RUNNING HEADER: Organization And Social Systems

KAM 3

Principles of Organizational And Social Systems

Walden University

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Ph.D. in Applied Management and Decision Science

Organizational Change Management

Assessor: Professor Earl Joseph

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8310 Breadth Abstract

This paper explores general systems theory. The theorists Ludwig von Bertalanffy, Walter L. Wallace, Robert Bales, Amitai Etzioni, and Barry Oshry will be discussed individually. Each theorist also will be compared and contrasted with the other. A conclusion will be offered giving personal observations of the author.

8322 Depth Abstract

This paper explores general systems theory and how it applies to a number of social and organizational situations. The introduction of technology into organizational systems and the integration of new technology with legacy systems are examined. The paper takes a historic view of the issue and then looks at recent events. Different perspectives are explored as well as a look into deeper issues of organizational turmoil in companies as new processes are assimilated in major business process reengineering projects driven by new information technology. Also contained in this work is an annotated bibliography of recent articles on the various subjects contained in the paper. The paper concludes with a summary.

8332 Application Abstract

This paper explores the effects of systems integration in software implementation projects. It explores current historical events and theories from recent publications. A survey is conducted using twenty-nine locations of a Fortune 500 company that have recently completed electronic procurement system implementations to determine what effect systems integration efforts had on each location's ability to meet its business objectives. The results of the survey are presented.

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Table of Contents

Introduction

General systems theory was proposed by biologist Ludwig von Bertalanffy in the 1940s. Since then it has become a recognized discipline which includes college courses, journals, and other trappings of academia. It is now used in a variety of scientific and technological fields (Bertalanffy, 2001).

The term “general systems theory” is often limited to its technical meaning in the mathematical sense. For example the theory that two plus two equals four can be applied to dollars, apples, and people. Regardless of the subject matter, the mathematical theory still holds true. But, general systems theory can also be applied in the same way as the “theory of evolution” is applied to anatomy and “behavior theory” is applied to everything from bird watching to complex neurophysiological theories (Bertalanffy, 2001).

In broad terms, there are three main aspects to general systems theory. The first is “systems science”. This is the scientific exploration and theory of systems in the other sciences such as physics, biology, and the social sciences. General systems theory is a doctrine of

principles applying to all classes of systems (Bertalanffy, 2001). Bertalanffy says that:

> General systems theory is the scientific exploration of “wholes” and “wholeness” which, not long ago, were considered to be metaphysical notions transcending the boundaries of science (Bertalanffy, 2001, p. xx).

The second aspect is that of “systems technology”. This is the problem arising in modern technology and society that includes the hardware of computers and the software of new theoretical developments and disciplines (Bertalanffy, 2001). Bertalanffy writes:

> Modern technology and society have become so complex that traditional ways and means are not sufficient any more but approaches of a holistic or systems, and generalist or inter-disciplinary nature become necessary (Bertalanffy, 2001, p.xx).

Multi-level systems need scientific controls. Ecosystems, formal organizations, and socio-economic systems are examples of this (Bertalanffy, 2001). To expand further on this idea, consider a complex organization such as the bureaucracy of a large multinational corporation. In these organizations, computer systems known as enterprise resource planning systems are used to integrate business activities such as order processing, manufacturing, and

financial, and inventory control (Gupta, 2000). These large corporations use these systems as controls to help avoid the financial problems associated with running a complex business.

The third aspect is “systems philosophy”. Bertalanffy describes this as “The reorientation of thought and world view ensuing from the introduction of system as a new scientific paradigm” (Bertalanffy, 2001, p. xxi). This is in contrast to the traditional analytic, mechanistic paradigm of classical science. General system theory has its philosophical aspects with an outlook of the world as a great organization (Bertalanffy, 2001).

This philosophical aspect of general systems theory has three subdivisions. The first is “systems ontology”. This is the defining what is meant by “system” and how systems are realized at different levels of observation. Real systems are those that can be observed and exist independent of the observer. Examples of this are a cat, a solar system, a cell and an atom. Conceptual systems are symbolic constructs. These include logic, mathematics and music. A subclass called abstracted systems are conceptual systems corresponding with reality. Science is an example of this (Bertalanffy, 2001).

The second subdivision is “systems epistemology”. It has the scientific attitude of empiricism but includes the study of organized wholes comprised of many variables that require new categories of interaction and organization (Bertalanffy, 2001).

The third subdivision is that of “values”. It is concerned with the relations of man and the world. It addresses the notion that symbols, values, social entities and cultures are as real as the atoms that constitute the individual items contained in them (Bertalanffy, 2001). Bertalanffy speaks to the humanistic nature of general systems theory when he says:

> While understanding and emphasizing the aspect of mathematics, pure and applied science, I do not see that these humanistic aspects can be evaded if general system theory is not limited to a restricted and fractional vision (Bertalanffy, 2001, p. xxiii.

Therefore general systems theory is humanistic but includes the mathematical and scientific structure necessary to produce testable and replicable results.

Ludwig von Bertalanffy

Ludwig von Bertalanffy begins by describing the shortcomings of modern science. He observes a tendency toward ever-increasing specialization. This specialization is driven by the enormous amounts of data and the complexity of techniques and theoretical structure in every field. These silos of activity and information are described by Bertalanffy in this way:

> In consequence, the physicist, the biologist, the psychologist, and the social scientist are, so to speak, encapsulated in their private universes, and it is difficult to get word from one cocoon to the other (Bertalanffy, 2001, p. 30).

He observed that similar problems evolved independently in the different scientific fields. The aim of classical physics was to explain natural phenomena with elementary units and blind laws of nature. The goal of biology was to resolve life into atomic entities and partial processes. Psychology attempted to resolve mental phenomena into units of elementary sensations. And finally, social science attempted to explain the concept of society as the sum of individuals (Bertalanffy, 2001). In each example, early theories evolved into ones including

the concept of looking at the effects of the system as a whole on individual aspects. Physicists determined that it was impossible to resolve phenomena into local events. Biologists discovered that the behavior of parts was different when studied in isolation or within a whole. Psychologists discovered that psychological wholes were not the summation of elementary units. Sociologists discovered that they needed to study society, economy, and nation as a whole. Each example cites a trend toward more generalized theories of universal principles applying to systems in general (Bertalanffy, 2001).

This is how the new discipline called General System Theory was postulated. Bertalanffy says “Its subject matter is the formulation and derivation of those principles which are valid for systems in general” (Bertalanffy, 2001, p. 32). “We can ask for principles applying to systems in general, irrespective of whether they are physical, biological, or sociological in nature” (Bertalanffy, 2001, p. 33). Models, principles, and laws exist which apply to generalized systems irrespective of the elements involved.

The aim of general system theory is not to develop a science of vague, hazy, and semi-metaphysical concepts. It is, instead, a general science of wholeness. Bertalanffy

says “In elaborate form, it would be a logicomathematical discipline, in itself purely formal but applicable to the various empirical sciences” (Bertalanffy, 2001, p. 37).

Bertalanffy summarizes the major aims of general system theory with this list:

1. There is a general tendency towards integration in the various sciences, natural and social.
2. Such integration seems to be centered in a general theory of systems.
3. Such theory may be an important means for aiming at exact theory in the nonphysical fields of science.
4. Developing unifying principles running “vertically” through the universe of the individual sciences, this theory brings us nearer to the goal of the unity of science.
5. This can lead to a much-needed integration in scientific education. (Bertalanffy, 2001, p. 38).

Bertalanffy describes open and closed systems. Closed systems are those which are considered to be isolated from their environments. Open systems are those that include the environments in which they exist. Kenneth Bailey offers these definitions:

> Closed System; A system whose boundaries do not allow transfer of matter-energy or information from the environment.
>
> Open System; A system whose boundaries do allow transfer of matter-energy or information from the environment [Bailey, 1994 #105] P. 151).

