEVELOPMENT METALOGUE

Figure 6: Phase Topics of the System Development Metalogue

3) After the planning and project preparation, the project is enacted, and discoveries of the actual project are "discussed with the virtual other." The relative isolation of the project team is required so the project may reach convergence with the greatest degree of internal integration in the
midst of discovery. To the extent that the internal dialogue and sociotechnical system find a satisfactory convergence, this phase reaches convergence.

4) Following the completion of the enactment of the project, stories are told of the effort, and the internal dialogue with the virtual other is declared. Meaning is attached to the significance of the effort in the recursive rituals of completion. To the extent that the previous effort was honored and a credible story of the project's significance is told, this phase reaches completion.

(5) Following the declaration of the results, a decision is made about how to segue into further inquiry. This could either be a continuation of the current project, a merger or split of the topic, or perhaps transfer of the interests to a new project.

**Conclusion**

The metologue of deliberations has been presented as a possible set of conversational forms that follows the general process of the project cycle. The greatest danger of all is perhaps that we cease to move through the cycle. Historically, the project engineers have been locked in the enactment phase of discursive monologue, and have had difficulty communicating in the orienting phase of recursive dialogue. Where is a particular problem is that as systems seek closure, we are often not even aware of the other's view point let alone their mode of dialogue. The
challenge is for both managers and team members to incorporate the environment of the other, and only periodically find isolation. Each has their work to do.

It is the quality of our opening to the world of the other that determines the quality of the metaleague. To the extent that we can enter into a genuine dialogue with the other, in the broadest environmental sense, we can build a new road through the even changing stream, retaining only that which is appropriate.
CHAPTER 6: ENVIRONMENTAL CONVERSATIONS &
OBSERVATIONS

In this section we take a broader view of this fundamental relationship between the core technology and the environment. Perhaps increasingly this concerns the boundary creation of the system. The environment in any activity of isolation and system creation is both within the "organizational" boundary and beyond it, meaning the unit operations are any isolated activity of synthesis. By definition, the encounter with the environment is an encounter with the stream. There are varying conditions of openness associated with this encounter of the "actual other." Thus we encounter the environment at many different levels. Traditionally when organizations were seen to be large, discrete and concrete entities, this boundary was very solid. This still was true for many in the organization. For instance, I needed a security badge to get into the building. Ampap employees were sworn to secrecy. I have had a fair amount of anxiety over what I can disclose about the system in this dissertation.

It is in our encounter with the environment that we test our new being, and through it our connection through representation with the ground of Being beyond our concepts. What reaction will we get from the consumer? Because of the increasing subtlety, complexity and dynamism of the relationship of the broader environment, this has required the establishment of boundary organizations like ABC, AGM...
and other subsidiary organizations which are related to the core transformation process and the attending primary work system. It is kind of like a dynamic/organic onion skin set of relationships. The embeddedness is not always apparent. The need for buffering and protection of the core process is a primary function of the boundary. But it is also a transactional boundary through the internalizing gate of dialogue and the externalizing gate of monologue. When the parental role of the organizational hierarchy is shed, the boundary is not simply a wall but a point of choice which each person in the organization needs to negotiate. The person who negotiates this boundary is not an isolated individual but is holographically the organization relying on the implicate process of the organization. The incorporated individual is the organization. And, the environment is not necessarily hostile but rather a community in which one must use judgment and wisdom. One cannot control the environment directly.

As Kanter (1988) noted, if the environment is not adequately represented in the phase of ideal realization, and there is insufficient isolation of that phase, then a great deal of "unilateral" power needs to be applied when the product is released to the environment. So the organizational choice is between the power of incorporative dialogue in the organizing phase, or the application of projective monologue in the releasing phase for the product to be implemented or diffused in the resulting environment.
The nature of "feedback" is extremely interesting, because measurement makes the most sense within the discursive monologue of the system synthesis. There is agreement on both the goals and methods (language). Measurement breaks down when these standards are not present. A great example of this is the nature of feedback after each cycle of the product development and scale-up process. In the beginning great openness is required because the product concept is still ambiguous. Focus groups return a feel and possibility of the encounter between the environment and the organizational product in a tacit awareness that is anecdotal. As the product-environmental relationship develops, increasing quantification is possible. However, in the push for rapid product development, there is most often not enough time to wait between cycles for this quantifiable or empirical result. Organizational decisions must be made on a very broad and deep tacit awareness. We have little difficulty with complexity at an implicate level, but are overwhelmed by even moderate levels of complexity at an explicit level of awareness. That is because explicate systems are in a state of breakdown, and are seeking to presence a new product.

It is interesting that people promoted in the organization to "represent" the product-environment relationship are people who have incorporated a bigger identity beyond their functional expertise. A financial, engineering, advertising, or research orientation is not adequate. The person must incorporate a huge incorporated identity. This increases as one moves up the hierarchy. As Jaques noted, there is
still just cause for the presence of hierarchy. But in my mind they again serve a different function than traditional bosses. They are in fact testers of the organizational synthesis. I expect that this is apparent and not particularly startling to those who have lived in complex and dynamic organizations.

In another sense, it is hoped that the members of the product team do not simply re-present their function but re-presence their function, bringing the experience of the core transformation process within the experience of their multi-functional team. Representation is often a mechanical replication of the explicit goals and desires of their functional "camp" or "silc." Represencing brings the added being of the function to be present in the group. Represencing creates a setting in which a creative response or synthesis can occur.

By nature this involves a presencing of the whole organization, whose primary relationship to power must be the incorporation of seeming contradictions. As Bernard Loomer (1976) suggests, "Power is the ability to hold two seemingly contradictory forces together until they can reach complemenarity." An alternative is the unilateral power of story telling... recursive monologue. It is the balancing of this power within the fundamental process paradigm of the core transformation process that is critical to system leadership.
It is interesting that often very little can pass through the gates of the local-environmental system. Our memories and attendant rationales do not easily translate between these "worlds." What comes in are anomalous observations that are anecdotal in nature. What goes out are products with internal integrity of their synthetic process. Hopefully they will be well received by the environment. This is contingent on the road of the organizational reality of the local system, fitting the stream of environmental encounter.

The mysterious nature of the environment and the mystery of synthesis are important to recognize and can be managed only through recursive practices. If the road becomes too concrete and stable, it will cease to respond to the environment. It is the commitment to discern the setting of opportunity, create and release that is the basis of success.

Many of the activities of executives in the organization appeared inappropriate in the older static and physically big environment. When big is seen instead as an interpenetrating concept, then there is a possibility of Being. If it is seen as a concrete entity without opening, there is no renewal and can be overwhelmed by turbulence. Organizations are fundamentally ungovernable solely with instrumental rationality; aesthetic awareness is also needed. So, plant tours, episodes of line work, playing with the incorporation and organizing process, dropping bombs in the convergence process are anomalous behavior by
the executives to develop a feeling for the techne-environmental relationship.

There is a great stress in not living with the ambiguity present in executive positions. All of the basic assumptions seen by Bion are pertinent. There is flight from ambiguity (Levine, 1994). There is dependency/counter dependency in the environmental relationship with the other as mystery and contradiction that if not surpassed and questioned may not result in sufficient synthesis and the creation of new being. We can be caught in a reactive rather than a responsive relationship. If pairing occurs, the multiplicity of the group can be over simplified and fall into competing camps. Rather than view each person’s perspective of a common underlying event, we can easily view the organization from a totalizing perspective thus allowing our assumptions to go unchallenged and denying the possibility of a creative synthesis.

Self-organizing systems perspective is insufficient because it focuses primarily on the replication of identity. It is helpful because it recognizes the internalization of the actualized environment. But it insufficiently recognizes the incorporation of the environment within the local system.

While boundary constraints are important to the system identity and creation process, an attendant identification with that which is being
created such as a product vision, organizational metaphor/form or positive image is also needed. The environment responds with anomalies illustrating the unintended consequences of our technical creations. These anomalies must be incorporated into the organizational paradigm if the local system is to retain a productive relationship with the environment.

This is a scary process, and the tendency of technology production is to remain isolated until an overwhelming difference is created. The organizational hierarchy wants to be involved in the isolated process of the project team. This can only be done to the extent that the executives’ interest and concerns are incorporated into the virtual system of the project team. This is accomplished through a series of task completion cycles or project cycles.

What we learn through these cycles is not just a matter of many repetitions but lies in the depth and breadth of the opening. Thus organizational learning is essential as a system creation cycle. Learnings often occur not with repetition as much as in the matching with depth process paradigms of the organization.

The nature of the environment is always bounded, however. Unplanned breakthroughs and openings extend beyond to real encounters with the stream, but just as enlightenment experiences and ahas can rarely be fully remembered or explicaded, the bounded nature of
this "operating environment" is surpassed. The recursive boundaries and processes are used to focus our encounter with the environment and guide that adventure in openness.

The boundary between the two brands of pidget was precarious. It was very difficult for us to distinguish between the two brands of pidgets, for they both were to include the same technological features. The relationship between these two brands caused a great deal of confusion in the organization, particularly seen in the meeting between the AD's in charge of the two new brand initiatives. If there is little separate identify between them, problems of identity are created because they are undifferentiated. The management of this differentiation and undifferentiation was vital to the organizational structure. This was managed by the commercial organization which was also at the head of the organization. Interestingly the distinction they saw was an esthetic and not functional distinction at the level of the consumers. I am uncertain of the extent to which this distinction is carried into the operating environment of PD and PEM. The distinction was certainly difficult for me to pick up on at the Agency Update meeting.

CONVERSATIONS FROM THEORY BUILDING

The Debundling Deliberation

The debundling deliberation began in the midst of the scheduling deliberations, but Jerry, the Director of PEM Engineering, said that he had been trying to bring the issue to the attention of the organization for the
last five years. Jerry had most recently mentioned it just before he went on vacation, and when he returned, everyone in PEM was talking about debundling. How could one break these large projects into smaller pieces so one would have greater flexibility in implementation? The current Z2B project was so large that they may have difficulty both getting funding and completing it on time. Every function had put all their long-term wish lists and funding requests under the title of this project, whether they were directly related or not. As Mick said, everyone follows the fast rabbit, the hot project of the moment. Well, the fast rabbit soon turns into the fat rabbit.

At our theory building sessions we planned to look at several deliberations as a group. Many were decisions that the "organization" had to immediately determine regarding the technical direction of the project. Would we have time for a market test before roll-out to the plant? How could we standardize the size of the two brands of pidgets so they could be produced on each other's lines to respond to product demand?

Some of the difficulty was that more pressing problems than reflection crowded out pre-work on the deliberations. I suspect that some of the difficulties were also disclosure, the same political dynamic that interfered with the production of the individual journals.
In the end, many of the deliberations collapsed into the debundling deliberation. It was very difficult to keep them apart, for the topics were often intermingled. But interestingly enough, it is also the same behavior that the members complained of earlier. Everything gets lumped together; it is your one shot to take a look at it, so throw it in the hopper.

The main conversation also included "vertical" deliberations of capital cost/schedule requests, plus "bundling" of a Core modification, a converter line redesign and Ultra High Compression. But the source of the deliberation was not clear, even after our reflection:

Sven (PEM process engineer): I got the debundling issue from (my AD) back in June from the scheduling piece. It came up in the Ad board meetings when they were talking about DX & DZ and how well it worked to debundle it.

Mark (project manager): I did not hear the discussion around schedule when we had the debunbling exercise, which I led.

Genny (PEM mfg rep): Well I did. I think because I was here while you two were on vacation when the issue arose for Greg on how to simplify the project so we could do it faster. We finally got it to the point where we told Otto, that if you want a good project you don't debundle it.

George (program manager): I wasn't clear about what the objectives were, even at the time I sent out the memo. If we had spent more time talking about This is what we are doing debundling for, that might have helped.

Paul (PEM process engineer): I am kind of confused when you say that the issue of debundling came from you, because when we got to that meeting a couple of days later all of the hierarchy was asking what we were doing about debundling?
Greg: I could see that due to the complexity of the program and the strategy standpoint, we were going to have to answer these questions. (Leading to his memo.)

Bob (PD engineer): Where did the term debundling come from?

Bruce: Jack told me that it came from him

Greg: I don’t know. I was doing some things with the category team and working this thing with Cal. This was something that I felt we had to get together before they ask the questions.

Peter: Why did we present debundling to the hierarchy if we were not ready?

Greg: I presented it to them with the statement that this is what we have right now. We want to bounce some ideas off of you. And I think that that ought to be OK. At this early stage, these are just ideas.

Bob: so we presented our ideas around debundling and then Ollie (Senior Director of PEM) dropped a bomb. (Much agreement and chuckling)

Mark: Ollie’s statements reinforce we all jumped to face what was in the air. In this organization, there is someone who watches the weathervale on the eleventh floor. This sucker moves one millimeter, and 13 thousand people know it in an hour and a half.

Paul: something about knowing that Ollie wasn’t a big supporter of this program.

George: The other thing was that we went into the meeting knowing that the cost was much higher than we presented before.

Mark: I gotta tell ya that this debundling thing was sort of like carrying another brick on your back. Before I came back to find the debundling thing I was trying to find out what this thing was really going to cost. I had gotten back an estimate from BGP which was nothing like the earlier estimates for the cost of the equipment.
The conversation was interesting for several reasons. First, the program team members expressed constant surprise. They could vaguely anticipate some of the issue and answers but they came to a shape focus in the infamous meeting of July 19th when Ollie, the Senior Director of PEM, returned from Europe to meet with the program team. Secondly, the issue came from many places in the organization, yet the team members wanted to identify only one source. Thirdly, it seemed that the issues always come too late to want to do anything about. "Why didn't 'they' bring this up before?"

