INNOVATION RESEARCH WORKING GROUP

AN INTEGRATED MODEL FOR TEACHING THE MANAGEMENT OF INNOVATION IN THE INTRODUCTION TO ORGANIZATIONAL BEHAVIOUR COURSE

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Abstract

If schools of business are to retain their relevance to contemporary business problems they must teach their students about the management of innovation. This can be accomplished in the introduction to organizational behaviour course by using the PETS model. The PETS model proposes that there are four essential elements of organizational function; people, environment, technology and structure; and that for an organization to function optimally the four elements must be compatible with each other. For an organization to manage innovation effectively it must have the appropriate mix of the four elements; namely, change positive people, uncertain environment, complex technology and organic structure. Suggestions are made for the teaching of the PETS model and its application to the management of innovation.

If schools of business are to maintain their credibility as institutions which prepare people for work in organizations, they must teach their students about innovation and how to manage it. A lesson learned by organizations, large and small, during the eighties and early nineties is that failure to innovate means failure to survive. Witness the recent monumental efforts of GM and IBM as they have struggled to become innovative despite their entrenched bureaucracies. There can be little doubt that the international market place demands innovation. It follows that no business school can afford not to teach the management of innovation.

Most business schools have courses in organizational behaviour and those courses are one place in which the management of innovation should be taught. People are essential to innovation and courses in organizational behaviour are the primary locus for teaching students about people in most business schools. If the management of innovation is to be taught effectively it must be taught in organizational behaviour courses. The realization of this fact has led to the appearance, in recent years, of chapters on innovation and/or change in many organizational behaviour texts.

Including a chapter or two on innovation and/or change is certainly a step in the right direction and is all that is needed in some educational contexts but it can be argued that more should be done. If students are to get a true appreciation of the nature of innovation, ideas about innovation must be brought into all topics in the course, and not be confined to a chapter or two. This is because an organization which is truly innovative has all of its aspects tuned to the process of innovation. We have all heard stories of organizations that have introduced innovative information technology only to have it go unused, or even sabotaged, by the people in the organization who were not prepared to be innovative. We have all heard stories of bright innovative managers who have tried to change their organizations but who have resigned in

frustration at their inability to overcome entrenched bureaucracy. If we are to teach students what innovation really is, and how to manage it, we must show them how it affects all facets of organizational operations.

To effectively show students how innovation is related to all facets of organizational life, we must have a single general model that is intuitively easy to grasp and yet allows us, with elaboration, to logically develop the many complexities of organizational behaviour and innovation. Furthermore, if this model is to be of practical use to those who actually teach organizational behaviour, it must be compatible with the material that is found in standard introductory organizational behaviour texts. Teachers of organizational behaviour cannot be put in a position in which, in order to teach about innovation, they must throw away much of the material that is traditionally taught in organizational behaviour courses. On this point it should also be noted that any good understanding of innovation will include and take account of the knowledge and concepts developed by organizational researchers over the last many years.

The purpose of this paper is to present a general model of how organizations work which enables students to understand the nature of innovation and its management. This model is intuitively easy to grasp and yet allows for expansions into the complex intricacies of real organizational life. This model provides a way to present the content of standard organizational behaviour texts using the theme of innovation as a single, timely and exciting topic to bind the chapters together. This model is so compatible with the content of standard texts that its only demand is that the chapters be taught in an order different from that in which they are normally presented in texts. The rest of this paper will present the integrating model using the same order of logical development as has been used by the author for teaching it to students. This

description assumes that the reader is familiar with the content of standard organizational behaviour texts.

Introducing the PETS Model

The integrative model used here to discuss innovation is easily grasped at the intuitive level by introducing the acronym PETS and the idea of compatibility. The acronym stands for four elements of organizational study; people, environment, technology and structure. For each element there is a dimension. People can be classified on a dimension which goes from stability positive at one end to change positive at the other; environments can be classified on a dimension that runs from certain to uncertain; technology, on a dimension from simple to complex; structure, on a dimension from mechanistic to organic. It is assumed that in any organization these four elements can be more or less compatible with each other. Level of compatibility among the elements is established by comparing their positions on their respective dimensions. The greater the compatibility among the elements, the more successful the organization will be. It will be shown later that successful innovative organizations are characterized by change positive people, an uncertain environment, complex technology and organic structure. The four elements and the idea of compatibility are so easy to grasp intuitively that they can be presented during the first lecture or two of the course. One can give simple and intuitively obvious definitions of the elements and their dimensions and then colourful examples of the consequences of incompatibilities. For example, worker sabotage on the assembly line can be used to illustrate the consequences of incompatibility between people and production technology. Stories of "bureaupathologies" can be used to illustrate the consequences

of incompatibility between people and structure. One can cite cases of companies like Chrysler to illustrate the consequences of incompatibility between environment and structure. This way of introducing the model is exciting to students, gives them a brief taste of many aspects of organizational life and gives them an intuitive grasp of the model around which the rest of the course is built. After this introduction one can go on to describe the elements in more depth making use of the contents of the textbook.