Conventional physics deals only with closed systems. For example, physical chemistry tells up about the reaction rates and chemical equilibria in a closed vessel where a number of reactants are brought together. This allows for the study of phenomena in a very controlled environment. But, every living organism is an open system. Bertalanffy uses organisms as an example when he says “It maintains itself in a continuous inflow and outflow, a building up and breaking down of components, never being, so long as it is alive, in a state of chemical and thermodynamic equilibrium but maintained in a so-called steady state which is distinct from the latter” (Bertalanffy, 2001, p. 39). In recent years physics has been expanded to include open systems. This expansion has shed light on many obscure phenomena in physics and biology, and has led to important general conclusions (Bertalanffy, 2001).

One example of this is the principle of

equifinality. In a closed system, the final state is determined by the initial conditions. If the initial conditions or the process is altered the final state will also be changed. In open systems, this is not the case. In open systems, the final state may be reached from different initial conditions in different ways. This was demonstrated, in one example, by the German biologist Driesch and his experiments on sea urchin embryos in the stage of early development. Driesch found that the same final result, a normal individual sea urchin can develop from a complete ovum, each half of a divided ovum, or from the fusion of two whole ova. The same applies to many other species, including man (Bertalanffy, 2001). The principle of equifinality is discussed in Wallace's writings in the context of social units. He describes how the basic units of individual behaviors affect and are affected by the basic units of the society in which he or she interacts (Wallace, 1994).

A Weberian Theory Of Human Society

The general theory of human society is inspired by the work of Max Weber (1864-1920) and articulated by Walter L. Wallace. This theory proposes a description of human

society, its causal explanation, and speculations about the future of human society. This is considered a general theory because of its perspective of society in time and space. Most social scientists agree that Weber's work contains extraordinary insight into may central concerns of late twentieth-century social science (Wallace, 1994). Bertalanffy considered social science as a systems science when he wrote "Social science is a science of social systems. For this reason, it will have to use the approach of general systems science" (Bertalanffy, 2001, P.195).

Wallace references the principle of equifinality, mentioned in Bertalanffy's work as he considers different psychological motivations as alternative explanations for the same psychological behavior. It bolsters the claim the society, as a whole, can do the things necessary for survival that individuals cannot do [Wallace, 1994 #100]. Bertalanffy references a final state that is derived from different initial states in different ways (Bertalanffy, 2001).

Wallace discusses the structure of society. He describes society as a nearly self-sufficient and self-reproducing throughput system. Wallace described it this way:

> Every human society, then, is here regarded as a throughput system-that is, an open system that exists in continuous, overlapping, iterations of:
>
> 1. Taking-in participants;
> 2. Organizing the behavior of these participants while they last; and eventually,
> 3. Allowing (or forcing) these participants to leave it (Wallace, 1994, p. 48).

This is consistent with Bertalanffy's definition of an open system which includes input from and outputs to its surrounding environment (Bertalanffy, 2001).

Conceptualizing human societies as throughput systems leads to the hypothesis that they always consist of three sets of institutions through which they manage the flow of participants. Participant-intake institutions manage the internal biological reproduction of new participants, the immigration of new participants biologically produced elsewhere, and the physiological and psychological preparation of both types of recruits so they can be organized into the societies. Participant-organizing institutions coordinate certain activities of the individuals provided by the participant-intake institutions for as long as they are members of society. Participant-outlet institutions manage the disposal of society's dead

participants and the emigration of its disaffected, disabled, unwanted, or adventure-seeking participants (Wallace, 1994).

Focusing on participant-organizing institutions, Wallace viewed them as functionally differentiated but interdependent economic, political, religious, and scientific components, whose distinctive products are specified as wealth, power, honor, and knowledge. These institutional specializations have not always existed at their present high levels. The starting point seems certain to have been in a small institutionally undifferentiated society. Internal differentiation seems to have proceeded in two discrete breaks. The main driver was the increase in population (Wallace, 1994). Wallace describes it this way:

> The first, prehistoric, break occurred when the political and religious institutions of some societies jointly split off from the economic and scientific institutions. The second, early modern, break occurred when the political institution of some of these societies split off from the religious institution, and, more or less at the same time, the scientific institution. In these two steps, the participant organizing institutions seem to have

> evolved toward increasingly differentiated (but persistently interdependent) functions (Wallace, 1994, p. 77).

Human society, as a global whole has evolved over time. The evolution has proceeded simultaneously, but at different rates from society to society. This evolution is governed by each society's specialization of participant-organizing institutions, the degree of choice provided by the society's dominant culture, the society's organizational scale, and in the society's spatial reach (Wallace, 1994).

As stated, Wallace claims that since prehistoric times the typical human's social world has grown:

1. More role-diverse, as a result of increasing institutional specialization (coupled with new modes of institutional integration);
2. Richer in choices, as a result of increasing cultural rationality;
3. More interdependent with other people, as a result of increasing organizational scale; and
4. Bigger, as a result of increasing spatial extension and consolidation (Wallace, 1994, p. 115).

The Weberian theory says that the second component, culture, is what orients and sustains the other three.

This view rests on the premise that all humans are cultural beings, endowed with the capacity and will to take a deliberate attitude toward the world. This cultural component is heavily influenced by individuals with the ability to exercise influence over others. Weber defines this revolutionary force of influence as “charisma”. Charisma is a term applied to an individual who’s personality causes others to perceive that individual as being endowed with supernatural, superhuman, or exceptional powers or qualities (Wallace, 1994).

In summary, the Weberian theory of society is a general system theory that describes societal institutions as open systems. These systems operate independently of each other and constantly interact. Through this interaction they constitute the wholeness of society.

Sociology And The New Systems Theory

Kenneth Bailey describes the “new social systems theory”. In it, he addresses only those systems approaches that contribute directly to social science. Bailey states three goals for his writings. First, he presents a more integrated view of interrelated approaches in an attempt to synthesize them in a way that maximizes their efficiency

for social scientists. Second, he attempts to integrate systems theory and sociological theory. The third goal is to make sociologists more aware of recent developments in social systems theory (Bailey, 1994).

Social systems involve regular relations of interdependence between individuals or groups. These relations can be described as recurrent social practices. Social systems are systems of social interaction. Systems have structured properties but are not structures in themselves (Bailey, 1994).

Anthony Giddens, for example, makes the distinction between general systems theory and systems technology, including information technology and cybernetics. He states that these were created in association with technological developments. By maintaining this distinction, it is possible to critique the ideology of systems technology (Giddens, 1979).

Bailey's writings are based on the premise that systems theory makes a vital contribution to sociology. It has the ability, through an integrative framework, to combat overspecialization and link sociology to other disciplines. Bailey describes it this way:

> One of the chief goals of systems theory is to expose and avoid duplication of effort, as when researchers,

> in different fields (or perhaps the same field) are doing essentially the same research, perhaps using different words or labels, without knowledge of the other's work (Bailey, 1994, p. 39).

Some sociologists reject the integrative potential of a broad approach and prefer specialization without concern for its potential inability to be consolidated. A systems approach does not, however need to replace the specialized approach, it can be used to supplement it by linking the specializations together. In this way, the systems view becomes part of the specialization and compliments the narrower approach (Bailey, 1994). Bertalanffy justifies this expansion of scientific approach when he says:

> The impact of and progress in the biological, behavioral and social sciences seem to make necessary an expansion of our conceptual schemes in order to allow for systems of laws in fields where application of physics is not sufficient or possible (Bertalanffy, 2001, P. 32).

Bailey lists three prominent types of systems that exist:

1. Conceptual systems; Those systems whose basic units are words or symbols instead of concrete entities. These are also called pattern systems. Mathematical

models such as differential equations are examples of this.

2. Concrete systems; Those systems that are nonrandom accumulations of objects in physical time-space. Solar systems are examples of concrete systems.
3. Abstracted systems; These systems contain relationships, not objects, as the basis units of analysis. These systems are used in social science and biology and focus on noun and verb relationships. They describe a noun’s role in the verb.

Bailey goes on to describe the same types of systems as Bertalanffy.

4. Isolated systems; Those thermodynamic systems whose boundaries cannot be penetrated by either matter no energy.
5. Closed systems; Those thermodynamic systems in which energy, but not matter can cross system boundaries.
6. Open systems; Those systems in which both matter and energy can cross system boundaries.
7. Regulated systems; Those systems in which matter-energy as well as information flows can be regulated.