In this conversation we identified several major variances:
1) Chartering process apparently is not working because agreement to basic objectives of program is questioned as the project attempts to proceed, concerning schedule, capital cost and organizational project structure/process.
2) Weak link between project goals/objectives, and category strategic goals/objectives
3) Objective of debundling unknown (for a long time), hierarchy wanted smaller "chunks," technical folk saw more features needed to achieve and assure product/project performance
4) Knowledge of market outcomes highly valued but not available till late in the program, reinforcing drive for "home run."
5) See list in attachment two for other disrupting variances decreasing coherence and continuity in project.
A more complete list of variances includes:

1) Vacations interrupted continuity
2) The objective of 'debundling' was unknown. Who wanted it? Whose idea was it? What does it mean?
3) Quick answers were given to hierarchy. After more consideration an alternative is found. "Is there egg on our faces?"
4) Concurrent evaluation of technical options and the execution of design led to a lot of rework. ABC method not flexible, options extremely open.
5) Program Manager not appointed by hierarchy - lower system recognition
6) Raising of project options disoriented "routine work" in progress.
7) "Winning goals" term is confusing (making them mandatory) vs. "outstanding goals"
8) No clear forum between Launch team and business team/hierarchy/Category team for Chartering Process. Complicated by change in LT composition. Chartering process did not work - no commitment to it.
9) Misalignment between parts of organization and their models around the product concept and its development:
   a) Product launch model is still largely sequentially based & not in agreement with short-cycle principles
   b) Charter of PSDF & mfg do not allow for development, require start-up difficulties
   c) ABC design process is sequential, can't start with 90% known spec and iterate with moderate design changes.
10) 9 mo product introduction cycle and SCM (small group in pipeline) not compatible with entire system change (2-10 yr cycle and depth functional expertise?)
11) Much of the routine engineering design work has been viewed as non-routine. We appear to confuse and complicate what should be straight forward.

Several other events added complexity to the unbundling deliberations.

There were many previous events that created emotional constraints.
Pervious projects had experienced six month to one year delays. How accurately could they predict their program's timeline, for not only did
they need to find their “breakthroughs” for known conditions, but changes in the environment seemed almost certain to impinge on the known sequence and expectations. The immediately preceding project in the Zephyr brand had become lost in the system because it failed to produce a 5% consumer preference in testing. This added to the urgency to include every improvement they could to achieve this prime but still ambiguous program goal. As in the scheduling deliberation found ambiguity in the time deadline, so the debundling issue found ambiguity in the goal of a 5% consumer preference win. Who was the competition? What if the competitors came up with a new product in the timeline? Or, what if some bad publicity occurred such as the environmental concern for the recyclability of disposable pidgets as almost 50 billion were added to landfills each year?

The demands of these issues on the project organization is to do things in shorter cycles and in smaller increments, while not lowering the quality of the product enhancements. In the end, it appeared to become clear that the number of technological enhancements needed to be reduced and the expected market impact may not be a 5% consumer preference win over the competition for each product enhancement. The most current version of this is pressure from the president to introduce a product enhancement only one month later than X upcoming enhancement, four or five months sooner than currently planned.
As a conversation, it has been quite frustrating in this culture over the last few years, as there have been a number of changes in personnel as well as in the desired strategies and their relationship to the project structure in the Zephyr's business. The Zephyr's X project has been a tough act to follow, and the category strategy has taken a long time to become clear.

A second aspect of these issues also had to do with adding product features to the project. More technical features were being added over time, increasing the demands on the organization to deliver the package of improvements. Presumably, these additional features came from the product and process engineering staff so they could meet the unit cost and the consumer preference objectives of the project. Experience on the Z1 project was that an set of enhancements were developed which did not appear to get a consumer win.

How can this conversation be improved? It could be improved by having all of the parties present and aware of tradeoffs early in project and maintaining disciplined conversation with early reality testing of project goals/objectives. Chartering between hierarchy/business team and Launch team needs to be done through category team. Perhaps by viewing the process as iterative cycles, the team could expect the general nature of recursive questions that would be addressed to the situation and keep these in mind as their synthesis proceeds.
The Concurrency Deliberation

The thing we can't figure out is, how can we design both the product and the production process at the same time? We get designs from PD that we can't manufacture, and I know that if the two processes could work together it would move a lot faster.

Program Manager of Z2B

George and a senior engineer from PEM prepared and presented a topic of their current interest: the concurrency deliberation. A lot of the discoveries can come from the interplay between these two types of development. Historically the product was first designed and made by hand, and then the engineers figured out how to produce that same (actually similar) pidget in vast quantities. The project was largely a one-shot venture, so there was little interplay, if any, currently going on (except by "accident").

The major variances they identified were:

1) Bottleneck at SPL
2) PD resists convergence on specs and alternatives
3) ABC/Plants resist broad early specs
4) Attention and budget go to "fast rabbit" projects while long-term development and organizational capability have difficulty receiving funding priority.
5) Early concept development involving commercial not sufficiently completed or convergent, before development and evaluation undertaken.

Engineering has historically been seen as a sequential process and images of what it means to do concurrent or parallel engineering are not very clear. Overall, it does require a greater tolerance for ambiguity and more
flexible design technology if less of the effort is not to be thrown away when revisions are needed. Of course CAD/CAM technologies help with this, but what is also needed is for the conversation between product and process developers and equipment engineers to be improved as well. There is great pressure and market rewards to use the newest product/process in the upcoming product enhancement. Yet often this conversation results in spending a lot of time doing things over and not taking the time to do them right by being more aware of the process.

We discussed, how can this conversation be improved?

a) Finding ways for getting funding and attention for long term reliability and organizational ability projects, e.g., global standardization of technology,

b) Getting the best expertise on the project up front, and adding newer personnel later after direction is set.

In terms of the metatologue, this deliberation is in fact being addressed at each iteration of the project cycle. Product and process development is occurring within each of the four scale-up cycles of the PDM. A primary difficulty is that PD sees itself as off the map of the PDM. While a great deal of concurrent activity does occur on site at SPL, this is not part of the explicit understanding. PEM feels isolated by PD's insistence on their "maverick" nature and their aim and interest in making "home runs."
When Projects Do Not Ratchet Down

Bruce: So, does do the specifications become more specific and number of alternatives decrease as we go through the PDM process?

Bob: Not really. The answers are not in yet to be able to do that.

Kevin (PEM process engineer): That's true. Like in the learning cycle. It stays wide open until the program is done. There is always something major that is in question.

Mel (PEM mftg rep): It drives us crazy. We have no idea how it is going to turn out until it is done. But somehow we manage to make it work.

A very helpful tool for members of the breakthrough team involved in the theory-building sessions was Kolb's learning cycle (Kolb, 1984; Keene, et al., 1985). During our theory-building sessions, it was interesting that the members from PD in particular did not see the cycle as ratcheting down. In the eyes of PD the specs and alternatives did not diminish. The representatives from manufacturing concurred, that the issues of the project seemed to retain the same level of ambiguity up until the final months of the program. The open issues may change, but the overall uncertainty and ambiguity were retained throughout the process. As soon as one issue was resolved, another issue would enter. There seemed to be a continual intractability to the overall program. This is problematic and created the gap between PD and PEM. There was in fact a huge chasm between the two, except in the environment of SPL where members of the two were indistinguishable.
CONVERSATIONS WITH THE LOCAL TEAM

Deja Vu Engineering

This project launch model isn't really that much different from
the basic process of engineering which we all learned in school.
Mark, Project Manager

There is a precarious nature to the dominance of project in the
organization. There can be a great deal of anxiety, particularly at the
beginning and end of projects, wondering what it will be and what will
come next. There are extensive literatures in self-organizing systems and
process thought that can help to understand this phenomenon. To a
large extent this is creating a new identity, to the extent that this project is
a living entity of interactive elements. There is a consciousness and
awareness to the project team that cannot be separated from its
environment.

Again the crossing over of concepts between East and West is
informative. As Alfred North Whitehead relates, "Reality exists not in
material existence but in events and occasions"(1929, p.35). He points to
the central "Fallacy of misplaced concreteness" as the source of our
resistance to living in the temporality of a complex and dynamic world.
Related to this notion are the Buddhist concepts of suchness and
interbeing (Thich Nhat Han, 1992). Suchness is discovering through co-
creation the nature of a process or occasion, as in the care and
development of a Bonzsi tree. The notion of Interbeing suggests that
'we are the life we live', and more. Our identity is not limited to our
physical bodies, but all that which is related to our process of being in the world.

**Ghosts of the Past**

The following conversation took place at a Z2B program meeting;

Genny: What is happening with Z1? Is the program dead? I haven't hear about it for a long time?

George: Not its still going, but it got shelved for a long time because they did not achieve their objective of a 5% consumer win.

Genny: That scares me. Guess that's why we have put everything but the kitchen sink into this one (Z2B.)

As seen in the variances of the debundling deliberation, throughout the projects we were "plagued" as was Ebenezer Scrooge, by ghosts of projects past. These included the unresolved and unreleased projects like Z1, which did not find Being, or XYZ, which found ambivalent meaning. These often influenced "over reactions" in Z2B. How do we deal with these dis-embodied ghosts? Several recursive monologues were presented regarding the events of previous projects and their meaning. In the hermeneutic understanding of these events, and in the evidence of few collective meeting notes, the meetings themselves did not resolve the issues. The recursive monologues were helpful in creating a variety of stories in the environment, the intersection of which was interesting. If one interpretation did not dominate, but each story simply was considered as something for the stew, they had the possibility of becoming resolved in the synthesis of the current projects. Resisting the
temptation to totalize the interpretation of these events was important either in the sense that one party's perspective was the only interpretation or that these past projects were entirely good or bad, successful or unsuccessful.

The difficulty of seeing the perspective of others occurred also at the presentation of the breakthrough team's recommendations to the steering committee. Neither side was able to appreciate the perspective of the other. My advisor made this primary observation with a request for the steering team to listen to the breakthrough team's experience, as a valid interpretation of the experience. Unfortunately the direct implications of their experience pointed to the increased focus on the project rather than the functional organization. How can we create conditions so that the implications of our observations can be suspended to allow a completely new synthesis to occur? Over time this occurred as months later, upon talking with the team members, their recommendations appeared to have some effect with the appointment of a program coordinator reporting directly to the GM. It was frustrating to not see a direct causal link between their request and a response. However, it is perhaps the wisdom of the organization to ignore this direct correlation so that they are not caught in simply reactive interchange.
Missing Parties

It seems that the most important people are not at the meetings where they are the crucial decision-maker; they are at the meetings in which they are the small fry.

Senior Engineer from Product Development

I got one of only two journal entries from the Breakthrough team members. His entry emphasized a central and recurrent problem in the system: very often the people who are most needed at a meeting are not there because of scheduling conflicts. This can go on for months. This senior engineer writes,

Just got out of the Product Launch Team meeting as well as the Functional Leadership Meeting. It was basically a waste of time for both * and myself. I was supposed to present the "outside" development work (what we're doing, where we are, what decision dates are coming up) and * was to do roughly the same thing for the "inside development work." It turns out that probably half of the people who were supposed to be there weren't, and the ones that were, were close enough to the projects that we're doing that it really wasn't a good use of our time. The key people that we needed to hit... weren't there. Net, I don't think we added much to that meeting yet we ended up spending about an hour on each of the subjects answering questions that may be valid, but we will probably have to come back and answer them again for the rest of the team members.

The issue of missing people was critical at Ampap, which relied on meetings every day. There were so many meetings that one of the directors commented, "For any given block of time, I have four different meetings that I have been requested to attend." As Shelly noted in trying to schedule our steering team meetings, and I experienced in trying to schedule our breakthrough team meetings, one could not rely on
perhaps the most crucial people showing up at meetings. Added to this, meetings were not always productive. As a senior engineer remarked, "Real engineering is done on a drafting table." It is difficult for many of the organizational members to feel that meetings were productive. It was a familiar experience of being "meetinged to death."

However, what often occurred was similar to my more obvious experience in Japan: meetings are largely ceremonial. Real issues are most often worked "off line" before the meetings are convened. Meetings were signifying events and alternatively information sharing. My most significant conversations occurred in the hallways and doorways of the organizations. Why is it that people feel so unproductive in meetings? I am left with an interesting question: where does the "real work" get done?

In terms of the metadiscourse, most meetings were not discursive... they did not have the proper conditions to be "working" or productive meetings. Enactments and convergence seemed to occur with very few people and sometimes within an individual. How it worked for individuals was similar to the consensus building method I saw in Japan with ringi. An individual was responsible for the resolution of an issue. This might either be assigned at a meeting from a brainstormed issue list, or occur privately as a project management issue. The individual would then talk with whomever was needed to resolve the issue.
The conditions in the organization made it impossible for "real work" to be accomplished at meetings with more than two or three people, unless one or two people "dominated" the situation. Sometimes this appeared appropriate, but often is was fairly coercive and was not perceived to be a consistent and elegant solution.

Dropping Bombs

We are asking for direction and decisions, but instead they keep dropping bombs on us.

Paul, Member of the Program Team

Why is it that management appears to be disruptive, rather than offering answers? Management are the reality testers of organizational projects. What guides projects is ambiguous visions and recursive processes, based on tacit experience and knowledge.

Both of these experiences with the scheduling deliberation and the project team point to a primary dilemma of the organization on the relationship of the organizational hierarchy to the project and program teams. Organizational strategy at AMPAP (often developed through the functional hierarchy) was ambiguous and uncertain, finding form and being tested within the programs and projects. The expectations and desire were for clear decisions by the hierarchy early on in the process, creating certainty on the direction and resources available to them. Instead, the team members experienced the hierarchical authorities
"dropping bombs" and disrupting their efforts to create certainty and predictability.

The emergent function of the hierarchy was instead to be reality testers and care providers for the system. They are the guardians of the journey of projects. A notion from process theologian Bernard Loomer is helpful to extend beyond the notion of socialized power into the temporality or living in the world. It is the notion of relational power taken from a piece by Bernard Loomer called "The Size of God." Relational power is seen as the power to hold the system together until it reaches a "proper" synthesis.

Currently, managers well know the role of managing constraints of the project system. However, it is also very important to create visions and guide the process of their creation. From Nihonel it was more clearly seen that ambiguous product visions and intuitive decisions guided the process.

This is not a easy phenomenon to deal with. Often in the gap, the territory most closely aligned with the hierarchy, responses are not directly correlated with the current road, but can appear out of nowhere. Sometimes it is radical demands that can shift the system into a very creative state, or can send it into chaos. In the case of the capital cost reduction request by the senior director of PEM, this appeared to be completely out of the blue and off the map. There was no preparation
nor apparently any precedent. The project team was almost half way through the project how could they now cut the capital requirements in less than half? It appeared to be the task of managers to create pressure for the team in which to "cook" their program. These constraints often created the density required for true synthesis to occur. If the organizational environment was "free of pressure" and demands, perhaps synthesis would not occur. What is suggested by the descriptive model of the iterative project cycle is that periodic pressure and loosening might promote the best conditions for innovation to occur.

The Plan Is Not The Project

All I have to show for four months of planning is on this 8 1/2 by 11 sheet of paper.