People: Stability Positive and Change Positive

In the PETS model, the people element includes all those who work for the organization. Individually, and as groups, people can be classified on a dimension going from stability positive to change positive on the basis of their motivations and cognitions. People are change positive if they are motivated to seek change and if they have the cognitive capacity to deal effectively with it. People are stability positive if they are motivated to keep things as they are and lack the cognitive capacity to deal with change when it does occur. The material in organizational behaviour text books on motivation, perception, problem solving, and decision making can be drawn upon to show this. It will now be shown that people who are change positive are motivated by higher level needs and have high-capacity unbiased cognitions.

The role of motivation in being stability or change positive can be explained by considering content theories of motivation as shown in Table 1 which is based on a table from Gibson, Ivancevich and Donnelly (1988, page 127). This table shows the four most commonly taught content theories; Maslow's, Herzberg's, Alderfer's and McClelland's; aligned in terms of the motives they describe. Maslow's and Alderfer's theories include an explicit concept of

hierarchy with some motives being classified as "higher" than others. These hierarchies are aligned with each other in Table 1 along with a plausible hierarchy for the motives of Herzberg's and McClelland's theories. In the PETS model, the more strongly people are motivated by higher order needs, the more change positive they are. Consideration of the definitions of self-actualization need (From Maslow), growth need (Alderfer), motivator (Herzberg), and need for achievement (McClelland) should make this clear.

Process theories of motivation are compatible with these concepts as well. Reinforcement theory (Luthans and Kreitner, 1985) proposes that people tend to repeat behaviours which are rewarded and to drop behaviours which are punished. PETS says that if a person's behaviour is modified by rewards and punishments related to needs at the high end of the hierarchy (e.g. need for growth), that person is change positive. If a person can only be reinforced and punished by appealing to needs at the low end, that person is stability positive. Expectancy theory (Nadler and Lawler, 1977) provides a refinement on this. People are change positive if outcomes associated with needs at the top of the hierarchy have high valence for them. People are stability positive if outcomes associated with needs at the low end of the hierarchy have high valence for them while those at the high end do not.

Turning to cognitions, being stability or change positive has to do with the cognitive capacity that a person has. People with high cognitive capacity are able to deal with the high levels of information processing required by constant change and this characteristic predisposes them to be change positive. People with low cognitive capacity are unable to deal with the information processing required by constant change and will tend to be stability positive.

When people attempt to deal with information overload, they are likely to use various

techniques to try to simplify their information processing and this can lead to several kinds of cognitive bias. The cognitive bias is, then, a symptom of information overload. This will be illustrated with three cognitive processes that are commonly discussed in organizational behaviour texts; perception, attribution and decision-making. Perception is the selective construction of an interpretation of the world (Northcraft and Neale, 1990). Perception is a selective construction because we do not have the unlimited cognitive capacity necessary to take in and interpret the unlimited supply of information available to us from the environment. The more limited one's cognitive capacity, the more selective one must be in the use of information. The less information that is used, the more likely the perception is to be inaccurate and biased. Psychologists have thoroughly documented the occurrence of perceptual biases, distortions and illusions (Coon, 1977). Stereotyping, the halo effect, projection and expectancy effects are some of the biases which occur in organizations (Gordon, 1987). In the PETS framework, people who strongly cling to their stereotypes and biases are less change positive than those who relinquish them more easily. Relinquishing one's prejudices comes about by paying attention to new information and reorganizing one's perceptions in a new, more effective way. People are unlikely to relinquish such prejudices if they do not have the cognitive capacity to deal with the cognitive reorganization. Attribution is the process of assigning characteristics to people and things and of assigning causes to events (Kelley and Michela, 1980). Their importance for organizations has been repeatedly demonstrated (Bartunek, 1981). But attributions, like perceptions, are subject to biases, including the actor-observer difference, the fundamental attribution error and the self-serving bias. In the PETS framework, the more a person is subject to such biases the less change positive that person is. Decision making is the process of