All social systems are regulated systems. They must be open some of the time to allow matter-energy, such as food, to enter to sustain life (Bailey, 1994).

Social Interaction Systems

Robert Bales writes about the SYMLOG system. SYMLOG is an acronym for: Systemic, Multiple level, Observation of Groups. It stems from an instructional booklet written for the SYMLOG consulting group. He describes the system this way:

> The SYMLOG System is a theory of personality and group dynamics integrated with a set of practical methods for measuring and changing behavior and values in a democratic way. It is designed for application in a specific group in its natural situation. The theory and methods are applicable to many kinds of groups and situations. Typically, the purpose is to understand the group better in order to improve productivity and satisfaction (Bales, 1999, p. 3).

Its aim is to indicate ways in which leaders and members can act to encourage changes in group-performance and to reduce stress. It can also facilitate fundamental and

applied research in social psychology and sociology (Bales, 1999).

Bales breaks down the terms in the SYMLOG acronym to better explain its meaning. Systematic refers to the theory and methods that provide ways for leaders and group members to include and measure a more complete set of variables pertinent to their behavior and values than would otherwise be possible. Multi-level refers to the fact that there are a number of methods of measurement. These methods enable one to measure many aspects or levels of individual behavior. This includes aspects of internal psychology, nonverbal behavior, overt behavior, and the value content of communication. The observation of groups refers to the fact that the theory is based on findings derived from the systematic observation of real groups. The observations included rating the frequency of various kinds of behavior and values made by group members (Bales, 1999).

The SYMLOG theory is an integration of findings and theories from psychology, social psychology, and sociology. As a field theory, it takes account of the fact that every act takes place in a larger context and is part of an interactive field of influences. Using this approach, one must understand the larger context, which includes

personal, interpersonal, group, and external influences. Once understood, these patterns of behavior can be influenced. The measurements of SYMLOG include behavior patterns, values, and their larger context (Bales, 1999).

Research indicates that at least three bipolar characteristics are fundamental and universal.

1. Dominance versus submissiveness;
2. Friendliness versus unfriendliness; and
3. Acceptance versus non-acceptance of authority.

Because research shows that these characteristics are universal, they always need to be taken into account. The process measures the frequency with which individuals show one aspect or another of each characteristic. It also measures the frequency with which an individual implies that a given kind of behavior is good or bad to make evaluations of values in behavior. Group members record their observations on a rating form. The results are then plotted on a cube diagram. When plotted, the results reveal the perceived direction of the person or concept being studied. These directions point to one of the three dimensions mentioned above (Bales, 1999).

An individual who receives a rating in the dimension of “Dominance versus Submissiveness” is perceived, by the rater, to display prominence, status, power, and personal

influence in relation to the other group members. These dominant group members may be extroverts. They may also show a tendency to impose their views on the group. Wallace references charisma as the term applied to an individual who's personality causes others to perceive that individual as being endowed with supernatural, superhuman, or exceptional powers or qualities [Wallace, 1994). Individuals rated in the "Friendliness versus Unfriendliness" dimension often display behaviors that may be perceived as self-interested and self-protective. In the general SYMLOG framework, the term authority is used in a very broad sense. It refers to a group environment of organized restraints and constraints that is widely recognized to have some kind of legitimacy. The dimension of Acceptance versus Non-Acceptance of Authority uses rating items with wording adapted for different types of organizational settings. The items describe values shown in behavior instead of simply behavior (Bales, 1999). Considering Bertalanffy's principle of equifinality (Bertalanffy, 2001), the SYMLOG framework seems to be based on the general systems theory.

Bales believed that SYMLOG can contribute greatly to the satisfaction and productivity of group members. Transformational change can be encouraged by open group

discussion in which all members contribute. Discussing change, Bales writes:

> The roles of group members and the value of organizational significance can be changed. They are much easier to change than the deeper personality characteristics of group members. One of the great secrets of successful change is that it may be easier to change the whole interdependent constellation of roles and values than to change them one at a time. Roles and organizational values are interdependent – the successful movement of each one is dependent upon the supporting movement of others (Bales, 1999, p. 26).

The probability of effective change is increased when discussion is carried to the point of explicit decisions and commitments to modify behaviors (Bales, 1999).

Complex Organizations

Amitai Etzioni, in his writings on Compliance Theory talks about effectiveness, goals, and system models. He defines effectiveness as the extent to which a goal is realized. In describing the purpose of organizations, he says:

> Basically, effectiveness is what organization is all about: An organization is an artificial social unit whose inner logic and manifest purpose call for greater effectiveness than found in natural units (Etzioni, 1975, p. 133).

He cautions, however, that the goal of high effectiveness can undermine an organization in the long run. This can happen when an organization's goals are inconsistent with its compliance structure. The means of control must be compatible with the goals or the goals will not be realized and the organization will become ineffective. Bertalanffy supports this when he describes the Malthusian law which is when the size of an organization grows beyond the size of it's resources (Bertalanffy, 2001). Etzioni cites, as an example of this, when output is increased by coercion to get more output from labor. Output may be increased temporarily, but production can suffer in terms of quality. Quality is harder to monitor than quantity (Etzioni, 1975).

Etzioni suggests that organizational effectiveness cannot be measured only by the level of goal realization. One needs to consider the pattern of relationships of the elements of an organizational system that services one or more goals. By considering these relationship patterns,

system needs that ensure effectiveness in the long run can be taken into account (Etzioni, 1975).

Goal models are in integral part of the systems model of organizations. The goal model is considered an objective analytical tool for assessing effectiveness. It uses the values of the subject being studied as the criteria for judgment. There are limitations to goal model analysis. The findings of the study are often dependent on the model's assumptions. These studies often come to two conclusions. The first is that the organization under study does not realize its goals effectively. The second is that the organization has other goals than it claims to pursue. Goals are cultural entities. They depict target states of being. Organizations are social systems. They are systems of coordinated activity by more than one participant. Cultural systems are more consistent than social systems for two reasons. First, the attainment of a cultural state requires investment. Due to the fact that more investment is needed than is actually available, social units are less perfect than their cultural anticipation. Second, there is a discrepancy between goals and social units. All social units, including organizations are multifunctional. They devote part of their resources directly to goal attainment, and part to

other functions. These other functions include the acquisition of additional means to goals and the maintenance of those that serve the attainment of current goals (Etzioni, 1975).

An alternative to goal models is the system model. This approach starts with a working model of a social unit capable of achieving a goal. It is a multifunctional unit, not a goal or a set of goal activities. It assumes that resources are allocated to non-goal functions like those needed to maintain the unit itself. The system model recognizes that these activities are functional and necessary for organizational effectiveness. If a social unit puts all of its resources into one functional requirement, then other subsystems will be neglected. This is true, even if the activities are directly related to the goal. Etzioni describes the mobilized system model, which deals with the organizational patterns of the mobilization of resources. In this model he says that organizations treat all subsystems, other than goal attainment, as instrumental to goal attainment. All system models deal with relationships among subsystems. Organizational systems differ in that they focus on goal attainment rather than other subsystems or integration (Etzioni, 1975).

Social systems have four basic functional problems. When simple social systems grow in complexity, four subsystems form to deal with these problems. Etfioni says that the four problems are:

a. The systems need to control the environment;

b. The gratification of the system's goals

c. The maintenance of solidarity among the system units; and

d. The reinforcement of the integrity of the value system and its institutionalization (Etzioni, 1975, p. 141).

These problem areas are referred to as adaptation, goal-attainment, integration or solidarity, and latency or tension-management, respectively. An example of how to apply these terms to different organizations is discussed in the Iowa State Compliance Studies.

In the Iowa studies, an analysis was done with the Civil Defense Preparedness Agency. This organization is charged with contingency planning for disasters. The definitions and measurements are listed below.