Planner-Scheduler

There seemed to be a strange calm in the voice of the planner-scheduler, as he told me this. His "standard issue" office was just across the hall from mine on the fourth floor of the sleek, black Engineering building. I had seen him every day, but this was the first time I had a chance to talk with him about his work. He was very welcoming with alert eyes and a quick but measured pace to his conversation. His office location, like many, was the vestage from an earlier project, and he was now several offices away from another person from his program. His office was completely functional; there was very little personal artifact present, not even the "Porche" wall poster that was on my project manager's office wall. I suspect one had to travel light in this company.
His job at AMPAP, a consumer paper products company, was to work with the program and project managers to plan the activities in extreme detail for perhaps hundreds of people covering a two to three year period of time in developing the new product in their product line. But because of constant changes in the company and market, most of the shelf full of carefully and thoughtfully created planning documents were out of date even before they were distributed. What they had to show for months of effort on the part of the program team was a living social network of people. Because of the planning experience they had thought through the process and become familiar with the other people involved on the project. Event though many of the particular people and issues changed, invalidating the plan as a monitoring tool, they had a general sense for who was involved on the project and had gained momentum in their work and conversation.

This disruption of predictability and sequence has been called turbulence (Vail, 1989). Turbulence is caused by increasing complexity and dynamicity. The "bar was always being raised," or the "target was getting smaller," for the new product development teams at AMPAP. They were an extremely intelligent set of individuals in the company with a fairly open access to resources.

The situational complexity, or the technological sophistication and ecological fit, appeared to be great and increasing, both in their working environment and the environment of the marketplace and consumer.
Technically complex, the products were continually incorporating the latest advances in materials and construction methods. The demand for perfect product performance in the marketplace was at a very high level. AMPAP was the world leader in many consumer products. Socially complex, almost every function and aspect of the company was interrelated. Most people worked on several projects at the same time, and so the cross communication was confusingly constant among projects.

The situational dynamicity, or the swiftly changing situation and conditions, was amazingly swift. Just two years prior to this program an earlier product line had lost billions of dollars within a week because of the suspicion of a link to a newly discovered disease condition. Even within our product area, whole industries had been created to supply materials and equipment not available before the genesis of the product concept at Ampap.

Turbulence is talked about primarily as a quality of the external environment by contingency theorists, but here it was internal to the organization and its members. Not only did the market for their products change, and the competing products, but also people moved in and out of the project constantly. At least once a month during my tenure, one of the principal people related to the project changed. The Product Development program co-manager left just as I was trying to get unto the project. The project manager from PEM was changing over a
two-month period of time. The old project manager was rotating to a
plant for his career advancement. A number of the core program team
members had major responsibilities beyond just the Zephyr project.

Another curious aspect of the organization was that there were very few
"minutes" to meetings produced. Written word was both scare and
cheap. There was very little written conversation, interestingly enough.
The written material was mostly scheduling diagrams, specifications, and
financial spreadsheets. In fact there was a whole shelf full of scheduling
documents for this project.

It is interesting to see this in comparison to Mark Twain's description of
learning to pilot on the Mississippi. The river kept changing. There was
an importance to written notes, but they were rather short. One's
knowledge of the river needed to be updated continually through
conversations with other pilots who had just been through that section
of the river. And, yes indeed it was an impossible feat of memory.

The scheduler on the Zephyr project had a seemingly impossible task, to
try to reduce the collective schedule composed of perhaps hundreds of
"black boxes" which were tasks controlled by the "functional" members
of the program team.

The product of the planning process was not a predictable set of plans but
a social process. Little credence was given to written word as such
because the situation continually changed. But even the people changed so what was dependable was often an 'ambiguous' ongoing process that went from step to step. All you could see clearly in this 'fog' was perhaps the next step. But you needed to act. You needed to trust, even though who you were working with and what you were working on kept shifting.

What was developed was an organizational conversation. One knows who to talk with about "what." The topics shift as do the precise cast of characters, but a conversation is building in the organization. The general thrust of the organizational effort is to create the next product in a line of products. The new product needed to be a discernible improvement or difference from the last product and the product created by their competitors.

Seen more fully, it was an action/reflection cycle. The organization grows as action is taken and reflected upon collectively, although the reality and the agreement is not precisely in the propositions (i.e., the plans). The situation is extremely contingent. Still language was important.

However, an extremely important aspect of the social process is that the patterns are ambiguous. The spirit or principle behind them was the most important thing in this professional culture. There was
fundamental incorporation of social process that remained undefined but nonetheless present in many different situations.

The primary requirement to thrive in this turbulent environment, then, is a tolerance for ambiguity. There is a core socio-technical process which is often ambiguous in nature, but also very particular. The ambiguous core social process which was the result of planning was played out in the day to day particulars of an specific product and process engineering environment. The product needed to reach the consumer in a very limited period of time through the creation of millions of dollars of sophisticated processing equipment.

The limits of cognitive complexity call for new strategies, beyond the sequential, linear project methods. Instead, we are learning to create whole systems through iterative stages of prototyping. Management of the recursive process is increasingly important. What this often means is that one becomes aware of the shifting sands of people and topics that one is working with. Does this mean that the linear methods are worthless? No, they are a very important part of the process that needs to be redone periodically. It is important to remember that "the map is not the road." At time the schedule becomes more important than the project itself. The realization of the planner-scheduler was that he was in a living organization that was constantly changing, and he could only document a snapshot of it.
The Execution Team Offsite

Boy, did I feel foolish. Who is running this show? Here we come in with a plan and they overthrow us. Still, we accomplished what we needed to accomplish with the day. It actually turned out pretty neat. It just goes to show you, ya gotta trust the team.

Mark, Project Manager

This was a fascinating experience for me. Mark, the new project manager, and I planned for an off-site team building session for the execution team. On the day of the offsite there were about fourteen people assembled from various subgroups of PEM and their equipment design company ABC. As Mark and I went through our plan for the day, a couple of the members objected, saying that the core work that needed to be done that day was to determine who the team was and how it would work. We did change our plan as a result and went with this desire of the room. We created a mission statement and a set of operating principles. They felt that the team was too large, at times growing to meetings with twenty people. Therefore they would limit the working team to seven people, and each of these people would sponsor (represent) the remaining people in their groups. This would allow for a greater action potential in the group and ability to converge on issue resolution.

In reflection, while a challenge to Mark's and my egos, the meeting was a great example of the team taking responsibility for altering its own process and local environment. This capability was also seen in the initial redesign of the hierarchy of teams for the Z2B program. Some of
the group hierarchy had been in place, and that aided the creation of the
design. However, the program team itself and PD wanted to change
things that were outside their control and local experience. This meant
creating recommendations for approval by the hierarchy, rather than
simply altering their choices and products, thereby influencing their
environmental relations.

A Sense Of Loss

Ya know what I miss? Someone who can make a decision. We
used to have the WEB team, with the directors of PD, Engineering
and Manufacturing. They would sit down with any issue you
brought to them and they would resolve it.

Project Manager

The primary experience of the organization was a sense of loss. When a
plan was presented, it was soon deconstructed by the stream of activities
in the environment. Somehow if the social agreements of the
organization were to function, they would need to "push the bottom out
of" individual professionalism. By this term I mean the self becomes
more authentic in relationship to its environment, and discovers its
primary values present in the environment. In addition, the size of self
increases to include many interpenetrating levels. We are what we do.
We are our company. We are our team. In this state boundaries are
much less important, for one sees an underlying process that is operative
at many levels of experience.
The interpenetration and increased size of identity were prepared for by the practice of individual take-aways regarding the "meaning" of events, and the concurrent assignment of issue resolution. Tasks were assigned by the group often hierarchically, but meaning was much more open to choice.

**Attention**

The only project that gets attention is the fast rabbit, the project that's got movement and flash.

Mick, Director of PD

Issues go up way too high in the organization. It seems it takes a huge leap up the hierarchy before people figure they have power to say something and have other listen.

Cal, Director of PDM

The greatest frustration in this project was also mirrored in the organization. How do you get people's attention? We each get wrapped up in the immediacy of what we are each building or creating, and the openings are often not there for very much else. Part of it is a function of time and cognitive complexity. Mechanical systems can operate with only a limited set of goals, I suspect. The team I followed had a great deal of difficulty tracking on more than one goal at a time, or one criterion around which to optimize. This was initially a schedule problem, but the team also needed to include many other criteria. Therefore convergence was very difficult to achieve, if not impossible.

How is it possible to have multiple points of attention, rather than one organizational spotlight?
How is it possible to consider many facets of a project, rather than seize on one aspect of the project? In the scheduling deliberation the program team was relieved to believe that time was the most important factor in their project. Of course, this did not turn out to be true, as was seen in the "debundling" deliberation. Cost, customer response, production feasibility, international and interbrand standardization, and many other factors had to simultaneously be considered. Perhaps the only way to keep all these factors in the same project is by taking rapid scale-up seriously and producing product at each level which is a close microchosm of the next phase.

The difficulties of having single sources of funding, manufacture, and career promotion all generate notions of a single spotlight in the organization. To the extent that there might be multiple sources of sponsorship and consumers, there might be the possibilities of more than one spotlight. But given the desire for standardization across brands and the world technology, Jon's idea of slotting regular six-month intervals of product upgrade has the rather interesting potential of forcing the modularization of the environment and the creation of many spotlights.
CONVERSATIONS WITH MANAGEMENT

Deep Cycle Projects
I had a great short series of hallway conversations with Jerry, the director of PEM. The question was how can we expect to stuff the whole organization into a SCM project? It won't fit. The sources of funding needed to be separated, so some development work (particularly process) can be accomplished with a longer time frame than the immediacy of the current "fast rabbit project."

This was my primary contribution while in the organization. It struck me that the current fast rabbit was a very small "bucket" into which to stuff a large organization. In reflecting on my experience at Nihonel, they divided their projects and funding sources by time horizon. Projects whose products would be used in consumer products within two years were funded by business product sponsors. If they were two to ten years from production, they may received funding from the central administration as independent research projects. And if they were over ten years from realization they fell under a rather small resource pool of what they called "North Star" projects.

So at Ampap, perhaps different sources of funding could be given to projects with different time lines. One pressure bonding technology which could potentially replace glue guns in the pidget conversion process took over ten years to perfect. The project team was constantly requesting an organizational "shelf," so that when a program needed to
be assembled quickly in SCM fashion, they could just take the components "off the shelf." Later Mick said he did implement this notion in PD as Long Cycle projects.

**Give Me Decisions to Make**

On several occasions I had the opportunity to talk with various managers about their views of decisions and proposals from subordinates. Jerry, the director from PEM said he missed not being given alternative choices. But when we were considering the scheduling deliberation, I talked with Cal about giving Jon, the GM, more than one choice to choose from. He said, "That's an interesting issue, however, it generally works better to pick a course of action, and let Jon know the major factors surrounding that choice." The rationale was important and would supply some leeway in implementing the recommendation. The primary functions of the project review session in which these decisions occurred was to first conduct a reality check on the feasibility of the direction and second to align the needed resources and attendant strategic decisions to allow the decision to succeed.

**The Fifth Size Deliberation**

The product category (division) in this case study is one of the more profitable in Ampap, and consequently received particular attention from the executives of the company.

At a program review meeting, a Group Vice-President raised the question of whether there should be an additional size added to the product lineup. This larger size was more profitable, could be
advertised as the "Mercedes" of the product line, and might promote product to be used longer than normal.

The program team was opposed to adding the fifth size for a number of reasons. First the team was aware that the current size fits 95% of the consumers, making it unclear how much was to be gained by introducing the larger size. Adding the larger size would delay the product improvement roll out, add to the manufacturing changes and therefore costs, and demand even more shelf space from retailers who were already complaining about the amount of space devoted to pidgets in their stores. Manufacturing strongly supported the team's position, and the team believed that the issue was dead.

The group Vice-president did not give up the idea, however. His suggestion that the team consider the idea turned into more directive statements to the team leader in one-on-one discussions. He wanted to see consumer data that would clarify the decision, but the way the previous consumer testing had been conducted made it impossible to tell what the effect of adding another size would be. If the new consumer tests were to be run, the program would be delayed further. (from the official project report)

The program team leader heard through indirect sources that the group Vice-president had been complaining that she was not responding to his request to add the fifth size to the lineup. At that point, she began to prepare contingency plans to add the new size to the program. In the meeting of the Business Team (two levels below the Group Vice President and a level above the program team), a decision was made to add the size to the lineup. This resulted in considerable rework in packaging design, advertising copy, commercials and communication to the trade as well as putting extreme pressure on the manufacturing organization to make changes in equipment to produce the new size without delaying the scheduled product improvement introduction,
which had already been announced. In the end, the decision was the right one, the fifth size added market share and profitability to the product line.

The Experience of Simplicity
To be complex is to be ineffectual.

Conrad Adenauer

I had a great conversation with Mick in which I asked how we can do anything effective if we are complex. How can we experience simplicity in the midst of this complex organization with so many program contingencies? My simple reflection is that cognition of explicit concepts is only part of the metalogue. The system is created as a tool. What is released is only a product and a story. In the environment with the managers, the system may be presented, but what is discussed is much more simple, observations of anomalies which will be responses to gaps in the being of the plan, and the manager's internalized expertise and judgment of its ability to succeed in the broader environment.

Launching Product Launch
Cal, a visiting director in the pidget category, was the process manager for the Product Launch model. As mentioned earlier, the model had been developed by several successful senior project managers and hoped to incorporate their best thinking from their experience of executing
successful product introductions. There were several issues that made this not a straightforward task.

1) each project had its own characteristics, and so many of the specific requirements and gates needed to be changed.

2) the empirical consumer tests to go through each of the four gates and receive funding to go through the next cycle in scaleup and risk level, often could not be accomplished in the given time frame. Empirical testing required too much time, and timely decisions needed to be made based on tacit knowledge and similar experience.

3) like the project planning model, this model was a helpful starting point for conversation, getting the whole team on the same page. However, it did not work well as a monitoring device.

4) even though the model was introduced to the category by Mick's predecessor, the director of PD, the people from PD did not see themselves as part of the PDM. They were outside it.

In terms of the metalogue, the model is a rough and ambiguous heuristic device to recursive dialogue. It suggests common questions to ask at project review meetings during various stages of scale-up. It is worrisome that PD does not see themselves as part of the model, and that makes it difficult for them to authentically participate in the discussion. Vicarious participation is not the same.