choosing a course of action. Ideally, when people make decisions, they should search for and choose the optimal course of action (Huber, 1980). However, the less cognitive capacity that is applied to a decision, the more likely the decision is to be made using less than optimal techniques. To deal with their limited capacities, people practice bounded rationality which includes limited search, satisficing and sequential evaluation of alternatives (March and Simon, 1958). People's decisions are also influenced by judgmental heuristics and biases such as the availability bias, representativeness and anchoring effects (Tversky and Kahneman, 1974). In addition, people's decisions are influenced by the degree to which they are risk averse or risk seeking (Holloway, 1979). All of these biases and limitations are deviations from making truly rational decisions on the basis of all the information available. In the PETS framework, the more people are subject to these decision making biases the less likely they are to be change positive.

In summary, in the PETS model, people are more or less stability positive and change positive. The degree to which one is disposed to be stability positive or change positive is determined by both motives and cognitions. The more people are motivated by needs high in the needs hierarchies shown in Table 1, the more likely they are to be change positive. The greater cognitive capacity that people have, the more likely they are to be change positive. Since innovation involves the creation of, and adjustment to, change; it follows that if an organization is to be successfully innovative it must have employees who are change positive.

Environment, Technology and Structure

For the purpose of explaining PETS, after explaining people it is useful to go immediately to environment, technology and structure. This is at variance with the way in which most introductory organizational behaviour texts are organized. In most such texts, the chapters on motivation and cognition are early in the book and the chapters on environment, technology and structure come in the second half, separated from the chapters on motivation and cognition by a number of intervening chapters. However, my experience is that students can jump from motivation and cognition to the chapters on environment, technology and structure with little problem. Organizing the material on environment, technology and structure around their respective dimensions will require less explanation than that required for people. The ideas for environment, technology and structure have already been described by other authors so they need only be sketched here.

In the PETS model, environment includes all of the influences outside of the organization that are relevant to the activities of the organization. Environment includes such things as suppliers, culture, political systems, labour markets, competitors and customers. Taken as a whole, these external factors can be classified on a dimension running from certain to uncertain. This is based upon several theorists who have developed models of the environment. Burns and Stalker (1961) classified environments along a continuum running from static to dynamic. Emery and Trist (1965) described four types of environment; placid/randomized, placid/clustered, disturbed/reactive and turbulent. Lawrence and Lorsch (1967) classified environments along a single dimension called uncertainty. Level of uncertainty was determined by five fundamental characteristics such as time span of feedback and cause-effect uncertainty.

Duncan (1972) also categorized environments on the uncertainty dimension but based that dimension on two sub-dimensions, simple/complex and static/dynamic. Khandwalla (1974) described environments along five dimensions; turbulence, hostility, diversity, technical complexity and restrictiveness. Robbins (1990) describes three dimensions of the environment; capacity, volatility and complexity; all of which contribute to the general level of uncertainty of the environment. In PETS, although environments do have many dimensions, the most important thing about all of them for organizations is the degree to which they contribute to uncertainty. For this reason the terminology of Lawrence and Lorsch, Duncan and Robbins has been adopted for PETS. All of the other characteristics of environments are taken to be contributors to uncertainty. This is summarized in Table 2, based upon Daft (1989).

When teaching this part of PETS one can draw upon whichever model(s) of the environment are given in the text you are using. As shown in the previous paragraphs, most models can be meaningfully linked to the certainty-uncertainty dimension. Innovation can also be tied to the certain-uncertain dimension. An uncertain environment is constantly changing - that is why it is uncertain. To keep pace with those changes an organization must be good at changing itself - it must be innovative. Conversely, an organization in a relatively stable environment has less need to be constantly changing itself - it has less need to innovate. Innovative organizations are compatible with uncertain environments.