Adaptation was defined as the ability to secure outside resources for the organization. Metrics included completed forms, increases in office space, and personnel increases. Integration was defined as linkages developed

with other local government agencies and local groups. Staff integration was not included since there was no real paid staff. Latency (tension management) was defined as the degree to which local directors were satisfied with their positions. The assumption was that the more gratifying the role, the more managed the system's tension. Goal attainment was defined as the measure of how well the official goals were met (Etzioni, 1975).

Seeing Systems

Barry Oshry begins by talking about system blindness. He states that humans spend their lives in systems. Families, churches, bowling leagues and organizations are all examples of the systems in which we live. Oshry contends that there are negative ramifications when people do not recognize the systems in which they participate (Oshry, 1996).

There are four types of system blindness. They are spatial, temporal, relational, and process. Spatial blindness refers to the fact that we only see part of the system. One sees what is happening with him or her, but not what is happening elsewhere. One doesn't see how his or her world impacts others or how other worlds impact

them. Temporal blindness is when one sees the present, but not the past. The current experience is recognized, but not what led up to the experience. Relational blindness refers to relationships with one another. It addresses the levels at which individuals relate to each other. Process blindness is when one does not see systems as wholes and entities in the overall environment (Oshry, 1996).

Bertalanffy And Wallace

Bertalanffy's theories are an attempt to take a holistic view of societies and organizations. He asserts that the ever increasing specialization in science has led to more complexity in research and a disjointedness to the way information is stored and used. He also believed that research done in a closed environment mistakenly ignores the effects of an event's surroundings (Bertalanffy, 2001). Wallace asserts that Weber's writings suggest that society has developed in much the same way. Increasing specialization has led to the development of more role-diverse societies (Bertalanffy, 2001).

Wallace describes every human society as an open throughput system. The participants in societies are taken as inputs, processed as they are organized, and output as

they leave or die (Wallace, 1994). This coincides with Bertalanffy's theory that all systems take in inputs, process them, and produce outputs (Bertalanffy, 2001). Considering Bertalanffy's aspect of systems philosophy, Wallace's interpretation of Weber's views hold true as a system theory. This plays on the view of the world as one great organization (Bertalanffy, 2001).

Bertalanffy talks about the aspect of systems technology. He states that the complexity that exists in many modern organizations have necessitated the need to develop computer technology to integrate them. This is especially true in multi-level systems that need scientific controls (Bertalanffy, 2001). This is a natural extension of Weber's belief that the need for more exact transactional accounting required the development of more complex accounting practices. Weber called this the field of rational commerce. It is a natural requirement of the expansion of capitalism (Weber, 1922/1961).

Bertalanffy's wholistic view of organizations and society align well with Weber's systems view of how societies evolve in a complex capitalistic environment. This evolution drives the development of systems to deal with the increased complexity.

Bailey And Wallace

Bailey focuses his efforts on improving the social sciences with his work. In doing so, one of his goals is to integrate sociological theory and systems theory. He makes the distinction between societies and social systems by pointing out that societies have structure and therefore substance. Social systems are merely ways of studying those societies (Bailey, 1994). Wallace uses Weber's work to categorize societies as throughput systems helps structure the study of societies by the ways in which the members are processed (Wallace, 1994). In this way, both Wallace and Bailey are very similar in their views on the way societies are studied using systems theory.

Bailey's reference to systems theory and systems technology seems consistent with Weber's contention that technology has developed to support the accounting requirements of more complex societies (Bailey, 1994) (Weber, 1922/1961). This view separates systems theory from systems technology in much the same way that Bertalanffy separates the aspect of systems technology (Bertalanffy, 2001). Bailey goes on to say that systems theory can be used to critique the ideology of systems technology (Bailey, 1994).

Bertalanffy And Bailey

Bertalanffy and Bailey had a number of common themes in their writings. Each looked at systems theory as a framework for achieving integration in complex situations. Bailey aims to avoid duplication in research efforts when researchers are working in different fields (Bailey, 1994). Bertalanffy states that one of the major aims of systems theory is to integrate various sciences in a general theory of systems (Bertalanffy, 2001).

Both authors talk about open and closed systems. Bailey also describes conceptual, concrete, and abstracted systems. These additional models define systems that aid researchers by describing open ways of dealing with different research output (Bailey, 1994). Utilizing a systems approach breaks down the silos created by separate branches of science (Bertalanffy, 2001).

Neither author offers systems theory as a substitute for the hard sciences. Some social scientists, for example, reject an integrative approach and prefer specialization without regard for the ability to consolidate (Bailey, 1994). But Bertalanffy points out that the aim of general system theory is not to develop a

science of vague concepts. Instead, it is a discipline that is applicable to the various empirical sciences (Bertalanffy, 2001).

Discussion Of Topics

Equilibrium

The concept of equilibrium is referenced in much of the reading on systems theory. Bertalanffy refers to the equilibrium principle as “the principle of stability”. “The basic function of the mental apparatus consists in maintaining homeostatic equilibrium” (Bertalanffy, 2001, P. 190). Behavior is, essentially, the reduction of tensions. Bailey says “only systems have equilibrium, as it is a group property not an individual one” (Bailey, 1994, P. 87).

The equilibrium state is reached when opposing forces are balanced. This is apparent when one studies the different forms of equilibrium. Stable Equilibrium is achieved when a physical object is at rest with its center of gravity at its lowest point. Static equilibrium is achieved when an object in linear motion comes to rest. Rotational equilibrium is achieved when two torques are balanced (Bailey, 1994). In all of these examples, the

open system, consisting of an object and its surroundings interact in such a way that the open system is in order or balance. Objects reach an equilibrium state naturally as forces equalize. Bales, in his study of social interaction systems, observed that there was difficulty in achieving equilibrium in small group settings (Bales, 1999). He writes:

> At the time I began observing groups, the prevailing theories hypothesized that social groups and social processes tended to reach and maintain an "equilibrium" of some kind. Try as I might to find support for this hypothesis, my actual results seemed to show that maintenance of equilibrium, while it might or might not be characteristic of some social systems, was a constant problem or whole set of problems in the particular groups I could observe (Bales, 1999, P. 179).

This seems to contradict the other research that proposes that an equilibrium state is achieved in perfect social systems and is obtained by other systems as they evolve.

Entropy

If equilibrium is considered the stable state achieved in systems, entropy is the opposite of stability. In

closed thermodynamic systems, entropy increases to a maximum, and then reduces to a stop as equilibrium is achieved (Bertalanffy, 2001). Bertalanffy says:

> In a closed system, entropy increases according to the Clausius equation:
>
> $$dS \geq 0$$
>
> In an open system, in contrast, the total change of entropy can be written according to Prigogine:
>
> $$dS = d,S + d,S$$
>
> d,S denoting the change of entropy by import, d,S the production of entropy due to irreversible processes in the system (Bertalanffy, 2001, P.144).

This leads one to believe that open systems naturally move toward an equilibrium state.

Bailey refers to entropy as a measure of societal integration when he says “Obviously, a measure is needed which varies from zero societal integration to maximum societal integration. Entropy is such a measure” (Bailey, 1994, P.246). Entropy can be defined both in matter-energy and information.

Observing Bales’ experiences with small interactive groups, his research supports the reduction of entropy in open group systems when communication and feedback mechanisms are in place. He describes his results by

saying “It varies within many different types of constraints and conditions. Sometimes it is relatively ‘effective’ and sometimes not” [Bales, 1999 #101] P.180). This seems to be consistent with his findings in equilibrium in small interactive groups (Bales, 1999).

Equifinality

Bertalanffy discusses the transition from entropy to equilibrium when he says:

> If a steady state is reached in an open system, it is independent of the initial conditions, and determined only by the system parameters, i.e., rates of reaction and transport. This is called equifinality as found in many organismic processes, e.g., in growth. In contrast to closed physico-chemical systems, the same final state can therefore be reached equifinally from different initial conditions and after disturbances of the process (Bertalanffy, 2001, P. 142).

This model suggests that a steady state evolves from different initial states, in different ways from the interaction of open systems.

This supports Wallace’s assertion the society, as a collection of interactive open systems is capable of accomplishments that individuals are not (Wallace, 1994).