In its current framework, it suggests greater linearity than actually exists in the project, at least in how it is interpreted through the scheduling packages used to visualize the process. The simultaneity of all engineering phases of concept, development, implementation and
evaluation occurs within each phase of scaleup and is not reserved for separate stages of the model, as it was commonly understood when the team first worked with the model.

**Asking The Right Questions**

I guess we did not ask the right question; instead of asking how we could accomplish the program four months earlier, we should have asked what we could accomplish with the shorter time period.

We always ask for the same thing: more, better, faster.

Director of Product Development

The role of the hierarchy in Ampap use their demonstrated expertise in addressing questions of and throughout the entire product launch process. They are often seen to be "product champions" who support and guide project through the various gates of the organization. These "product champions" then direct questions at the inquirers which guides the inquiry of the entire organization. This comes from an awareness of a gap. By knowing this gap, they help focus the knowledge process in the organization through simplification in the "fertile fields" of possibilities. Though their declaration of a discrepancy, they initiate a social building process.

The personality and style of the inquirer seem to have a dramatic effect on the expenditure of time and energy in the system. *How do we ask good questions*, so that we do not go down the wrong path or worse, end
up in chaos without a centering question or domain of inquiry? What are we trying to do? In the scheduling deliberation, there was the perception that Z2B's entry into the market would be too late. It can be a difficult and changing call as many ambiguities and uncertainties exist. These are judgment calls based on intuition.

The strongest way of creating an environment in a discovering system like Ampap is in asking good questions and focusing awareness and inquiry. One of the most common places for recursive questions is at project review meetings. How important is a short development time to the success of the product? I don't think that the organization bought Jon's question. Some questions are asked, just to get their voice out in a politicized environment, into the chaos, to get a reaction. I think in Jon's case, as in many others who are new to the programs, it is simply to learn about the system.

The nature of this knowledge of inquiry is tacit by nature and extremely situational and contextual. It is where discontinuities in the system come from, and the chance to redirect a stream of activity in an area of promise. The authority structure acts often as an inquisition. The exact perimeters and goals of any project will shift as the project proceeds, with incredibly difficult demands for integrating diverse elements. But not only that, there is a great deal of coordination of research questions posed by other active inquirers in the system.
What happens when someone is asleep at the wheel or offers answers that somehow need to be integrated into the reality of the project? This is what throws off the inquiry. These questions can consume a great deal of time in the organization; their framing is extremely critical. Ollie, the Senior Director of PEM, had a dramatic effect on the Z2B program team, reversing an number of assumptions.

If the Product Launch cycle is the simplified wisdom of the system, where does it direct the inquiry? Its primary role has been to manage risk, which is probabilistic in nature. Perhaps more difficult, it the task of managing ambiguity which is made extremely difficult by the push for decisions without market data.

In deliberation analysis, I think the most important parts do not have to do with the supplying of information but with the orientation of the participants at the inquiry. Can an active inquiry take place in the forum? Unfortunately, when senior managers become insistent with questions that don't resonate in the system or overpower the inquirers, learning cannot occur. While in the broader scheme, project review meetings are the place for recursive dialogue for orientation, they also have their own cycle of task and enactment. In our rush for actions and decisions, we often do not hear the other, as in the meeting in which the breakthrough team presented their recommendations. Sometimes we need to slow down.
Perhaps the greatest questions of value can anticipate the response and not the answer. Questions in systems focus the attention and often initiate a host of actions which can be missed if the questioner is too focused on the answer to his or her own question.

OBSERVATIONS

Site Convergence

Everything comes together on sites and in practical problems. It was the common situation, a common activity, a project, and a journey that convergence is reached.

Each of the sites was typified by a co-presence of functions. At the hand-made facility at PD, commercial was represented perhaps illustrating the biggest or broadest gap in perception. At the test stand site (SPL), PD and PEM were joined under one roof. At the Pilot Plant, PEM engineering and manufacturing were combined. At the plants there was less room for joint projects; however, the reliability group was present to assist in the increase in productivity by working out the bugs and kinks in new processes. Doing "lead lines" in the plants, where process engineers were present, was rejected by manufacturing as creating too much confusion.

The site convergence was a very important condition for co-presence of PD and PEM despite their apparent division in both the integrating devices of the hierarchy and PDM. If somehow PD could see itself on the map of the PDM, they may see that their role in concept
development continues through all of the four scale-up sites and attendant cycles.

**Overlapping Experience**

When transitions occur, often there is little that can be directly documented to completely assist the transfer. One possibility is to simply release the development. If continuity of the context is needed, then a co-presentation is necessary. Just as the project team sought to be co-located at the SPL site, so too the outgoing and the incoming project managers worked together for a few months so that the tacit understanding of the project might be transferred.

Yet every time a new person came onboard the project, he or she brought new issues and perspectives. Sometimes these issues or perspectives were helpful, and sometimes they appeared to be a diversion. But it seemed that the project always needed to cycle through a period of re-orientation because of the gap created by the departing and new presences. Every significant change required a new cycling.

This could even be extended to the overlapping responsibility of the hierarchy of teams. In a unity of command perspective, the teams were in conflict because they did not have discrete tasks. However, it is through having a common task that they might reach convergence past an awareness of the gap, the difference of perspective that each level could see. Each level represented a different "size" of the project environment.
A Hierarchy Of Teams?

We have too many teams around here. We are stepping all over each other and the buck never seems to stop.

Project Manager

There was an interesting effort to create a hierarchy of teams. However the experiment did not work in the Z2B program. They were not able to create discrete levels of tasks for each team to do. This poses an interesting set of challenges.

In what way might it be possible for each team (extended individual) to assume responsibility for the whole project? How can one create environments of continuity for project driven organizations? To a certain extent the size of the organization may be arbitrary. Creating sites, events and tests for levels of risk requires flexibility. Efficiency and effectiveness are notions of discursive systems. The recursive aspect of systems establish system identity. A main concept is that the system organizes itself on the premise of the engineering process paradigm. Almost everyone in the organization is an engineer, and the fundamental process and principles are known to most of the people in the organization and acted out even in the PDM.

Conflicts and boundaries occur between localities which have different paradigms. In fact innovation is based on the synergy between two unlike systems. The more different the two localities, the greater the possibility for creative synthesis; however, the probability of synthesis
decreases. Systems with highly differentiated subsystems would tend to take longer for convergence, but the resulting synthesis would have the greatest possible innovations. The more alike the subsystems, the easier the convergence but the more incremental the result. It is in the process of crossing-over that discoveries are possible, as well as the "heads down" job of project enactment and convergence.

What was found in the organization are several sites that managed projects with various levels of risk and have probable implementation timelines from a month to ten years. Product Development, Engineering, Manufacturing, and Brand (the category manager was from brand or advertising/marketing) all have different cultures. Managing the interfaces between these "linearly related departments" was difficult. The directors felt that the programs needed to change hands as they progressed through concept, development, execution and evaluation (for appropriateness). The program teams felt that there should be one person in charge of the program from beginning to end (for continuity). Two paradigms were operating here.

What in fact seems to be happening is that the whole process from concept through evaluation occurred at every step with: 1) hand made product, 2) test stand made product, 3) limited converter line created product, 4) full plant-produced product. Members from all the functions often were present at each of these sites, with varying levels of
involvement and influence. This is a very organic and pluralistic process that includes mind and body at every step.

Solution to the form of the organization was beyond the conceptualization of either the managers (hand off) or the project team (pipeline), iterative cycles of multifunction site development. It took the perspectives of each group to see a fuller whole. And, it was already present in the organization!

There was a great deal of anguish and frustration expressed by organizational members, and a desire for unity. What they found instead was chaos, ambiguity, and unpredictability. The system seemed to converge only at the last second. What was seen in retrospect were the certainties of site, the product launch model, timelines, and constant pressure. The direction of the organization was to be "data based" decision making, but the data was most often available after decisions were made, often leaving decision making to be "arbitrary" or at best intuitive.

To a certain extent, discovery can be a painful process. We do not have to make it more painful, but also perhaps we should not make it less painful either. What we can do is to explicate tacit knowledge and the rhythm of action. What provided greater assurance was the implicate recursive process of their core technology or paradigm. The process was both the same and different.
My main contribution to the organization was the observation that they could not stuff the whole organization into the "Short Cycle Management" process that was their current interest. Research was funded only if it was directly related to a program that would "hit the market" within the next couple of years. I suggested that they consider "deep cycle management" as well, partitioning the risk and discovery away from the requirements for certainty of the program organization. What one of the PD Section Head's said was perhaps more appropriate than I thought: "We are not part of the Product Delivery Model if it is the same as the program." The hand made models of PD were most likely pre-program.

AD Board - Organizational Learning Sessions

Mick had originally introduced my breakthrough inquiry project at an AD board meeting in terms of organizational learning, through interactions from program to program. The Ad board met every couple of weeks, and I attended six of these sessions which they put under the title of organizational learning. Perhaps the most curious aspect of these meetings was that they were all stories of projects' success and failure, all in recursive monologue. There was very little discussion or dialogue present. I wonder what kind of learning could take place without dialogue. It is only later that I discovered that the working of these issues occurred "off-line" of the meetings. Great intimacy seems to be required for recursive dialogues, for they can be quite threatening even for peers,
let alone to a junior member. The higher ranking person is also leery because often the resulting action that can occur could go far beyond his or her interest in initiating action.

Meetings

The conversations around meetings were very interesting. Recapping observations made earlier in this dissertation, the primary characteristics of their meetings were that:

- often the most important parties were missing
- there were few if any minutes
- they resulted in a single recommendation
- they often used issue lists, not always with responsibilities
- they were experts at scheduling and diagramming
- "working the issues" occurred outside meetings, one-on-one
- "outages" occurred frequently, particularly between PD and PFM
- meetings with leadership often resulted in brainstorming possibilities and not closure/decision
- it was very difficult to know when decisions were made, and what was decided

I found that most meetings I attended were not working sessions. They were most often recursive monologues, or discursive dialogues. They appeared at the gates between the local system and the environment. As such these meeting were largely ceremonial rites of passage, either recalling various accounts or meanings to previous events, or generating possibilities in brainstorming. Recursive dialogues and discursive
monologues tended to occur in more private situations. They each could be quite messy and required more ambiguous processes than may be possible at more public meetings.

Rewards

The distinction between intrinsic and extrinsic rewards is extremely interesting. Perhaps the most difficult aspect of the Ampap organization is the question of how one rewards performance. The functional organizations held onto this role very tightly, and there appeared to be few rewards apparent for success in projects (as expressed by members of the project team).

This is an age-old division in organizations with two ladders (professional and managerial). They were to a large extent unified at the AD level where project success began to be more fully rewarded. Below this level, functional optimization was more fully rewarded.

The difficulty arises from the identity issue of professional individualism or team reward.

I do not have a clear way of resolving this dilemma to date.

Many aspects of the control system in the organization worked at cross purposes to project success. For instance the accounting and financial systems were often fragmenting. Vick, the outgoing project manager, was faced with four separate accounting systems and several pages of
signatures necessary to authorize project expenditures. He was able to consolidate these systems under his signature for several million dollars in expenditures.

Another challenge came in a meeting between the program manager of Z2B and the new joint brand program. There was a great deal of enthusiasm expressed by the two program managers in the cooperative sharing of resources, but this also threatened the control and review system, which desired the two programs to be separate line items in the budget. It is reminiscent of recent shifts in the cooperation of competitors in the automotive and electronic industries. This is a fascinating development with dramatic challenges to the hierarchical thinking of control systems.

RESPONSE TO THE CONVERSATION

A Model of Project Ontology

The shift to a more primary level of relating the relationships behind the management of innovation can be seen in the developmental psychology of Freud, Erickson, Levinson, and many others. The salient point from these views of human development is that humans go through phases in their lives, and the completion or resolution of the issues or crises at each stage in part determines their success in dealing with issues of the next. The inevitably unresolved stages will return later in life as recursive issues, i.e. the oral and anal stages of Freud. This is also seen in the literature in group development particularly in
Bennis & Shepard (1967), Srivastva & Neilsen (1979), Slater (1956) and perhaps Bion (1953). For Srivastva & Neilsen this meant a group generally moves from inclusion issues, to influence issues, and perhaps finally, to intimacy issues. As with the previous models, these stages suggest greater development in the life of a group, but usually are not encountered entirely sequentially but often simultaneously as well (1979). Concurrent with the aforementioned stages of group development, their personal relationships could be characterized by independence, counter dependence, and interdependence or withdrawal.

This level of analysis could also be seen from social constructionist perspectives, popularized by Peter Berger and Thomas Luckmann (1967). They contend that our social reality is created through interaction of people in three movements. First, by externalizing in action, people cause things to happen in everyday life. Next, by objectifying the results of that action, people talk about and interpret those actions and their results. And thirdly, this socially constructed "objective" reality is again internalized by people as they find their own internal sets of associations. Because of our interest in "organizing" in particular, this may not be a bad place to begin.

Heidegger (1962) looked at this shift from objective to subjective perspectives from a slightly different angle. Heidegger identified three states, or modes of engagement in the world, which he called readiness-to-hand, unreadiness-to-hand and present-to-hand. Barrett (1990)
describes readiness-to-hand as "the basic practical activity one is directly involved in. Our awareness when carrying out such 'automatic' activities is effusive and holistic: We are aware of our situation not as segmented entities, but as a network of potentialities" (p.19). Heidegger uses the analogy of a man hammering a nail. The man is not aware of the experience of holding the nail, or the movement of his wrist, only the activity of hammering. When this "routine," or taken-for-granted set of associations breaks down, like hitting his thumb, he is then in unready-to-hand mode. The man becomes aware of his mechanics of hammering and of the hammer as an independent object that has struck his thumb. Before this occurrence, the man would not notice anything special about his activity except that he was hammering a nail. From this state of breakdown, the man might then try to figure out what happened, what went wrong. He would then be engaging in an "present-to-hand" mode of reflection and interpretation (Heidegger, 1962). Being-in-the-world, Dasein, is a process of subjectivity and objectivity. It is through this interaction that understanding is created. This is the basis of ontology for Heidegger, or his notion of being in Being. Another distinction that Heidegger makes is in our condition of thrownness. It is a "condition of understanding in which our actions find some resonance or effectiveness in the world" (Winograd & Flores, p.33). We are thrown into situations in which we have to figure out what to do, like my appearance as a consultant at Ampap.
The main significance I wish to draw from Heidegger's notion of Being is in the ontology of the project cycle. It is in the breakdowns in the project cycle that we become aware of our system and have a possibility of taking a different relationship to it.