In PETS, technology refers to the "tools" used by workers to perform their work. Some tools are physical machines, such as knives, backhoes, computers and pressing machines. Some tools are intellectual, such as accounting systems and techniques of management. Technologies, physical or intellectual, can be arranged on a dimension going from simple to complex, based

upon several of the theorists who have developed typologies to characterize organizational technology. Woodward (1958) organized technologies into three groups called, (1) small batch and unit production, (2) large batch and mass production, and (3) process production. She described these as being in order of complexity. Thompson (1967) categorized technologies into three groups on the basis of task interdependence and cost of coordination. The three groups are mediating, long-linked and intensive. Perrow (1967) organized technologies along a dimension running from routine to nonroutine, based upon the number of exceptions found in the work and how analyzable those exceptions are. Robbins (1990) developed a table, parts of which are shown here in Table 3, which shows the alignment of these various topologies with each other. PETS adopts the simple-complex terminology. A simple work technology is one which presents the user with few surprises and when those surprises come they are simple to deal with. For example, making toast in a restaurant with a toaster involves simple technology. The bread come in standard sizes, fits into the slots on the toaster and is browned by the toaster appropriately. Occasionally a mis-shapen piece of bread comes along but it is simple to deal with. It has so little value that it can be thrown away. Using a newly acquired management information system involves the use of complex technology. New problems are constantly arising and the documentation and advice provided are often inadequate so the users must sort out the problems themselves.

When teaching this part of PETS, I have found it is best to use Perrow's taxonomy of technologies since it is most easily related conceptually to innovation. However, Woodward and Thompson are both workable if Perrow is not in the text you are using and you do not have time to cover Perrow in lectures.

The simplicity or complexity of work technology is linked to innovation. Innovation, by definition, involves changing how work is done. The new ways of doing work put the worker in the position of having to learn how to use the new technology. At the beginning this can be fraught with complexity. Once the worker has "learned the ways" of the new technology, the work becomes simpler because things that were once surprises are now avoided or expected and can be dealt with by techniques learned through experience. An innovative organization constantly confronts its workers with complex technology.

So truly innovative organizations can be characterized as having change positive people, uncertain environment and complex technology. Change positive people are needed to deal with complex technology and uncertain environments which demand people motivated by change and with the cognitive capacity to deal with change.

In PETS, organizational structures are the sets of rules or agreements which govern the behaviours of workers and are classified on a dimension going from mechanistic to organic. Burns and Stalker (1961) coined these terms and more recent writers have adopted them and applied meanings slightly different from the originals. The Robey (1986) version is shown here in Table 4. In this version, mechanistic structures have narrowly defined jobs, many rules and procedures, clearly defined responsibilities, a clear hierarchy, an objective reward system, objective selection criteria and are official and impersonal. Organic structures have just the opposite characteristics. The Robey version of organic/mechanistic is used in PETS.

It is now almost a truism that to be innovative an organization must adopt an organic structure. That organic structure will be most effective when the people organized by it are change positive (motivated to bring about innovation and cognitively capable of dealing with the

ambiguities inherent in an organic structure). Organic structure also gives people the decision latitude they need to deal with complex technology and/or an unstable environment.

Compatibilities and Incompatibilities among PETS Elements

So far, when describing how the PETS elements interact with each other, the focus has been upon innovative organizations. It is useful, in addition, to consider the case of non-innovative organizations as well. What follows is a generalized summary description of the compatibilities and incompatibilities of the four PETS elements. This description has been couched in terms of dichotomies for ease of explanation. This is somewhat artificial since each PETS element is theoretically classified along a dimension rather than by a dichotomy.

In PETS, organic structures are compatible with uncertain environments and mechanistic structures are compatible with certain environments. This is a point of view initially put forward by Burns and Stalker (1961) and most of the evidence supports it. Bedian and Zammuto (1991) have a table (part of which is shown here as Table 5) showing that structures with mechanistic characteristics are more effective in certain environments and structures with organic characteristics are more effective in uncertain environments. This is because in certain environments things are predictable and efficiencies can be gained by developing standardized, relatively permanent ways of doing things which a mechanistic structure keeps in place. In uncertain environments flexibility is needed and organic structure provides that better than mechanistic. Daft (1989, page 63) presents a similar summary.

In PETS, organic structures are compatible with complex technology and mechanistic structures are compatible with simple technology. Daft (1989) and Robbins (1990) both came

to this conclusion after literature reviews. Complex technology is uncertain and complicated so the flexibility provided by the organic structure is needed to deal with it. Simple technology is quite predictable and is not complicated so standardized, unchanging ways of dealing with it can be adopted and held in place using a mechanistic structure.

Now, the compatibilities between people and each of environment, technology and structure will be considered. People will be considered in terms of both motivation and cognition. To facilitate discussion, motivation will be described using the three levels in Alderfer's (1972) hierarchy; existence, relatedness, growth. Cognition will be described in terms of the factors discussed above; amount of cognitive capacity and degree of cognitive bias.