The specialization that occurs as societies evolve create areas of specialization that interact dynamically as open systems.

Conclusion

The authors studied in this paper offer varying perspectives on systems theory. Some believe that it is a vague science of its own. Most look at it as an adjunct to the empirical sciences.

System theory provides a framework in which to accomplish many things. It can be used to organize research and research methods. It can be used to analyze organizations and societies. Using it as an organizational framework, Systems Theory can link multiple disciplines from the empirical sciences and allow for the sharing of research data.

Systems are comprised of inputs, processes, and outputs. Using this framework, it is possible to define organizations. Interactions within and between organizations can be defined and studied. I am particularly interested in the potential use of Systems Theory to analyze complex organizations. I can see real value to using this method of analysis to develop and

introduce technology in large business environments. Using a methodology like SYMLOG in an environment where complex computer systems are being implemented in a complex environment, the organization may better understand the change-management efforts needed to link people and processes with technology. By understanding the group-dynamics involved, members of an organization can better self-assess the structural changes necessary to adopt the new processes necessary to take advantage of new technology. Organizations, like any form of society, possess internal institutions for the recruiting, organization, and disposal of resources. Each of these institutions has a role to play in managing the societal changes necessary in an organization that is adopting new technology.

Studying the principles of entropy, equilibrium, and equifinality, one can use systems theory to study the evolution of societies. Individual, specialized subsets of society interact as open systems. Each strives to evolve from a state of entropy to an equilibrium state. This individual evolution and interaction, as specialized open systems, naturally produces a more stable state that is better positioned for survival.

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RUNNING HEADER: Organization And Social Systems

AMDS 8322 - KAM 3 Depth

Current Research in Organizational Systems

Walden University

Mark T. Luckett

Ph.D. in Applied Management and Decision Science

Organizational Change Management

Assessor: Professor Earl Joseph

June, 2002

Table of Contents

Annotated Bibliography

Anderson, B., E. Klein, et al. (2000). “Why change is a conscious choice.” The Journal For Quality and Participation **23**(1): 32-36.

This article examines why so many change efforts fail. In it, the author asserts that a common pattern exists in failed change efforts. Crucial variables are ignored or underemphasized. The article describes four quandrants of change. Each quadrant contains a different change aspect. There are two primary ways change efforts are set up to fail. First, they lack a whole-system approach. Second, they ignore the internal quadrant aspects which deal, primarily with psychology and culture.

The research for this article comes from the author's personal experience and research. Facts are put forth in the article, but the sources are not cited.

This article is relevant to my research because it addresses organizational change from the systems perspective. It puts organizational change into a

framework for achieving success systematically by looking at change from the whole-system perspective.

Atkinson, P. (2001). “What's in & what's out in corporate transformation.” Management Services **45**(6): 6-10.

This article looks at change from the organizational, cultural, and leadership perspectives. In it, the author talks about corporate transformation and the core competencies an organization needs to effectively change and transform itself. A process for change is discussed as well as social trends in organizational change.

The research for this article comes from the author's readings, which are referenced. It also draws from the author's experience as a change consultant.

This article is relevant to my research because it addresses organizational change needed to effect true transformation. The article talks a little about how organizations are part of and affected by the social trends of the societies in which they exist.

Baba, M. L. (1999). “Dangerous liaisons: Trust, distrust, and information technology in American work organizations.” Human Organization **58**(3): 331-346.

This article studies the implementation of information technologies in American corporations. The objective is to understand the role of interpersonal trust and distrust on the use of new technologies in organizational settings. The study shows how parties often try to change the medium of information exchange to gain control over hierarchical relationships. Resistance often results when there is a perception, among less powerful parties in an organization, that the security and quality of information is at risk. The study suggests that local knowledge and interrelationships must be taken into consideration when implementing advanced technology.

Research for this article came from a study of nineteen workgroups in different divisions of manufacturing firms. The article also sites a number of publications on the subjects of organizational trust, managerial values among others.

This article is relevant to my research because it uses the natural-systems approach to explore

complex social and economic factors. It also addresses the subject organizational change.

Barnard, J. (1999). “The empowerment of problem-solving teams; Is it an effective management tool?” Journal of applied management studies **8**(1): 73-84.

This article investigates differences in the level of team empowerment in problem-solving situations. The study showed differences in team empowerment based on technical systems and formal team development processes. The study showed a positive correlation between quality scores and the level of team empowerment.

The research for this article included a review of relevant literature as well as a study of 652 problem-solving teams. It also leveraged the experiences of the authors.

This article is relevant to my research because it examines team circumstances from a total quality and sociotechnical systems perspective.

Brightman, B. K. and M. J. W. (1999). “Building organizational citizenship.” Management Decision **37**(9): 678-685.

This article asserts that an organization’s success is built on the participation and good work of its staff. It advises leaders to view their organization as a country, and frames their primary management challenge as creating “organizational citizenship”. It defines "organizational citizenship" as a voluntary consistent commitment to the goals, methods, and ultimate success of the organization. Most leadership strategies are designed to create specific business results; their effectiveness will depend on the creation of a culture of patriotism throughout the organization.

The research for this article is based on published literature and the experiences of KPMG, one of the world's largest professional services firms.

This article is relative to my work because it discusses the use of common systems and processes to build a commitment to the organization from its employees.

Cohen, M. (1999). “Complex organizations; Organizational change.” Organization Science **10**(3): 373-376.

This article looks at complex organizations from a systems theory perspective. The author looks at the applicability of general system theories to complex organizational situations. He addresses the effect of information technology and its ability to facilitate a change in organizational structure.

Research for this article came from a literary review of current articles and books. It also includes the authors' experiences and opinions.

This article is relevant to my research because it addresses the subjects of organizational change and the introduction of information technology. It looks at complex organizations and discusses the applicability of general systems theories.

Jarley, P., J. Fiorito, et al. (2000). “National union governance: An empirically-grounded systems approach.” Journal of Labor Research **21**(2): 227-246.

This article deals with governance systems in labor unions. It looks at democracy issues as well as the level of access given to union members. It takes a systems approach as it looks at governance structure functions and how these functions relate to each other and other attributes. It looks at the

adoption of governance systems with different attributes.

Research for this article includes the coding of 92 union constitutions. It examines the structure and complexity of the constitutions. Also included were results from National Union Survey (NUS) which included 111 unions.

This article is relevant to my research because it deals with organizational governance from a system perspective. It explores governance systems, their complexity, and their effectiveness.

Johnson, B. and W. Woolfolk (1999). “Counterintuitive management of information technology.” Business Horizons **42**(2): 29-36.

This article assumes that the past three decades of information technology management has been flawed and has produced an environment of inflexible systems that are too costly and do not meet business expectations. It makes note that, despite IT's focus on systems development, systems maintenance is the larger item in the budget. It discusses attributes of flexible systems that allow for job redefinition and

seamless data sharing. It also discusses several common IT myths.

The research for this article came from previously published works as well as the experience of the authors who are professors and consultants.

This article is relevant to my study because it takes a counter opinion to most of the writings I have found on the subject of technology adoption and its effect on organizations.

Kathuria, R., M. Anandarajn, et al. (1999). "Linking IT applications with manufacturing strategy: an intelligent support system approach." Decision Sciences **30**(4): 959-991.

This article researches competing priorities faced when matching information technologies with the competitive strategy of the company. The authors of this paper develop a decision support system that assists managers with the assessment and prioritization of competing processes and structures in an organization.

Research for this article was done using a decision support framework based on the research of several authors. The authors describe a decision

support system for aligning Information Technology initiatives with a company's manufacturing strategy. The technique described uses a mathematical model to prioritize competing corporate initiatives and their demands on an information system.

This article is relevant to my research because it attempts to apply a general decision support system to a common corporate dilemma. The system described in this article aids managers in making objective decisions.

Lassila, K. S. (1999). “Adoption and utilization of commercial software packages: Exploring utilization equilibria, transitions, triggers, and tracks.” Journal of Management Information Systems **16**(2): 63-90.