**Ontology of the Project Cycle**

**ORIENTING**
1. EXISTENTIAL AWARENESS & SPEAKING THE UNSPEAKABLE
2. BEING vs. NONBEING
3. EXPLICATING IMPLICIT KNOWLEDGE
4. INTERDEPENDENCE/WITHDRAWAL
5. RAISE INTIMACY ISSUES
6. "LAND OF MYSTERY"

**ORGANIZING**
1. INTERPRETIVE PREPARATION
2. KNOWING - ANTICIPATION VS IMMEDIATE
3. EXPLICATING TACIT KNOWLEDGE
4. COUNTER/DEPENDENCE
5. RAISE INFLUENCE ISSUES
6. "RIVER OF CONSCIOUSNESS"

**ENACTING**
1. FUNCTIONAL ACTION
2. DOING VS. NOT DOING
3. ENACTING LITERAL KNOWLEDGE
4. INDEPENDENCE
5. RAISE INCLUSION ISSUES
6. "MOUNTAIN OF CARE"

**RELEASING**
1. INTERPRETIVE REFLECTION & SPEAKING THE OBVIOUS
2. KNOWING - MEANING VS ABSURDITY
3. EXPLICATE TACIT KNOWLEDGE
4. COUNTER/DEPENDENCE
5. RAISE INFLUENCE ISSUES
6. "SEA OF TRANQUILITY"

**KEY**
1. Primary activity
2. Existential issue
3. Epistemological expression
4. Relationship between group members
5. Associated stage of group development
6. Ontological metaphor
If one were to look at the tasks confronting the development of innovations, one could view the process as a cycle of four phases: gap, organizing, flow and releasing.

The major breakdown occurs between the finish of a project or iteration and the beginning of a new a new phase or project. At this time we become aware of the fundamental gap or thrownness of our selves in the organization. We have to come up with something else to do. This is why the gap is our biggest chance for reformulating the system, and perhaps the most difficult time to do it. Other breakdowns occur at each of the transition points between the major tasks of the project; however, increasingly the post-modern conditions can create an almost constant state of breakdown where we are constantly in an objective and alienated state to our project. Simultaneity in the system even further emphasizes the need to fundamentally address the gap of the overall process. We are in a constant process of trying to figure out our system and create models and other representations of our process. It rarely seems to be the case that we are in ready-to-hand mode at all for extended periods of time. As much as we try to routinize our behavior or system, something else causes a breakdown, most likely coming from the sources of variation in the hierarchy or upstream research.

A suggestion of ontological categories for these comes from Burrell and Morgans (1979) map of social and organizational theory, and correspond
to: gap-radical humanism, organizing/interpretive sociology, enacting/functional sociology, and releasing/radical structuralist.

The first of these modes of being starts with the recognition of a gap that creates an urge to act. This lies in Burrell and Morgan's quadrant of existential humanism. This is often a subjective realization of a gap between the current situation and where we want to be. The existentialist philosophers view this "mode of being" more fundamentally as a gap arising from our showing up in a world which presents a question of being and nothingness (Burrell & Morgan, 1979). The Christian theologian Bultman saw this as a primary enigmatic process in which we strive for or seek the "true and beautiful", yet are always cut off from ultimate completion (1955). This is his interpretation of "original sin." Our inherent underlying state is one of noncompletion. Existential psychologists have seen this as a state of ontological insecurity or anxiety. Conversation at this level can be seen as attempting to "speak the unspeakable." For this is an internal state in which we feel cut off from the direct experience of others, and one of the responses could be to try to bridge this gap through sharing our experience with others. Radical humanists (eg. Hegel, early Marx, Lukacs, Gramsci, Marcuse, Habermas, from Burrel & Morgan, 1979) form critical theory focusing often on the dialectical process initially formalized by Hegel. In this process, the thesis and antithesis create a synthesis. It is from engagement with "the other" that new states of being emerge. However, the danger of this mode is that we can fail to
see the synthesis, and feel caught forever in the tautology of this existence. It is only through faith that we move on to the creative act of inquiry. From this state of "mystery," there can also be an urge to find out or discover an answer.

This leads us to an interpretative mode as we strive with others to bridge this gap through joint inquiry and find synthesis. We build stories about our corporate life and seek to understand the life world with others. The interpretive thinkers (eg, Dilthey, Weber, Husserl, Heidegger, Gadamer, Mead, Berger, from Burrel & Morgan, 1979) have often assumed that the synthesis, which was somewhat in question for the existentialists because of their concentration on the conditions of existence, was in fact what we need to explain. They started with our social experience and worked back from these "products" to understand how they were created or constructed. The method of investigation is often through introspective analysis of what lies behind apparent synthesis, and is often in fact more deconstructionist and constructive. What this realm of organizing might mean as a mode of being is the join with others in seeking the answer and resolution to an issue, problem, or in this case, formulating a project. Here we join with others in anticipation of action, but at the same time it is an enactment itself. We learn about each other and about the focal topic that brings us together. There is a testing of the members with us as relationships form, and there are questions of dependency and counter dependency particularly between management and the team members. The team wants to be free to get on with the
project. But it often also feels like the "last time" the management will be able to influence the project before it is rolled out. The end of this phase is signaled by having done as much planning and preparation as we can in anticipation of action, and deciding to proceed with the enactment of the project.

The next mode of the being that we enter in the project (if we are prepared and the environment is not too turbulent) is often one of enacting. The preparation has been completed, the constraints set, and we can proceed with the "real work." This is what we often pride ourselves in doing. This is were we feel productive and are rewarded. In this stage, we often put on blinders and forge ahead unfettered by divergences of the earlier period. If the earlier issues of addressing the gap, understanding why we are engaged in the project, and in organizing, developing relationships between the social and technical systems have been resolved, then we have the possibility of fully engaging in the doing of the project. Csikszentmihalyi (1990) has addressed this experience as being in the "flow" experience. This is often in game experiences where our skills match the challenge of the situation. The organizational ability to enter into flow are set in the earlier phases or modes of the project cycle. To the extent that find convergence of this flow experience, perhaps in acting out a performance like a play, we are then ready to release ourselves from this experience and allow it to "live" in the broader environment. The group issues that ensue are whether there are parts for everyone in this production. Also,
the team is often fierce in asserting its independence from the rest of the organization, seeking isolation from influence so it can carry on its enactment or performance. In ritualized activities of flow, the ritual can often encompass a rehearsal of the journey through all the modes of being. For instance, there are heroic tales of journey such as those interpreted by Joseph Campbell in *The Hero of a Thousand Faces* (1969). Even more clearly than in other stages, there are often social rituals of completion that follow this phase. Plaques and celebrations are common near the end of projects at Ampap.

The specific mode of being at this point is one of releasing from the engagement in the flow. At this time of social experiences, a story is often given about the experience one has just been through, perhaps declaring the trials, the tribulations or the ecstasy. This is also the time when the "reviews come in" from the witnesses of the event, like customers or members of management. It is often the "customers" who declare the significance of the preceding event, and the project members are left alone with their thoughts about the experience. As Kanter pointed out in the fourth task, if the customers were sufficiently included in the early parts of the process, then little pressure is needed by management to transfer or defuse the innovation. It will be readily accepted, and no fundamental surprises are found. The primary group issues between the team and their management/customers, as part of the project, have to do with how the project or the reviews are received. As has been well demonstrated in attribution theory, there is a tendency to
distance ourselves from failure by blaming others while accepting credit for success for ourselves. There can often be strong urges on the part of team members to interpret the outcome of their project, so influence issues can emerge on whose story of the project will prevail. As a cycle of experience, the end of this mode occurs after the story of the project has been released and the members of the project are left with the issue of where next to turn their attention. As mentioned by Reese this can be a great point of anxiety for member of project-based organizations. This brings them again into an awareness of the "gap." When projects have no concluding ritual or story, they often wander like ghosts of people who have met untimely deaths. Never having been properly resolved, they are doomed to wander the earth, causing mischief and dread in future events.

Increasingly, we have recognized that the creation of this sociotechnical system creation in which projects organize themselves and then engage directly in the task has been found in the traditions of STS. This has resulted from an awareness that because of the complexity of technology and the independence of workers, people often perform better if they have the opportunity to organize themselves in the performance of their work. This can primarily be seen in the shift from organizing to flow.

The Danger of Technology without Poetry
Often the greatest difficulty and gift may be in the virtues of science to isolate. Yet if we are caught in the isolation of a single state reality, we will die. We will not move and lose our contextual surroundings. The
common ground is mysterious, and it is important to continue to move through the cycle of creation. It is what we do and how we operate. When we freeze systems or even assume they are frozen (as in the old model of OD), we do a disservice. This is how we kill people and ideas that are different from our own. Instead we have the possibility of incorporation and then seeing what will stand in the light of day, what will gain Being.

The hierarchy dropped bombs to promote the expansive awareness of the project team. Both needed to hear what each other was saying, and more importantly doing. These are results from our stance and action beyond that which we can explicitly know. There is discourse well beyond words.

Yet here must also be periods of isolation for completing our work and creating our technology. One solution seen in the world is through more quickly and thoroughly iterating through the project cycle. Perhaps the most difficult aspect of all of this is the phase of releasing.

**Boundaries As Bridges**

I found it fascinating that whenever boundaries were created, while they served to isolate activity, there was perhaps an even stronger tendency to view them as something to overcome. The distinctions between the two brands, or distinctions between levels of the hierarchy, were continually
assaulted by common experience. During the last months of my stay the program directors of brand Z and X pidgets spent a considerable amount of time discussing and deciding how to share resources and overlap as much of their work as possible. This was in a sense forced by the demands to reduce resource and shrink budgets. It was also influenced however by a continual drive to integrate all activities within the categories, signaled by the executive decision for all technology between the two brands to be shared. They asked me what I thought of their plan, and one of my responses is that it will confuse people to blend the two programs. Still their enthusiasm for integration was strong.

Early on Vick, the outgoing project manager, had consolidated the budget from over twenty signatures to only three; from four accounting systems to one. What these and other movements suggest that it is not only the terms that are deconstructed, but the organizational barriers are routinely crossed and merged.

The Pressure Cooker
A very strong image occurred to me while in residence at Ampap, that of a pressure cooker. The dominant image of the organization was the "hierarchy" provided predominantly constraints to the program. As Mick commented, "We always ask for: more, better, faster." Some of this came also through the process of project planning. It seemed like pressure came from everywhere. Just as I was leaving this project, the company cut all resource budgets by 15%. And later, announced a
massive layoff of almost 25% of company employees. Some of these constraints are extraordinary, but many of these constraints are a part of every project cycle.

What was most difficult to tell was, "is it soup yet?" Do they have a sufficient mix of product features to produce a 5% consumer preference in a blind test? Can they economically produce these pidgets on a manufacturing line? Have they heard from all the important stakeholders in the environment?

Mobey (1991) interestingly enough focuses on the management of constraints in his paper on iterative project development/prototyping. The roles of manager and professionals seem to maintain the division also. What if the philosopher-king roles can be joined, as I think they have been called to do? Why are the isolation and integration roles separated rather than joined within a single person?

Perhaps this illustrates a re-considered view of integrating methods. When one finds a distinction, one seeks to bridge that boundary with a coordinating or integrating method/device/structure. From the process view, this may be through a common journey as in an organization in which each person may be called upon to manage his or her environmental relations.
We are no longer buffered from the environment. In the past hierarchies were patterned after the parent-child relationship. If that authority over position is internalized within each person, we may recognize the unified position of pushing that below the level of the individual again to the land of mystery where it is within each of us to recognize and facilitate the convergence with others.

The overall movement of PM and SOS indicates that the role of objectification may be different from domination. Perhaps there is an authentic voice saying both that the emperor has no clothes and taking responsibility for the story/mythology/mystery of clothes. Science has been a strong demythologizing influence on society, promoting the secularization of the religious. Ultimately this "demystification" leads to fragmentation and despair of the gap.

It is now also a part of each of us to grow in size... to be the universe (holographically), both to produce good stories that enable productive synthesis and to challenge totalization as it occurs. We need to rely on a fundamental sense of appropriateness, built through our experience of organizational life. It is indeed a "middle out" process. Is this too much to expect or demand from people who are used to being children?

**The Organizational Dance**

The effort to coordinate the movement within the organization is tremendous. It was difficult to synchronize the schedules of individuals, of product and process improvements, of testing and implementation
decisions. Purser and Pasmore (1992) suggest that the STS principle of joint optimization might be replaced by a principle of dynamic synchronization.

It was like a dance. The metaphor that seems appropriate is. How do dancers maintain orientation and coordinate their movements? Often they practice beforehand, recognizing their breakdowns and working out their parts. Project planning often is that practice in the project cycle, however, it can never be replaced by the expertise gained from years of dancing. It is hoped, and often observed at Ampap, that the best dancers do rise to the forefront. It is the possibility of this recognition that gives hope for development of a heterarchy. There are many good dancers, each with their own style.

However, coordinating the dance in the organization cannot be simply a mental task, for that does little to produce a great dancer. The choreographers can only be current or former dancers. It is important not just to envision the organization, but to embody it and enframe it in what you do.

This is not only a dance between individuals and others in their environments, it is a dance between the road and the stream. To the extent that one can see what is occurring outside their current intentions and concepts, and envision the future not merely as a projection, one can enact the art of project management.
Breathing and Eating

These metaphors are extremely simple. The full project cycle is like the process of breathing in and out. People involved in technical professions, like engineers, (Pelz, 1988) often experience high proportions of career burn out. Part of the reason for this is the repetitious nature of the work. In terms of this metaphor, they may be working anaerobically, without replenishing oxygen. To breath in means to "inhale" out environment, anomalies and all. If the air is fouled for some reason, it can irritate our lungs, and we will keep our mouth shut as long as we can, or seek fresh air some where. Organizations often operate anaerobically, often as "cash cows" before they "die."

The metaphor of eating is similar to our experience of internalizing the environment. It too is needed for metabolism. As the phrase goes, "you are what you eat." This was true for the program teams at Ampap. Many people attended the focus groups held to evaluate the new (hand-made) pidgets. This anecdotal information was often all the product development engineers had to go on for quite a ways into the development of a new pidget. It certainly had its drawbacks though, when they might jump to conclusions on the opinions of a few. Still this was one of the richest forms of getting to know the mind of the consumer. Other empirical market studies either through diaries or actual market sales also contributed to this knowledge. Tours through the plants were mainstay experiences for new people in the commercial department.
But there is a cost to opening up for more "food" and "air." It can slow one down. It is often a contest in organizations to see how little food and air one can get by with. Ampap seemed to go through fat and lean periods, however, it looks like it is getting leaner. How much is enough? What is good food for product development?