In PETS, change positive people are compatible with uncertain environments and stability positive people are compatible with certain environments. Uncertain environments are difficult to predict and full of complexity. People dealing with them must have high growth motivation if they are to be effective. They must find satisfaction in the constant challenge and the constant opportunities to learn about the changing, complex environment. Stability positive people, who find constant challenge and leaning unrewarding, will not have the drive to meet the challenges. The cognitions of people who deal with uncertain environments must have sufficient capacity to deal with the complexities. They must be sufficiently free of bias to be able to truly understand the environment despite the high ambiguity it presents. In environments that are certain, there is little to challenge people with higher level motives and their cognitive capacity will be underutilized. Stability positive people, who have little interest in learning and challenge, and whose limited cognitive capacities are all that are needed for job performance, will do well in such certain environments.

In PETS, change positive people are compatible with complex technology and stability positive people are compatible with simple technology. The reasoning here is analogous to that just used for the environment. Complex technology has frequent difficult-to-analyze problems which change positive people can deal with cognitively and find fulfilling motivationally. Simple technology is more compatible with those low on growth needs and who lack the cognitive capacity to deal with frequent complex problems.

In PETS, change positive people are compatible with organic structures and stability positive people are compatible with mechanistic structures. In organic structures roles are ambiguous and are constantly under renegotiation. People who have no motive to deal with these changes and whose cognitive capacities demand clarity in their assigned roles, will find life in such a structure unfulfilling and will not work effectively in their constantly evolving roles. Change positive people, however, will find the ambiguity challenging and fulfilling and will have the cognitive capacity to deal with work of this kind.

The compatibilities and incompatibilities just described are summarized in Table 6. The elements are shown as dichotomies, again for ease of exposition. People are stability positive or change positive. Environments are certain or uncertain. Technologies are simple or complex. Structures are mechanistic or organic. There are four elements, each of which can be in either of two states, so there is a total of 16 different combinations. Of these 16, only two have compatibility of all four elements, numbers 1 and 16. Cell 1 has stability positive people, certain environment, simple technology and mechanistic structure. Cell 16 has change positive people, uncertain environment, complex technology and organic structure. PETS assumes that organizations will function best when all four elements are in harmony. Thus, cells 1 and 16

are the ones which organizations should work towards. The American automobile assembly line during the 1950's would be a classic example of cell 1. A small innovative advertising agency would be a classic example of cell 16. Organizations seeking a high level of innovation should work towards cell 16.

Although Table 6 is a good way to summarize the logic of PETS, it is misleading if taken too literally. The dimensions for the elements should be thought of as dimensions rather than as dichotomies. People, environments, technologies and structures should be placed on the spectra of possibilities shown on their respective dimensions, not in the dichotomous categories suggested by Table 6. Further, real organizations are unlikely to find themselves in either of cells 1 or 16. Most organizations will find themselves in one of the other cells, with a mixture of compatibilities and incompatibilities among the elements. One challenge for people in organizations is to create movement on one or more of the dimensions to try to achieve higher compatibility among the elements. However, most organizations will discover that there is no realistic prospect of ever achieving full compatibility among all four elements. In such cases the challenge is to provide ways to minimize the problems associated with the interactions of the incompatible elements. Occasionally organizations do achieve the state of full compatibility. When this happens they get synergy that leads to unprecedented levels of effectiveness.

When the basics of the PETS model have been presented with the depth provided by chapters in the text-book, I find that a natural and useful culmination is to have students do a case study. Two short articles that I have found very useful here are, "What Flexible Workers Can Do", by Norm Alster which appeared in Fortune on February 13, 1989 and "A Breakthrough in Automating the Assembly Line", by Gene Bylinsky, which appeared in Fortune

on May 26, 1986. Both of these describe changing organizations in which more than one element is changing. Students can be asked to explain which of the four PETS elements are changing and in what directions along their respective dimensions. They can discuss these changes using the vocabulary provided by theorists in the text. Most descriptions of significant organizational change can be subjected to this type of analysis. It is in discussing descriptions of organizational innovations such as these that the value of the PETS model is seen in a clear and provocative way. Starting from the intuitively grasped ideas of four elements and compatibility, students venture out into the intricacies of organizational innovation with considerable comfort and self-confidence.