This article examines the fact that researchers and managers are beginning to realize that the full advantages of information technologies are not likely to be realized unless both the information technology and the organizational context are adapted during implementation. This highlights the importance of understanding and managing the relationship between information technology and organizational change. Managers and users can enhance and prolong the useful

life of software packages by paying careful attention to implementation efforts that heavily influence initial utilization equilibrium, identifying periods of equilibrium and transition, and managing the internal and external change triggers that influence transitions between equilibrium states.

The research for this article was gathered by using a random sample of ten companies, of which eight participated. Twenty one individuals were interviewed. This was a truely scientific study using good research techniques.

This article is relevant to my work because it provides good, credible data from primary research.

Morel, B. and R. Ramanujam (1999). “Through the looking glass of complexity, The dynamics of organizations as adaptive and evolving systems.” Organization Science **10**(3): 278-293.

This article explores organization theory and Complex Systems Theory (CST). The authors focus on organizational evolution and social network analysis. They explore a model of organizational evolution based on biological evolution. The research

suggests that CST may best be used as a framework that facilitates formal modeling.

Research for this article consists, primarily, of a review of published literature. The authors also employed analytical tools such as Fractals, which is a mathematical tool used to analyze self-similarity.

This article is relevant to my research because it explores CST in the context of organizational evolution. This context fits with the study of organizational change management.

Reed, R., D. J. Lemak, et al. (2000). “Total quality management and sustainable competitive advantage.” Journal of quality management **5**(1): 5-26.

This article explores the validity of the claim that Total Quality Management (TQM) can generate a sustainable competitive advantage. The authors use systems theory, along with the theory of competitive advantage to substantiate the TQM claim. The article concludes that TQM is capable of producing a cost or differentiation advantage.

Research for this article consists of a literary review of current articles and books on the

subjects associated with TQM. With the methods associated with quality metrics, I would have thought that more hard data from primary research would have been used.

This article is relevant to my research because it uses systems theory to deal with the complexities of TQM. Using TQM involves multiple levels of an organization and tight integration between and among levels.

Romeo, J. (2001). ERP On the rise again. Network Computing: 42-47.

This article describes the use of Enterprise Resource Planning (ERP) software systems in an e-business environment. The author talks about current high-profile implementation failures.

Research for this article came, primarily from published reports in other publications and the author's investigation.

This article is relevant to my research because it establishes current popular thinking about ERP systems. It documents what current popular press is reporting.

Romeo, J. (2001). Less pain, more gain in ERP rollouts. Network Computing: 49-56.

This article discusses the complexity of Enterprise Resource Planning (ERP) software implementations. It gives advice on potential problems in implementations and ways to avoid them. It discusses the complexity of the software and the implementation of it in an organization.

Research for this article came, primarily from published reports in other publications and the author's investigation.

This article is relevant to my research because it establishes current popular thinking about the complexity of ERP systems implementation. It documents what current popular press is reporting.

VanGeert, P. (2000). “The dynamics of general developmental mechanisms: From Piaget and Vygotsky to dynamic systems models.” Current directions in psychological science **9**(2): 64-68.

This article describes systems model based on dynamic systems theory. This dynamic systems model is based on a developmental model adapted from Piaget and Vygotsky. The author describes a self-

organization process that employs a dual mechanism which works simultaneously on two levels of an organization.

Research for this article came from a literary review of published works. A case study would have made the article more credible.

This article is relevant to my research because it uses a dynamic system model. The model is used to assemble and develop organizations.

Technology And Social Change

As societies evolve and become more complex, technology evolves to meet the demands of dealing with these complexities. The introduction of technology has an effect on people and structures directly touched by it as well as the more macro environment that surrounds those people and structures.

The Weberian general theory of human society proposes a description of human society, its causal explanation, and speculations about the future of human society. This is considered a general theory because of its perspective of society in time and space. Most social scientists agree that Max Weber's (1864-1920) work contains extraordinary insight into many central concerns of late twentieth-century social science (Wallace, 1994).

Max Weber studied how societies and businesses changed with the growth of capitalism. In his theme of rationalization, he described how economic values brought forth a form of calculation in human activity that was more precise than traditional methods of social measurement. This rationalization led to the development of calculable law and the development of that part of the legal system that pertains to commercial activity. The gain spirit that

evolved from these developments changed the way economic and religious aspects of society related to each other. These changes in that relationship shaped the way societies evolved. This evolution continues in business organizations as corporate cultures are called into question just as religious traditions were during the industrial revolution (Weber, 1922/1961). Culture is analogous to religion in corporations. An article in The Journal of Quality Management says “Culture is the values, beliefs, and norms that guide behavior in organizations” (Reed, Lemak, & Mero, 2000) p. 15).

Technology has always been a part of human civilization and has had a role in its evolution. The wheel, spear, cooking, and every other advancement that has allowed humans to improve their condition are all examples of technology. Each advancement allowed the society, in which it was developed to achieve things that it was not able to achieve before (Temporary National Economic Committee (TNEC), 1999). A report by the Temporary National Economic Committee states:

> Technology refers to the use of physical things to attain results which human hands and bodies unaided are incapable of achieving. In this sense, technology reaches back to the beginnings of human culture, has

> always played a highly significant role in social evolution and will remain a mainstay of civilization (TNEC, 1999, p. 138).

To this point, technological advances are part of the natural development of humans and their societies. Advances in knowledge and technical understanding lead to the production and application of new technology which then causes changes in society (Norman, 1981). Collin Norman describes it this way:

> Technology development, according to this view, is an evolutionary process, not unlike biological evolution. We even speak of new generations of computers, automobiles, and other high-technology goods as if they were biological descendents of earlier models, and key technical developments are often regarded as the progenitors of a whole range of subsequent innovations (Norman, 1981, p. 20)

Historically, many social changes have been determined by technology. The introduction of technology changes the way society functions.

Technology And Organizational Change

Anthony Giddens makes the distinction between general systems theory and systems technology. He states that systems technology was created in association with technological developments. By maintaining this distinction, it is possible to critique the ideology of systems technology (Giddens, 1979).

Both social systems and technology influence performance and quality. Understanding this, the Tavistock Institute in England advocates the use of the Sociotechnical Systems approach to determine the task environment (Barnard, 1999). The key principles of Sociotechnical Systems model are human resource development, response to the environment, innovation, cooperation, commitment, and joint optimization of both the social and technical dimensions of an organization. The model defines the two dimensions this way:

Technical Systems:

Linear work systems follow a sequential conversion process of input to output, requiring the completion of a series of programmed activities to yield desired outcomes. Non-linear work systems have a non-

sequential conversion flow, with multiple concurrent, interdependent conversion processes.

Social Systems:

The emphasis is on the social organization of work groups, together with the support features from higher organizational levels. The social system includes such characteristics as team development, autonomy, task identity, and interaction (Barnard, 1999) p.76). By addressing the key elements, both social and technical systems are optimized.

A major issue in the implementation of new technologies at corporations is how the changes to organizations are identified and executed. Over the past few years, corporations have implemented new enterprise-wide software systems to improve business efficiencies and give themselves competitive advantages over their competitors. The growing popularity of the internet and its business potential have fueled this rush for businesses to increase their ability to do electronic commerce.

As computers perform more tasks in an organization, the need to change the structure of the organization grows. Some departments expand while others are eliminated. Human resources may be eliminated or reassigned. People may be required to change their home environment as the workplace

moves to a more virtual model. Changes in business processes often require additional education to allow people to gain new skill sets.

Technology implementers recognize the need to manage these organizational changes. They also recognize that the changes extend beyond the workplace affecting other areas of society. Failure to effectively manage these changes often results in a less-than-expected return on the technology investment. In the worst cases, the implementation of technology can have a detrimental effect on the business. In 1999, Hershey Foods Corporation's revenues fell 12 percent due to the company's inability to get products to market during the Halloween and Christmas seasons. The company blamed its implementation of the SAP R/3 software system (Romeo, 2001a). Hank Bromley (1997) says "Understanding the role of technology requires a nuanced, flexible study, one that does several different things at once, and balances them in ways that cannot be specified in advance" (Brightman & W., 1999, P. 65).