**Horse and Rider Crossing a Stream**

The following is a short fable that I wrote when considering the relationship between the project team and management.

Once long ago and far away in the land of Papma there lived two friends who decided to embark on a new adventure. They had traveled a great deal in the previous years, having traversed the land from Napaj to Eporue, but mostly living on the prairies and mountains. Reenigne was a strong young Appalosa from the Great High Plains of Atokad, an independent equine who was very fast and sure on his feet. His friend, Reganam, was a seer who had conjured up wonderful journeys in the past and knew how to find his way in the wilderness.

They were on their way to a fair and cross-country race in the western part of the continent in a village called Sllaf Xuois, but to get there they needed to cross the Xuois river. It was a foggy day, and even though Reganam’s eyes were quite sharp, much better trained than Reenigne’s, they still could only see part of the way across the young and mysterious river. The muddy river had a very strong current, and was filled with
debris from the recent heavy rains. Reenigne was a tall horse who could swim well when he needed to, but they hoped that they could cross the river with his hooves on the bottom so they would not get swept away by the current. Reganam was not a strong swimmer and because of many adventures over the years, he had survived by his wits and his physical talents were no longer so adept.

As they approached the eastern bank of the river, Reenigne was paying attention to navigating the way down the steep embankment, while Reganam was scouting out the scenery and the river which was looming before them. The path down the embankment was difficult with sharp, loose rocks and red sand in strata exposed from years of erosion.

Reenigne, like many ponies, could understand the many signals from his rider, the gentle pressure on his sides or an occasional tug on the reins. Mostly though, he was used to anticipating in ways he didn't understand...he just knew the direction they needed to go through his own intuition and Reganam's talk. Reenigne would occasionally talk also with Reganam; although they did not speak the same language, he could get his point across. But mostly it was left to Reenigne to navigate the terrain and pick the specific path to their destination. So it was true of this river crossing. Reenigne needed to fully concentrate on navigating the stream, while Reganam kept his eyes out towards the shore and floating debris.
Reenigne sought the path of least resistance, but because he was one who had to get through the hazardous terrain, this was rarely as easy as it appeared from Reganam's view from above. The terrain was tricky for a number of reasons. There were sinkholes in the bottom and occasional thickets of weeds that could trip you up. The rocks were many and varied in shape, often smooth and slippery. Of these things, Reganam could not know, although at times he did get his feet wet, and could recall the times in his past when he had forded streams.

Each river was different, and it took a while until Reenigne could find a good rhythm for the crossing. He could find just the right feel and gait, so he could run smooth and fast, but at first it was always awkward, for who knew what hazards and creatures were in these mysterious waters? He knew many things about a river...that they had to angle up stream to hit the bank directly across from them. But his vision wasn't so good, particularly because he had to concentrate on the torrential currents.

For Reganam's part, he was particularly concerned with picking the best overall path and avoiding the occasional log that would be drifting by up ahead. He was also concerned with their approach to the opposite bank...at places it was too steep to climb out...and he was always concerned that they might drift too far down stream, perhaps into a canyon. As they go closer to the bank, he could get a better idea of what the conditions were there. It became particularly difficult if they had to
get out further up stream because the current was very strong, while sometimes this was necessary.

They had once had a saddle, but this proved too difficult for them to communicate through. It did seem to make it more comfortable for the rider and sometimes the horse, but because of the difficulty of the terrain they needed to communicate as directly and clearly as possible. At times, though, it was important for each of them to forget what the other one was doing and focus on his own tasks.

It was difficult to say everything that needed to be said before they crossed the stream, they were both so anxious to get going, and they were afraid that the rains in the mountains might fill the stream even more if they waited. They just never seemed to be clear enough to begin with. If only they could see the other bank clearly...but it was too far away. If only they could anticipate the changes in the current and the debris that would appear seemingly out of nowhere.

What was particularly difficult were those times when they had to change where they anticipated getting out on the other shore, or, when they just plain got irritated at the other one. Sometimes it would start with Reganam giving many commands quickly to Reenigne and confusing him...commands, those were hard to take. Who did he think he was? Reenigne was just as smart as Reganam; they just did different things, felt different things, saw different things.
How could you change these things while you are in the middle of the stream? They usually said they would change when they got through this difficult stretch, but most often they got preoccupied with something else. So often they would not really sort out their communications into a system. When it went well, it went well. When it didn't, then they had trouble and it was hard to know which one had the better insight to get them out of danger or quickly out on the right patch of shore. Sometimes it seemed that they no longer wanted to go to the same place...the pony was tired of villages or the rider wanted to go into the high country rather than race.

They also had thoughts of different ponies and seers they had known in the past. It was not the first time for either of them. At times they would ride with other horses and riders. At times, they would even change in the middle of the stream. This was difficult to do, but was sometimes necessary because a horse wanted to go somewhere else than the group was going to, or longed to be with a new rider. At other times, the rider would switch horses because they knew that part of the stream better. Other reasons could be that they just lost confidence in the other, and the territory was too dangerous if you were not a crack team. At times, each of them felt jealous for the other's dissections. Early on the young rider felt he was or could be in full command of the horse, particularly an old horse. But this was no longer the case. Some combinations of horse and riders did not work. At times the horses were old and the riders were
young, or vice versa. Some liked to explore. Both Reenigne and Reganam knew too much, and the terrain was too difficult for such squabbles and foolishness. Both could fail or even die if they assumed control.

In the past, things have not always worked out, and it is these memories that continue to haunt us. We have lost a great deal of time and energy by picking the wrong spots to cross, where the current was too strong and the good spot on the opposite shore too small, where the horse and riders had not been able to work together with each other's talents. Almost equally difficult are the good, strong memories of previous rides which are not like our current ride and perhaps make us disheartened with where we are now, our current progress, and future prospects.

When it worked well, it could work very well. There would be just the right amount of pressure on the side, and the right sound with the right words. It could be a flawless performance, with the pony knowing exactly where to go even in unknown and difficult terrain. They would be completely aware of where they were, and memories from past crossings came readily to mind at the right time. They would ask the right questions and hesitate and pay attention to the right things. They could run through incredibly difficult terrain with great ease and be fully aware of the beautiful sights inside and out.
And as they approached the far side, Reenigne was almost into a full
gallop. The Rider had finally given him full reign to race ahead to the
shore line. They were on track to hit a good patch of shore. It would be
easy to get up the bank, and there was green grass on top. In the past this
was not always so; sometimes the journey had been too difficult and
made more difficult by bad relations between horse and rider. The horse
had bucked through the entire crossing, straining toward every clearing
he saw. Or, the rider tugged on the reins, giving many and conflicting
signals. Or perhaps, each of them lost confidence in the other or became
overly confident in his own insight. But perhaps most often it was that
they got caught up in the heat of the moment with the horse wanting to
run and the rider wanting to be on the other side, but both running into
difficulties without the patience or time to figure it out.

It is also difficult because you can’t tell the other everything that is on
your mind. We are too often in challenging terrain...and when we are
out it seems unimportant. In the middle it seems too important to keep
up our confidence to get into “thick” matters. Time passes so quickly,
and there is so little we can really say that sticks with us. The most
difficult to express, it seems, are the signs of mutual recognition and
admiration between horse and rider as they rise to the other shore.
Perhaps one might expect them to rest, but they are off on the larger
quest of the cross country run.
An Interpretation

A large part of the story has to do with the nature of dialogue between the self-organizing system of the horse and rider. In themselves, the horse and rider are self-organizing systems. They often have to communicate at the level of being, by having taken on the pertinent perceptual distinctions to coordinate their activities. Much of their communication is non-verbal and subtle. They are both sentient beings and not objects to each other in this communication. At the same time, within their own self-organizing system they contain the "virtual other," that becomes refreshed by actual contact with the other. The rider's "virtual other" of the horse is clearly updated when they run into something new. He senses that something is different from what he has experienced before. An underlying trust in the other needs to exist, particularly under these circumstances.

Discussion

It is interesting how we create "social reality" through language creation. At Ampap, the workers created a large number of technical terms but had relatively few for human relationships. Because they viewed their organization as a technical process, and perhaps not as extensively a social process, there were not many terms for different social aggregates and relationships. The concept of team appeared to be used to describe the desirable social form. To be a project seemed the only title under which to fund efforts ("If it is not a project, what is it?").
Our post-modern conditions and modern language structure do not seem to fit together very well. Notions of shared responsibility, cooperation, and coordination were very ambiguous. Our "efficiency orientation" could undermine our long-term progress if we could not discuss the complexity of issues (more than one parameter of product success...schedule, cost, design, manufacturability, etc.), the plurality of view points (various functions and perspectives), underlying norms or process agreements (decision making process, assumptions, future possibilities, global coordination.)

**Horse and Rider Crossing a Stream:**
The inner game of product development

![Diagram of Horse and Rider Crossing a Stream]

Figure 7: Horse and Rider Crossing a Stream

The unpredictability of the internal and external environment was a constant source of complaint. The aim and resource assumptions underlying the project were continually changing either through the
external environment, management or the technical discoveries of the project team. The notion of internal customers was only temporarily clarifying. There was constant change in social and technical conditions.

An interesting aspect of Japanese language and social relationships is that they are very often based on authority hierarchies. But because of the notion of identity as communal in Japanese society (often "parental"), one tended to talk on behalf of a larger system. In both systems, to be in authority meant that you "became the company." This identification with the larger system tends to erode with the "post-modern conditions," creating a very ambiguous identity.

Gergen directly addresses this issue in his book, *The Saturated Self*. Who is it that we internalize as the "virtualized other" in these systems? What did Mead mean by the "generalized other?" The struggle for power is often one for influence on the primary premises for action and knowledge, in the determination of being and therefore meaning in the system.

What are the implications of conceiving the system to be a heterarchy, perhaps instead of a hierarchy? How do we get a handle on the level of agreement necessary to operate as a heterarchy? We can strangle in confusion and relationships without some heuristics, or assumptions of hierarchical structure. How is guidance possible in self-referential systems? Perhaps the most that this dissertation can do is to clarify some
of the questions and provide some sort of framework from which to explore these questions.

How is it possible to generate the degree of involvement and generalized identification necessary to guide a hierarchy? One of the processes in hierarchies may be to promote generating and following interests. We create mystery and intrigue in a limited number of areas which will promote inquiry and enactment. It requires the continual development of listening and a questioning of fundamental assumptions. It requires an admission of the shadow side of ourselves, of error as an inevitable part of the discovery process.

What notions of security are possible, if we are to follow Pelz and Andrews's lead in this area? Most of their notions secure the rights of individuals, while the challenge is to participate with others in the notion of cooperation and coordination. This is found in the "home base" of the functional organization. It is also found in the foundational assumptions or primary distinctions of the system. The security lies in the development of rhythms of interaction in the organization, and in the underlying principles of process by which to understand synthesis in the organization. The security that people felt was in "professions." I am an engineer, scientist or marketer. These identities become more precarious as one got further away from identification with a profession, i.e. in project management. This identity could also come from one's relative position in the hierarchy: "I am a manager, director, or vice-
president." The identity offered by one's place in the hierarchy appears to be experienced as increasingly threatened.

Instead, through the process of crossing the stream, the separate identities of the horse and rider blur. One becomes a part of the other, each offering the advantages of his or her vantage point and capability, yet each also incorporating the other so that together something miraculous can occur.

CONVERSATIONAL CONCLUSIONS

What is the organization saying? To briefly summarize some of the perspectives present in the organization:

*Senior VP of R&D-* We need a *concept*. But, the concepts develop throughout the life of the project. We have many ideas about incremental improvements, and big ideas about the "environmental friendly" pidget are they the concept?

*Steering committee-* How can we improve connections between product development and process engineering? In the long run we want to improve connections also between marketing and the technical community. The market is extremely subtle, and we have been burned by extremely small phenomena/discrepancies. We represent the functional departments in the company. How can we direct the
development of projects with each function taking the lead for their portion of the journey, the part each knows best?

Program team- We want attention, isolation and certainty. We want to do one thing. The organization comes together where we are. We want answers, but all we get are more demands. We want the project to flow smoothly. How can you have breakthroughs with not 'bad' surprises?

Product Development- We are mavericks outside the outside the Product Delivery Model. We are off the organizational map. Our products are blueprints of the pidget. Product Engineering & Manufacturing is waiting for final plans, which will not be ready until the end of the process. How do we deal with a development project that lasts the life of the project? Is there no hand off?

Product Engineering & Manufacturing- We "cut metal" in four weeks, what are we going to do? We ask for direction, but we are the center of the organization, the place "where the rubber meets the road."

The overall conversation sees everyone in the organization striving for the creation of order in the organization. Sometimes this appears as disorder. It is easy in this organization to become isolated, viewing the proceedings from one's particular position or from the vantage point of one's particular technology and function.
The variances in the organization appear to be errors from the instrumental rationality perspective of discursive project organization. Variances include; missing parties, dropping bombs, product of planning, unfinished projects/failures, and fitting the whole organization into a fast rabbit project. From a recursive standpoint, these variances are opportunities for creation by incorporating the environment in a new project. It is through the current effort that the ghost of the past may be consumed, and subsumed by a new event or occasion. In lieu of such participation, as was the case with PD, workers become disoriented and seek to fix the "objective" system that is beyond their control. This is a similar issue in attribution theory, where when something goes wrong we often look for an outside source, rather than to our relationship to that environmental force.

If the organizational solution is a prototyping process, how can the whole organization stay interested and involved throughout the life of the project? PD had already lost interest in X2B. Commercial was present, but so young and inexperienced. PD is old; they move at such different paces. A value to incrementalism may be fostered by allowing PD personnel to follow projects through all scaleup sites to final completion, rather than keeping them bottled up stream.

Our framing, broadly conceived of as the enframing process of technology, creates boxes which trap us. Viewed more dynamically in time, they become the roads, and we have a limited ability to see an open
future. Through the refreshment of testing in the environment, and the openness of our attendance to those times of trial, we can create an open future and we create certainty, we project it, rather than simply trying to predict it in the effort to somehow control the environmental response to our efforts.