Other Organizational Behaviour Topics

PETS can be related to other organizational behaviour topics which have not yet been discussed. This can be done by considering the two challenges to management mentioned in the preceding section: creating change in one or more elements in order to enhance their compatibility, and minimizing friction caused by the interaction of incompatible elements. Leadership is concerned primarily with minimizing the problems caused by incompatibilities between people and the other elements. For example, the Vroom-Yetton (1973) model shows how to get good decisions by taking into account the cognitive limitations of subordinates and the nature of the problems provided by the environment and technology. Job design describes how to reduce the incompatibility between people and primarily structure and technology, although environment can also play a role. Recruitment, selection, training, socializing and career processes all have to do with enhancing the fit between people and structure, technology

and environment. When these other topics are tied into the PETS framework, they can all be linked to issues in the management of innovation. The central themes provided by PETS enable them to be all linked to each other in a quite parsimonious way.

The PETS model has been developed as a way to teach the management of innovation in organizational behaviour courses but it can also be useful to practicing managers. The easily remembered logic of PETS can be taken to the work-place and used as a problem exploration guide even when the details from organizational behaviour texts are forgotten. Managers can analyze their problems and develop solutions intuitively and/or by going back to the texts.

In conclusion, we have seen that the PETS model provides a general framework for understanding and teaching the management of innovation. The four elements; people, environment, technology and structure; and the idea of compatibility, provide a set of ideas that is easily grasped at the intuitive level and can be developed to include a great deal of the material that is presented in organizational behaviour texts. Thus, teachers of organizational behaviour are able to teach an essential contemporary topic (the management of innovation) as well as the fundamentals of organizational behaviour as they are found in most text books.

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Table 1

Change Attitude and Content Theories of Motivation

	Alderfer	Maslow	Herzberg	McClelland
Change Positive	Growth	Self-actualization	The work itself Responsibility	Need for achievement
		Esteem	Advancement Recognition	Need for Power
	Relatedness	Belonging social, and love	Quality of interpersonal relations	Need for affiliation
Stability Positive	Existance	Safety and security Physiological	Job security	

Based on Figure 4-6, page 127, Gibson et al, 1988.

Table 2

Environmental Uncertainty

Certain Environment	Uncertain Environment
Small number of external elements and elements are similar	Large number of external elements and elements are not similar
Elements remain the same or change slowly	Elements change frequently and unpredictably
Examples: soft drink bottlers, beer distributors	Examples: electronics, aerospace firms, airlines

Based on Exhibit 2.2, Page 54, Daft (1989)

Table 3

Simple and Complex Technologies

	Technology	
Theorists	Simple	Complex
Woodward	Mass, Process	Unit
Thompson	Long-linked, Mediating	Intensive
Perrow	Routine, engineering	Craft, Non-routine

Based on Table 7-4, page 195, Robbins (1990)

Table 4

Mechanistic and Organic Structures

Mechanistic	Organic
Jobs narrow in scope	Broadly defined jobs
Rules and procedures	Few rule and procedures
Clear responsibilities	Ambiguous responsibilities
Hierarchy	Diffuse channels
Objective reward system	Subjective reward system
Objective selection criteria	Subjective selection criteria
Official and impersonal	Informal and personal

Based on Figure 4-1, page 104, Robey (1986)

Table 5

Environmental and Structural Contingencies

Structural Characteristics	Environmental Types	
	Certain	Uncertain
Centralization	high	low
Job specialization		
(horizontal)	high	low
(vertical)	high	low
Coordination	rules policies procedures	training socialization mutual adjustment

Based on Table 8.4, page 331, Bedeian and Zammuto (1991)

Table 6

Combinations of the Four PETS Elements

People	Environment	Technology	Structure	Cell
Stability positive	Certain	Simple	Mechanistic	1
Stability positive	Certain	Simple	Organic	2
Stability positive	Certain	Complex	Mechanistic	3
Stability positive	Certain	Complex	Organic	4
Stability positive	Uncertain	Simple	Mechanistic	5
Stability positive	Uncertain	Simple	Organic	6
Stability positive	Uncertain	Complex	Mechanistic	7
Stability positive	Uncertain	Complex	Organic	8
Change positive	Certain	Simple	Mechanistic	9
Change positive	Certain	Simple	Organic	10
Change positive	Certain	Complex	Mechanistic	11
Change positive	Certain	Complex	Organic	12
Change positive	Uncertain	Simple	Mechanistic	13
Change positive	Uncertain	Simple	Organic	14
Change positive	Uncertain	Complex	Mechanistic	15
Change positive	Uncertain	Complex	Organic	16

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