Many technology consultants now include organizational change components to their implementation plans. Specialists are brought into the projects at the beginning to help identify the change effort required and lead that part of the implementation project. These specialists work

with the members of the organization to explain the changes and why they are necessary. They help the company and its people work through the cultural barriers to change and deal with the adverse effects of it (Goodwin, 2001). Half of the Enterprise Resource Planning (ERP) system implementation projects cost up to 5 million dollars to complete (Romeo, 2001b). With costs this high, companies look for ways of reducing the risk of failure.

An interesting point of view is offered in an article in Business Horizons (1999). It reports that the success rate for technology development projects is 9 percent with a 31 percent cancellation rate. The article asserts that these consistently poor results from business automation systems indicate flaws in the underlying assumptions about technology implementations. In reference to the above mentioned statistics, the authors state, “For the projects alluded to above, undertaken to implement business changes, the systems themselves underlie the failures by resisting change” (Johnson & Woolfolk, 1999, P. 29). They propose a new set of assumptions centered around built-in flexibility that no longer perpetuate IT systems that impede change.

The authors go on to describe the relationship with the real world and what they call the artifact world. The artifact world is the modeling of the physical state in the

system's software. For the systems to function properly, the artifact must mirror reality. The authors describe the necessity for total flexibility by saying that, "Real world systems must change or they will die. However, most artifact systems are so brittle that, when modified, they die anyway, unless costly life-support measures are taken" (Johnson & Woolfolk, 1999, P. 29). This theory is supported by the concepts contained in the Agile Wheel Reference Model (AWRM). This wheel is a tool to determine the agility of an organization. The theory is based on the idea that structure and processes stifle a company's agility and capacity to react to rapidly changing market conditions (Meredith & Francis, 2000). This approach facilitates the implementation of technology with minimal impact on organizational structure and eliminates the need for organizational change.

Bailey has a similar reference to real and artifact systems in his description of abstracted and concrete systems. In describing abstracted systems, he says "The units of abstracted systems are relationships abstracted or selected by an observer in light of his interests, theoretical viewpoint, or philosophical bias" (Bailey, 1994) P. 259). And with regard to concrete systems, he says "A concrete, real, or veridical system is a nonrandom

accumulation of matter-energy, in a region in physical space-time, which is organized into interacting interrelated subsystems or components” (Bailey, 1994) P. 259). The equilibrium seems to evolve from the theoretical system becoming a real system as the entropy associated with adapting concepts to reality subsides. Changes are required on both sides. Theoretical changes are made in the abstract of the design. Organizational changes require much more effort.

Research indicates that leaders of organizational change consider that 85 percent of all change efforts result in failure (Anderson, Klein, & Stuart, 2000). Organizational change is complex and involves some crucial variables that are often ignored. An article in The Journal For Quality and Participation (2000) states that there are internal and external aspects that pertain to both individuals and the collective organization. Substantive change requires a prior change in consciousness (Anderson et al., 2000).

The article goes on to say that there are two primary ways that change efforts are set up to fail. The first is that they lack an approach that addresses the whole system. This is what Barry Oshry refers to as Process blindness (Oshry, 1996). This type of system approach should

address collective, external issues such as organizational design, workflow, and policies and procedures (Anderson et al., 2000). The authors describe it this way:

> Change efforts fail when deep system design issues are mistaken for isolated problems to be solved. This is analogous to treating the symptoms of a disease rather than the disease itself. Short-term improvement is usually followed by worsening conditions in the long term (Anderson et al., 2000, p. 33).

The second way that change efforts are designed for failure is considered the most common. Collective and individual internal issues are ignored. These issues include psychological, spiritual, and cultural issues. Most change efforts focus on skills, behavior, organization design, and policies and procedures. In this scenario, technology is introduced, the organization is restructured, policies and workflows are changed, and individuals and teams receive the training required to function with the new system. This approach seldom works because the system cannot organize in a sustainable way (Anderson et al., 2000). An organization’s climate and culture are directly related to post-training behavior. An organization’s social system is a strong contributor to the success of training initiatives (Reed et al., 2000).

Looking at this problem through the Parsons Social Systems view, one can see that organizations, being societies in and of themselves, should be addressed as such when making structural changes. Bailey describes the three areas when he says:

> Parsons's systems theory focuses on three basic systems: the personality system, social system, and cultural system (which form a hierarchy of sorts). The personality system is basically psychological, dealing with individual personalities. The social system deals with relationships, The cultural system deals with values (Bailey, 1994, P. 109).

Each of the main systems is a system in its own right, and all three are interrelated.

The problem is that change efforts often focus on problems, not systems. They ignore the need for inner shifts in consciousness and culture that are better addressed using the integrated model approach (Anderson et al., 2000).

Equilibrium And Organizational Change

Philip Atkinson, a cultural change consultant, believes that transformational change is a core competency. He says that “We must always remember that changes in social trends and patterns have a major impact on organizational life” (Atkinson, 2001, p. 9).

Kenneth Bailey says “only systems have equilibrium, as it is a group property not an individual one” (Bailey, 1994, P. 87. Equilibrium is the state of stability and attained when opposing forces are in balance (Bailey, 1994). Robert Bales observed the problems of small-group organizations as they tried to achieve equilibrium (Bales, 1999).

This concept of equilibrium is explored in a study in the Journal of Management Information Systems (1999) which suggests that the full potential of information technologies, in particular commercial software packages, are not likely to be realized unless both the information technology and the organizational context are addressed in the software implementation project. It is important to manage the relationship between information technology and organizational change (Lassila, 1999). The article states that:

> Underutilization and nonuse of information technology, especially software, frequently results in failure to

> meet objectives and frustration on the part of senior managers. This may be true even when the technology is functioning exactly as planned. Research has shown that, regardless of the features available, users mediate software impacts through avoidance, resistance, or adaptation (Lassila, 1999, P. 64).

The article references the punctuated equilibrium model which describes organizational change as consisting of long periods of stable infrastructure interrupted by brief periods of revolutionary change. Three distinct features of the punctuated equilibrium are:

1. Deep structure; the set of fundamental choices an organization is made up of. These are the basic parts into which an organization is segmented and the activity patterns within these segmentations.
2. Equilibrium periods; the stability in the organization’s structure and activity patterns. Equilibrium consists of maintaining the deep structure. Equilibrium periods are maintained by awareness, motivation, and obligation. As long as an organization’s deep structure is intact, it is difficult to change.
3. Revolutionary periods; the major upheaval and reformation of deep structure. For significant

> change to occur, the deep structure must be dismantled, leaving the organization temporarily disorganized. This period includes a reconfiguration of the organization with a new set of rules (Lassila, 1999).

In successful cases, the initial implementation of technology signals the beginning of a revolutionary period which concludes when the new business processes and technology are mutually adapted within the organizational structure of the company. These adaptations can result in a stable, routine utilization of the new technology and denote the return of an equilibrium period. This is characterized by the utilization of technology in support of the deep structure within the organization. The outcome of the revolutionary period is a new equilibrium state (Lassila, 1999).

Organizational Systems

Addressing the deeper organizational issues in technology implementations allows companies to more effectively deal with the organizational power struggles inherent in changing information flows. Resistance can occur when less powerful parties perceive that the security

and quality of information are at risk. This risk can be addressed by considering local knowledge and interrelationships when implementing advanced technology. Marietta Baba says:

> “With respect to corporate policy and practice, decision makers should recognize that the increased risk represented by loss of control over boundary maintenance can fly in the face of simultaneous efforts to encourage cooperation across work groups” (Baba, 1999, p. 343).

The changing landscape of business has led to the study of complex organizational systems (Cohen, 1999). An organization is an artificial social unit whose purpose calls for greater effectiveness than found in natural social units. To improve effectiveness, organizations often employ goal models as an integral part of their system models because it is considered an objective analytical tool for assessing effectiveness by using the values of the subject as the criteria for judgment. (Etzioni, 1975).