The metaplace of deliberations provides other tools, grounded in the implicit order of Ampap, and perhaps other organizations, to see beyond the time and space limits our individualism. Rather than attempting to predict precise rights and wrongs, it intent as an implicit process is to aid in the asking of recursive questions. As anomalies and variances appear as gaps between the road of our intentions and the environmental stream, we may view these as opportunities and assume responsibilities collectively for their resolution within our local sphere of involvement.

As Morgan (1993) has noted in his method of action research, the next phase of this conversation is to bring the metaphors back to the organization and see what in them is evocative. The result of the inquiry leads to an active experiment (Kolb, 1984).
CHAPTER 7: CONCLUSIONS & IMPLICATIONS

The primary aim of this dissertation is to develop a more generative basis for sociotechnical systems and the study of non-routine work. The primary question of this dissertation is: How is it possible to guide non-routine work? To answer this question we must answer: What is most fundamental basis for analysis and organization development?

The simple answer is, the guidance on non-routine work needs to work from the fundamental practices of the organization, grounded in the underlying process paradigm of the organization. The core unit of the organization is in project, conducted through the project cycle. The fundamental basis for analysis is the management of the project cycle and its development through interface with the environment.

From these core questions, the primary question of organizing for innovation involves the politics of Being. The issue of power and authority in organizations is severely challenged by the turbulent environment and its demand for increasingly complex and dynamical organizations and products. So, the secondary set of questions in this dissertation are: What is the nature of effective coordinating methods in turbulent environments? How can knowledge and power be appropriately supported by organizational structure and process?
The nature of coordinating methods is the conversation that accompanies the project cycle. Recognizing the various forms of the metalogue helps guide to organizational conversation. Knowledge and power does indeed need to be appropriate to the locality, time and space, of the interaction. It is suggested that to the extent that the entire environment is internalized in the project, the outcome will be accepted and proliferate in the environment. Thus, to the extent that projects include all the parameters of concern, they should be successful in the environment.

However, both sets of questions and answers are predicated on the acceptance and acknowledgment of a process orientation. To the extent that the program team can take on all the necessary orientations needed to successfully guide the project, the role of the "hierarchy" becomes that of reality testers. However, because there is a strong vestige of organizational hierarchy, knowledge and discretion are withheld from the program team and an internal competition for resources is the result.

The central propositions at this most general level are:

P1: The primary coordinating method of the organization is deliberation.

It is the act of conversation in action that can allow for the application and creation of new language with common meaning. While the organization wanted a more clear decision-making process, the issue was much broader.
P2: The primary shift from simple and stable to complex and dynamic organizations is in the recognition of time and Being.

The biggest two changes as seem in the central deliberations of the program team were with time as seen in the scheduling deliberation and the attention paid to Short Cycle Management. But the debundling deliberation highlighted an even greater concern, how do we know what we are building, and will it work? More broadly time needs to be seen as non-linear and circular if they are to slow down their work and achieve convergence on a successful product. The Being of the product requires the broadest grasp of its existence. The multifunctional team is not enough, each person needs to incorporate the perspectives of the entire environment somehow if they are to act as agents of synthesis.

RECONSIDERING STS ASSUMPTIONS & PRINCIPLES

This dissertation is about an action research project that took very little action. The project did not work out the way we intended. In many ways the project was a failure for; the design team rarely convened, the team members did not follow our agreed upon inquiry, and the steering committee did little to steer and in the end rejected the design committee's recommendations. So, what in the end did we accomplish?

The simple conclusion was that I did not find the existing set of tools and perspectives available in STS to be generative, to make significant suggestions for the system at Ampap. My primary contributions appeared to come outside the STS framework. However, much of the
existing principles can be reframed to the turbulent conditions. The method of the Search Conference appears to be more generative than the large system, long term method. Partly because it is a much simpler method. My contribution may lie in bringing the new organizational realities together with extensions of thought, something done in the past with STS. The aim of discovery however is for an evocative framing. I think the metalogue of deliberations can be a helpful tool through which to view the incorporation of management within the line work of organizations. Much can be learned from the role shift of supervisors to coordinators and facilitators. However, increasing the ability to handle the politics of ambiguity is needed to create generative possibilities for organizations without managers.

The shift of STS is in some ways to continue their work, extending the shift in discretionary coalition building throughout the whole organization. To do this, they need to account for the 10% ambiguity in the reduction of equivocality. Thus the shift from supervisors to facilitators would occur throughout the hierarchy. The hierarchy would remain, perhaps based on the individual's size, his or her capacity to be big. One thing that does change would be the methods of STS, needing to incorporate the examination of implicit process that underlies the core interfunctional professional process of the organization.

We find a different phenomenon than routine STS assumes. Space, time, relationships, corporeality are different: The internal and external
environment is turbulent. Groups are not stable. It is an organization of professions, without clear and stable job descriptions. New functions and professions are created inside the organization. Hierarchical authority is not legitimate power. The informal and ad hoc organization is very active. Product development is often a messy process, the quality of a few miraculous connections that must be nurtured and not destroyed to correct common failures to achieve synthesis.

The simple but difficult shift is to view the variances as gaps, not simply correcting them, but somehow incorporating them and creating within that gap. The response to variance identification is not clearly indicative; the resulting organizational design is not clearly indicated by the nature of variances. However, the gaps and anomalies that are identified create the ground on which creative responses can occur.

The movement from external to internal control would continue, relying more on intrinsic rewards and implicate organizational structure. These are tremendous demands on people in the system to not be children. In the new organization the order is not based on the "family" but rather on community. Managers no longer can buffer organizational members from the environment. They serve a different role, perhaps as facilitators, as elders, through which knowledge is discerned in wisdom. It is not then only a can do attitude, but a contextually based, "what will we do" attitude.
On the relationship of people and technology: You are your technology. Because of the process of *enframing*, who we are is self-similar to what we *create*, in a metaphorical sense. We fashion our tools in our own image to a large extent, and our tools shape us.

On environmental relationships: Again there is self-similarity with the environment, but as a general setting for individual response. It is only determinate in the sense that it sets some limits to response possibilities, but yet it is those constraints which can be overcome and innovative responses result.

Group process: Given the dynamic and temporary quality of personnel shifts, group development is precarious. The continual change in personnel would indicate extensive expenditure of time directly with group process. Instead the "group" is perhaps more internalized and generalized to allow for this coming and going. Multifunctional teams are common, but the goal of group solidarity can be elusive. Since specific functional roles often are lost in this multifunctional environment, it may be that involvement is dependent on the phase of the process cycle. It is quite possible that the issues of inclusion, influence and intimacy will be predominant issues of the project environment. The inclusion issue is behind the debundling. Influence issue is also very strong here, particularly seen as having only one "hot project" rather than "a thousand flowers bloom." Intimacy is a very interesting question and was not necessarily predicated on the two earlier
issues. However, the reflexive nature of the organization was toward "good news" and the political nature of resource and goal negotiation made sharing of their own experience difficult. One example of this was in the breakthrough project, where the participants did not want to talk about their current experience in part because it might undermine their position in the organization.

What is suggested by the descriptive model of the iterative project cycle is that periodic pressure and loosening might promote the best conditions for innovation to occur.

One of the primary lessons for the organization is for the environment of our thinking life. Ampap long considered the consumer testing as central in its organizational success. It has been becoming more aware, particularly through its conversations in Total Quality, that the internal customers or rather stakeholders create a very important web of relationships forming the "internal environment" of thinking life which also is important through each iteration of the scale-up process. But, we are perhaps even less attendant to the environment of our thoughts themselves. The need to open our thinking to contextual framing becomes ever more important as each of our assumptions is challenged as a necessary part of the product development and launch process.
But this is not just a one-way conversation; as we know, it is a dialogue through and around our creation of new tools and new technology that we incorporate into our lives. The probability of our tool building's acceptance and the awareness of its impact are not always attended to. We seem to resent changes in our context as they provide new possibilities for alienation as well as opportunities for growth and development.

Productivity is not as simple as it might seem in the first instance, for not only is it metaphorically a matter of the golden egg, but also care of the goose. If our corporate life is filled with the "lack of" past securities and unequivocalities, we live in ontological insecurity. It is not just a matter of doing it right, but of finding a greater sense of Right and appropriateness, as though we already know but don't do what we know. We ourselves reject that certitude, for the commonalty we are seeking is at a more basic level of dialogue and not just the adoption of a hierarchical mandate. It lies deeper in our sense of mission, principles and profession as an organization.

Topics are not very easy to follow and neither are forums. They are difficult to isolate and identify at an explicit level, particularly as they are occurring. I had to back up and view the directional flow of the organizational conversation, looking for a more implicit pattern. One can perhaps follow the topics and forums retrospectively in some detail and plan them in generalities. However, the "topics" more often appear to be issues, and deliberations are the organizational conversation. Each
meeting generated an issues list, which was then assigned to various members for research and consideration. But topics had a way of merging and splitting, emerging and disappearing very quickly. It is hoped that they could stand the glaring light of inspection and reflection, but often they could not. Issues were often worked out by necessity in the field, so that what once appeared to be a choice was not rationally resolvable. Issues are often resolved by creating technology and the interplay between theory and testing. It was rare to actually offer a decision maker alternatives, only presenting a proposal and testing it for feasibility.

The major propositions from this analysis might then be stated as:

P3: Systems are episodic in nature. What is most concrete are events and occasions.

P4: Systems appear differently at different phases of opening and closing.

P5: As systems become more organic, they appear to become more chaotic as the patterns of order shift from explicit to implicit.

The primary shift in systems thinking is that the cognitive realization of systems only occasionally occurs. While planning would appear to systematize the organizational environment, it is temporary in effect. The desire expressed in the organization is for product scheduling to be equivalent to project management. However the management of projects is much more untidy.
P6: The primary shift in STS is in recognizing variances not necessarily as errors to be eliminated but as the potential source of organizational thriving.

For mechanically repetitive systems, it appears clear that variances in the process should be eliminated. However in human systems it cannot be fixed so easily. More often it is a process of healing in which the variance or anomalies is absorbed by the system. Responding and not simply reacting to systems brings us to a more subtle level which can dramatically alter the basis of the system. Solutions often cannot be found at the same level as the symptom.

P7: The concept of ambiguity is more fundamental than uncertainty.

The primary system of coordination, the Product Delivery Model, had a much greater difficulty with the ambiguity of product concept than it did with the probabilistic issue of risk management. How can we deal with the unknown "10%"? At its core the PDM and all other language at a high level is ambiguous by nature allowing for many interpretations. But by being so, it can create an avenue of discretion for the program teams. The trick is to somehow allow the program team to have the confidence to also engage with that ambiguity.

P8: Appropriate enframement between people and technology replaces joint optimization.

It makes little sense to 'optimize' people. By equating people and technology in a directly correlational relationship, the people are set in a reactive stance to technology. This is still a mechanistic system with only
accommodations to humans. An alternative is perhaps a more conservative relationship to technology that allows for people to appropriate it, and create from it. As E.F. Schumacher (1967) long ago stated, "Small is Beautiful." The technology needs to be encountered in more intimate settings over longer periods of time than we are currently used to.

P9: Because of the holographic quality of the organization, redesign of the organization can begin with very small projects with few people, to later demonstrate to the organization where others may also enter a cycle of inquiry.

There has been a big shift from large scale projects to smaller scale projects. Operational experiments have long been a part of STS methodology. However, in the effort to comprehensively approach the system these operational experiments have often been very involved and lengthy processes, seeking to incorporate all the bits and pieces that made up the environment. However, if one proceeds at a more implicit level seeking those processes that underlay seemingly discrete pieces, a small piece of work can proliferate throughout a system as did A.K Rice's brief comment transform the idea of ownership and control at Calico Looms (1958).

P10: The more non-routine the issue, the less structured the deliberation, and the more dependent it is on the fundamental process paradigm of the participants.

As one moves further up stream into Product Development and research, or up in the organization one more and more becomes the
company.' Therefore one assumes responsibility to live with the ambiguity of that position and sequential activity become more rare as the art of the enterprise increases. Even activities at the project management level are becoming more non-routine, however they are comprised of small practices and heuristics that can be quite powerful if brought to awareness.

P11: The metaphorical use of language is needed to bring life and generativity to technical processes. It is in the creative use of language (and other arts) that a connection of Being and technology occur.

One of the primary difficulties with the co-inquiry we attempted to conduct was its failure to gain a name and inspiring concept. I suspect that one reason that most of the projects used numbers and letters for their names were in part to detract from too much attachment by its team members. Their project was simply one of the alternative product scenarios which they decided to fund. There was a tremendous generation of technical language in the organization, but also a great number of more poetic phrases used particularly by some of the older hands in the program team. There was a surprisingly sparse set of words for human relationships.

P12: The more concrete the road, the more difficult it is to see the stream.

It was very difficult for technicians to see a hammer as anything but a hammer. There is mechanical utility in that detached perspective. When the road is broken up by the steam this can be extremely upsetting, resulting in statements like "Everything is wrong this organization. I
know how do it right." To the extent that we are aware that the road is a road, we may be less upset and may find greater fascination with and insight in the stream. This is the seat of appropriateness.

P13: The less concrete the road, the less productive the process and the less transcending (different from what has existed) the result.

It is interesting that Mick, the Director of PD wanted evolutionary change. The program itself was really quite evolutionary for it was an extension of an existing product line. Through closer relationship with the environmental stream, we can become more aware of subtle changes that can produce more intuitive insight into what will work.

**IMPLICATIONS FOR SYSTEM MANAGEMENT**

The following are a few ideas that have occurred during this reflection regarding general systems and the shift from open to complex systems perspective.

**Middle Out**- Growth and change come from within the system, neither strictly from the top nor from the bottom of an organizational hierarchy. The interaction is from localities to system-wide behavior. Each element interacts with the environment. Your are the organization.

**Global/Local Phenomena**- Under postmodern conditions (internal and external turbulence), the system includes the entire globe. Strong external buffering through boundaries is far less likely. However, system awareness is most often experienced in localities of synthesis in process...
terms, "events" or "occasions" (these can be virtual localities). It is important to do small things.

**Application of Mild Chaos-** Sufficient variation needs to be present in the system to assure that convergence does not occur prematurely through feed-back cycles in isolation of (organizing and) synthesis. Recursive questions often disrupt systems, many times during organizing and synthesis. I still don't know if the "bombs" were helpful or harmful.

**Recursive Positive Feed-back Loops-** Interestingly enough, systems are built between iterations through positive feed-back loops and not a balance of positive and negative feedback. Discursive/mechanical learning systems require positive and negative feedback loops (model I learning), while the process of selection from a heterarchy is largely a question of promotion rather than one of suppression.

**Distancing-** Between iterations, or when the system again emerges to objective status. The sociological reality is often separation, alienation, anomie, ontological insecurity, or immediacy. Most often this calls for recursive dialogues of "speaking the unspeakable", to bridge the gap between seemingly irreconcilable differences. This is the source of great power.
Delays: Time has re-entered prominence in system management ... particularly in organic systems. This often calls for appropriateness as well as quality as a topic in critique. What is called for at this particular time?

Incoherence: The system is always viewed from a locality. Only occasionally is it possible to "get outside the system," and then it is usually curious but not helpful for system growth unless engaged in a following synthetic iteration. Internalization and metabolism is a messy process. Strange metaphors of consuming the environment illumine this incoherence of digestion and synthesis, like: You have to "mess with it" to be a part of it. Or, you have to eat it.

Uncontrollability: Systems cannot be continually directed through a position of objectivity and distance. The result is crass and ignorant action. It is only a phase of emergence from engagement. Cycles of reflection and engagement allow for control to be a system characteristic.

Start small: You can act anywhere in the system, and if it succeeds, it can spread. (draws from holographic principle)

Interest Driven: Attention defines systems. As systems become organized, there are questions of inclusion which provide a temporary sense of boundaries as a phase. Iterative systems do not have the goal continuity, for they are reassessed recursively. Perhaps the word "aims"
is a better term to describe iterative cycles. We often do not know what we will get into when we enter organizing and synthesis. By its nature we cannot predict the outcomes of synthesis. We often do not start a cycle with a clear concept or agreement. This is realized later.

**Synthesis is the aim of iteration**- The politics of human interaction have often been seen compromise as the goal of negotiation. However if one adopts a motto that no idea that comes in here survives, it can create the basis for unity through synthesis rather than political wars of unilateral power.

**Ethics**- Values and virtues are realized in synthesis but are not usually predetermined in synthetic systems. Ethics are realized in system localities. Inequities occur when the system does not include all necessary (or interested) parties. Parties that are often disruptive to the outcomes or acceptance of the system require strong power from the entire system, so they can participate in the synthesis.

**Diversity**- Diversity is generally not bridged by awareness but through joint action or engagement in a "project." Between iterations "the other" (systems) appear foreign (objective).

**Handful of Principles** - There are strong limits of cognitive complexity. Each new group (locality or discretionary coalition) needs to define its
mission (identity) and operating principles. (Corollary to minimum critical specifications.)

WHAT I HAVE LEARNED

The Power of Description

One of my primary assumptions I have discovered in writing this dissertation is that whatever the organization is doing is most likely not in error, is not a mistake. This is quite a surprise. I believe that they are most of the time intuitively organizing their interactions in a wonderfully intelligent and synergistic way. However, it has been my experience that my informants could not easily explain what they did with an organized set of concepts. They often acted beyond their ability to theorize, and this would get them into trouble when they would explain or act according to the principles of organization that they did know and screw up what they had so wonderfully created through intuition, before they were asked to explain and justify their actions. Reflection in the organization is often problematic. They were operating beyond an explicit map, beyond their explicit paradigm of organizing. This creates the awareness of fragmentation and may limit their ability to function successfully.

Most often we feel that our intentions and thinking are good, but our actions are bad. The opposite was more often true in my experience at Ampap. The member’s organizing activities seemed more often on
target than their thinking about their actions. This counter-intuitive in our culture.

This dissertation is about organizational learning. One thing I am beginning to learn about organizations is that they often are designed more intuitively and intelligently than we could redesign. The future organization is already present in the organization. What we/I could and did accomplish is to reflect about action already occurring in the organization. In many ways the organization did not have very meaningful terms for the way it organized. It acted beyond their simple cognition and available organizational theory. The most I can hope for in this thesis is to describe and conceptualize about the organization that its members already intuitively know. We did not create dramatic new designs for structures or processes. Using Thomas Kuhn's (1970) view of new paradigms, the new organization already exists in anomalies long before we have a name for the new paradigm.

The Organization is Alive

It has taken me a couple years to begin to recover from this abject failure to bring about change. It is difficult to not be able to direct the flow of change. I now better know how managers in the organization felt. Few felt they could say that they personally were the cause of change in the organization. The organization was too 'organic' for its causal structure to be so directional. Henry Mintzberg's term, Adhocracy, was an appropriate description. Change resulted from a number of forces
beyond the control of any individual. However, it often only took one person to screw things up. As one person stated, "Why is it that no one can make this project move faster but anybody can pull the brake?" The power to disrupt was constantly present and obvious. It is difficult to 'be the train.' We prefer to ride a train. What we found in the organization was that everyone was the organization, the division between managers and employees largely did not exist for all the members were professionals, mostly engineers. This organization was alive!

**Road Building in a Turbulent Stream**

Hence the name for the paper. Most people longed for a solid road, but found their road constantly washed out. Most of the time they were operating in unknown territory. The most I can hope to do is perhaps to fall back into my imagination and seek to describe what I saw in the organization and of its new paradigm, as in a dream about the many parts already in place. For I suspect that what we need to do more is to dream about what is already here than to come up with maps of a new idealistic vision.

This study started from the sociotechnical systems approach as the road. Our assumptions about knowledge and knowledge work is often that knowledge is a thing that can be used to build a strong and enduring road to a predictable future. This is an instrumental discursive logic often used in tool building. What I found instead was a raging stream of events and awareness, where knowledge was more often exemplified by
aphorisms and antidotes. Knowledge is often the embodiment of recursive experience in the midst of the turbulent environment which is ultimately uncontrollable and only partially describable. We can develop intuition and wisdom as events reoccur and as we cross over through other realities. Our encounter with the mystery of our broader environment, not the least of which is the human psyche, has a way of breaking up monolithic knowledge structures in favor of simple insight.

Many of the impressive roads of history were built by armies of laborers at the whim and will of dictators. The organizational feats are equally as impressive. However, few grand projects and grand narratives can survive long in this 'postmodern' (for lack of a better term) world. The roads are built from many individual voices and small efforts who speak for the common unconscious, some are better dreamers or mediums than others. It is rare to find a single voice that can or should speak for all, and even hopefully less rare for people to passively follow such a voice. The world beyond cognition is a powerful stream, that is tenaciously resisted by our will to control it by modeling it and turning it into a technology, a tool, a machine. Yes, organizations are getting more unruly and unrulable all the time I suspect. The organizational members I was with at Ampap never followed orders unless there was a huge power distance, and even then it was largely for appearances. I know that my design team was like a herd of cats. Utterly uncontrollable.
Who Will Empower Us?

It was very curious that the program team I was on did not seem to catch on that they already had the power to create their own existence. They were constantly searching for permission (as I have for the past 3 years) to do what they already had the power to do, and they were in fact doing in disbelief. Perhaps the key was that they were acting in disbelief rather than faith. They already had the organization they wanted, but the resounding thunder of external (hierarchical) control had rattled their senses. "Hierarchical control" still rattled their cages from time to time, but really could not affect projects which were the central drivers of the organization. The hierarchy was constantly dropping bombs on the program team. This means that the hierarchy was constantly challenging and changing the assumptions of the program. However, they could also plant seeds like a whisper in the ear which could contribute to a new concrescence and a new understanding.

Without the awareness that you indeed have the power to create your own existence, through listening, observing and working in concert with the environment around you, we are still looking for the organizational parent. We search for 'where the buck stops.' The program team where I was resident was constantly looking for decisions to be made by someone in authority, while they were obstensively the authority. There are many examples of how people in the program assumed such authority. For instance, the previous project manager had consolidated about $12-25MM under his signature, and the same process could work
for most other organizational resources. They were waiting to be empowered. One of the strongest examples of this was the program manager had not been formally acknowledged as the program manager in the organization, most likely because no one else knew they had the authority to do it or that it needed to be done.

Organization Without A Concept

The strange thing this business was that they did not have a concept for this kind of an organization. You had to hope that you read the situation right however or else you would be seen as foolish. Hierarchical authority did not seem to mean much although most people would tell you that they got to where they are today by successfully managing a visible and important project. What I feel is the core to this organizational process, is that authority comes from authoring. It is a hermeneutic process of declaring what you see, and naming the anomaly. This is an orientational issue. The walls of the hierarchy have fallen, and each person in the organization is the organization if they take up the awareness of the whole organization. Being the organization includes taking in the whole environment and waiting for the wisdom to precipitate. This is very different than just the discursive rationale of instrumental logic. This is opening one's self up to the broadest sense of environment and owning that awareness.
Guided By the Core Process Paradigm of Our Profession

So what is central to the organizing of this organization if it is not the organizational structure/hierarchy? Most likely it is the profession (predominately engineering/advertising) as played out through the scale-up process of handmade product through production plant. The profession is specific to this trade as it is to any historical craft like shoemaker, printer or pharmacist. However, with the growth of the enterprise and the enhancement of its technology, the sense of profession is not always present and there are many pretenders in the crowd, historically often among middle managers thanks to business schools.

Our Core Process Paradigm is Creating and Recreating Systems

The central paradigm of the profession is analogous to the system development life cycle, in which you design, build and test a system within a client environment. The primary danger in the organization of course is that we tend to build the product for ourselves... and engineers can seek design elegance at the cost of customer preference. We often do not listen or observe very well. There has been a particularly successful emphasis of this consumer and customer awareness at Ampap. However the key to its organizational success is to open up even more to its own processes, and recognize its power to ‘incarnate the dreams of the environment in their personal work.’ A tough order to be sure, but this does seem to be the nature of their world.
Truly Unifying Concepts Emerge Mid Stream

The programs were often in search of a unifying concept. They seemed to rarely start with a sufficient concept or goal. Still it appears to be important to proceed with a concept or goal. The what distinguished the languishing versus successful programs of the past seemed to be this discovery of a unifying concept. Historically, in this organization, the last success had been the creation of the distinction between boy and girl pidgets. The discovery of this concept midstream in the project created a great sense of unity in the organization, with everyone (correctly) claiming credit for its creation/discovery.

The Core Issue Is Social

The concept of team did not fit their organizational reality very often. People were constantly moving in the organization. One could say that they should stop all that moving and behave like teams. But I suspect that the answer is that we do not know the social identity that is taking shape in this organization. Pava's term discretionary coalition only begins to hint at the necessary direction. In terms of internal satisfaction of the organizational form, team members preferred tightly coupled teams while the broader organization preferred more loosely coupled project discretionary coalitions. The Z2B program members felt that the successful programs of the past were often run by leaders from manufacturing, perhaps because they seemed to best understand the end state of both manufacturability and broad customer acceptance (thanks to
the reliability group which made incremental adjustments according to consumer and customer feedback once the product was in market.)

The Drive to Control Others and Our Environment

An aspect of my project and a characteristic of the organization) that bothered me the most was that we often strive to change the behavior of others. This also lead to my primary disappointment as a consultant and 'change agent.' This is in accordance with attribution theory that we tend to associate success with ourselves and failure with others. It bothered me that I came in under the auspices and authorization of Product development but was quickly 'pawned off on' the Product Engineering & Manufacturing organization. Even the members of PD on my 'design team' sought to extricate themselves. I speculate that this is because they wanted to change the behaviors of others rather than to too closely examine their own behavior. There is a great deal of reflexivity and self-consciousness in organizations particularly when dealing in real time.

Thoughts on Design: Functional Homes and Project Adventures

The nature of the organization was that the programs were the main driver of the system. A great deal of pressure was applied in terms of constraining time, money, personnel, pilot plant time and other resources to create a pressure cooker so that the program was fully cooked. What was more intangible was the nurture of the concept, or recipe, or even the aim or goal. This expertise had to exist inside the
program most often and be tested periodically in the field with customers or at program review meetings with the brass. Program success was not a foregone conclusion. It is safe to say that perhaps a majority of programs were deemed failures. In fact the mythology of the organization had it that a handful of successful programs ('home runs') supported the company through hundreds of 'failures.' For this conceptual 'breakthrough' to occur in the midst of the project, this generally would require authority to also lie within the program, if knowledge was to be aligned with authority and only tested externally. In fact most of the corporate strategies, which originated in the various organizational functions, converged and were only really tested at the program level. For instance, what does it mean to have equivalent conversion line technology throughout the world (Japan, USA and Europe) while at the same time keep capital expenditures at a minimum (particularly because they felt a recession coming on.) That the two strategies were largely inconsistent (and exactly how) was only evident at the level of programs, several organizational levels below the formulation of company strategy.

It appears that the functional organizations probably weld too much power in strategy formulation, and that the Product Delivery Model seems right on target for the development of a corporate core paradigm of the core technology. The functions continue to redefine themselves and serve as organizational homes. The various sites related to product scale-up are probably better descriptions of functions than the organizational charts indicate. But the core organizing paradigm of the
organization is in fact the product launch which is analogous to the core paradigms of traditional engineering. However field conceptualization and testing needs to be added to an iterative view of the engineering paradigm if there is to be a fit with the whole organization. The PDM while core probably needs to be the central deliberation of the organization and perhaps remain largely ambiguous so it can serve as the starting point of conversations about programs, rather than to become more specified as would seem reasonable in a single phase of product or process design specification.

The Challenge is Remain Aware & Alive

The primary danger is that we will get what we seek, a single organized system that is a simple formula for success. If we convince ourselves that we can create a technological system that captures all that is needed in the organization, the organization becomes a dead machine. Because we have this idealistic vision of objective clarity, I suspect that set ourselves up for failure. The task is instead to become more of who we are. The way of organisms is to create progeny and nurture their development, and to know that in the long run we cannot control them, but we must provide an environment in which control is internalized. But this power to control is to be able to open up and embrace the situation in the desire to co-create; to both trust our intuition and examine it; and to search for environmental elegance in the appropriateness of fit between the social, the technical and the environment.
Water which is too pure has no fish. -Ts'ai Ken T'an


19-24.


Forman, R. (1993). Of deserts and doors: Methodology of the study of 
mysticism. Sophia, 32(1):31-44.

Row.


Galbraith, J. (1977). Organizational design, Reading MA: Addison- 
Wesley.


Scott, G. (1990). *A brief introduction to chaos and the self-organization of life*. unpublished manuscript based on a series of lectures presented to the faculty development Chautauqua Short Course Program at the University of Texas, Science Education Center, Austin, TX, March 1990.