The system model starts with a working model of a social unit capable of achieving a goal. Resources are allocated to functional requirements as well as the subsystems necessary to maintain the unit itself.

Governance systems identify, legitimize, and foster member commitment to goals (Jarley, Fiorito, & Delaney, 2000). Competing functional requirements and the multi-layered subsystems necessary to sustain them result in complex organizations (Etzioni, 1975). The challenges associated with being a contemporary organization include globalization, process reengineering, workforce diversity, and quality improvement. These organizational transformations cause organizations to place a premium on responsiveness to change. They want to be more adaptable and better able to learn from experience in order to reconfigure themselves when faced with new demands (Cohen, 1999).

With the dramatic reductions in data storage, processing, and transmission costs, organizations now find it possible to exploit technology to link activities that have previously been separated by time and space. This creates opportunities to use technology to increase the responsiveness of one process to another through the use of the virtual organization. General systems theory and complex system research techniques help system researchers and organization scientists understand and analyze how these developments affect social units and how they can be evaluated for effectiveness (Cohen, 1999).

Since organizations are routinely looked upon as dynamic systems of evolution with multiple parts, which interact with themselves and the outside environment, this representation fits the criteria for categorizing them as Complex Systems by scholars in the field of Complex Systems Theory (CST) (Morel & Ramanujam, 1999). This leads, logically to an interface between Organization Theory (OT) and CST. This is especially true when you consider an organization in terms of a Complex Adaptive System (CAS). In this view, individual units of an organization are considered interactive adaptive agents that are affected by each other. This interaction is, in OT terms, called self-organization. It can be described this way:

> Self-organization is a dynamic process by which under its own dynamics, a system spontaneously gets increasingly more organized. Biological evolution can be construed as the ultimate form of self-organization, i.e. a dynamic process leading systematically to increasing levels of organization and complexity (Morel & Ramanujam, 1999, p. 282).

In other words, the overall form of a phenomenon emerges from the way its components interact (VanGeert, 2000). Systems with a large number of interacting elements can display self-organizing behavior. These complex

organizations drive the development and implementation of technological solutions.

Applied Systems Theory

One initiative that applies systems theory to complex organizations is that of Total Quality Management (TQM), which uses a systems-based approach for examining work performance and as a vehicle for addressing the issue of complexity (Reed et al., 2000). An article in the Journal of Quality Management (2000) states:

> TQM fits within the open systems view which, of course, recognizes that firms interact with their environment, and it aligns most closely with the rational systems perspective. This latter point it not surprising given that the rational systems approach (as opposed to natural systems approach) was the dominant organization paradigm at the time when most of the seminal TQM literature was being written (Reed et al., 2000, P. 16).

The open systems view stresses the complexity and variability of individual parts as well as the looseness of the connections between them (Reed et al., 2000).

In order to exploit technical advances, it is important to match Information Technology (IT) applications with the competitive strategy of the company. An article in Decision Sciences states that:

> When a company with a given dominant process structure emphasizes two or more competitive priorities, such as quality, product flexibility, etc., an unaided manager faces a complex decision problem in choosing from alternative IT applications available in the areas of product design through distribution (Kathuria, Anandarajn, & Igbaria, 1999, p. 959).

Attempts have been made to develop an Intelligent Decision Support System (IDSS) to help managers assess the relative importance of competing priorities in an organization and identify IT applications that are consistent with both the competitive priorities and the process structure of the organization. This IDSS is described in an article in Decision Sciences (1999). A knowledge based systems approach is utilized to develop the IDSS. The competitive priorities used in the decision model include quality, delivery, flexibility, and cost (Kathuria et al., 1999).

This systems approach to decision making employs a mathematical formula which assigns mathematical values to fifteen attributes that are categorized into the competing

priorities. This mathematical approach is consistent with Bertalanffy's definition of system's theory in the traditional, technical sense (Bertalanffy, 2001). Whenever a mathematical model can be defined and variables entered for consistent computation, a kind of systems theory is employed.

When independent manufacturing consultants reviewed the output of the IDSS, they found that the results were consistent with their own recommendations to similar clients (Kathuria et al., 1999). It was, however, difficult to make these comparisons due to the varying degrees of competency of the client managers. The consultants agreed that IDSS would be a good tool for identifying IT applications consistent with competitive priorities, but that some customization may be required from environment to environment (Kathuria et al., 1999). I conclude that using a mathematical system model would, at least, maintain consistency in decision making and help remove management competency as a factor in the process.

Summary And Conclusion

Technology has had a role in the evolution of human civilization. This includes the development of the wheel, spear, and the computer. These advancements have allowed humans to improve their condition and achieve things that they were not able to before. Technology development is an evolutionary process similar to biological evolution. Historically, many social changes have been determined by technology. The introduction of technology changes the way society functions.

Both social systems and technology influence performance and quality. Organizations must jointly develop people, innovation, cooperation, and response to the environment. This, along with the optimization of both the social and technical dimensions of an organization, is necessary to maximize results.

The introduction of technology usually requires changes in an organization’s structure. How this change is identified and handled can have a dramatic effect on the success on the implementation of technology. Several high-profile system failures have occurred in large companies over the past few years. In some cases, these failures have been due to the inability of the business organization

to accept and execute structural and cultural changes. This has become such an important issue that many technology consultants have incorporated change management into their implementation methodologies. These consultants help the company and its people work through the cultural barriers to change.

Abstract systems are those that conceptual. Concrete systems are those that are real. As conceptual systems are implemented in the real world, the entropy of the implementation effort is replaced by equilibrium as the interacting systems, both social and technical, are organized in a manner that maximizes performance and value to the organization.

In order for change efforts to be successful, they must include an approach that addresses the whole system. Elements of organizational design, workflow, policies and procedures, as well as external elements must be addressed collectively. Along with these societal issues, individual psychological, spiritual, and cultural issues must be included as interactive systems.

The Parsons social systems view says that organizations should be treated as societies when making structural changes. This systems approach recognizes that personality, social, and cultural systems interact as one.

The underutilization of information technology frequently results in the failure to meet objectives and frustration on the part of senior managers. Research has shown that users often mediate software impacts through avoidance, resistance, and adaptation. Equilibrium is not achieved until the deep, structural, fundamental elements of an organization are broken down and reconstituted with the new organizational structure and cultural changes incorporated. The changes must be included in the organization's core values and rules to be effective. In successful cases, the initial implementation of technology signals the beginning of a revolutionary period which concludes when the new business processes and technology are mutually adapted within the organizational structure of the company.

Since organizations are looked upon as dynamic systems of evolution with multiple parts, which interact with themselves and the outside environment, they fit the criteria that scholars use for categorizing them as complex systems. The study of complex organizational systems looks at an organization as an artificial social unit. To improve effectiveness, resources are allocated around functions. These functional units form subsystems that interrelate and form the larger complex organizational

system. General systems theory and complex system research techniques help organizational specialists understand the inner workings of these social subsystems and adapt information technology systems to improve the linkages between groups by maximizing the flow of information between them.

Organizations that adopt Total Quality Management (TQM) use a systems approach to process design. The TQM view recognizes that firms interact with themselves and the environment. It stresses the complexity and variability of individual parts as well as the looseness of the connections between them. This often poses a problem as competing priorities vie for information technology resources. Structured intelligent decision support systems help managers assess the relative importance of competing priorities and match information technology strategy to the overall strategy to give the organization a competitive advantage.

Using a systems approach to selection technology and implementing in an organization can help maximize the opportunity to achieve the expected results from the use of the technology. Using a methodology that addresses the whole organization and its environment facilitates a better way of designing an organizational structure to addresses

the organization’s goals and ensures the best implementation of technology to support that structure.

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Professional Practice and Organizational Systems

A Study Of Information Technology Implementations And Organizational Change and Integration Methods

Walden University

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Ph.D. in Applied Management and Decision Science

Organizational Change Management

Assessor: Professor Earl Joseph

June, 2002

Table of Contents

Introduction

As societies evolve and become more complex, technology evolves to meet the demands of dealing with these complexities. The introduction of technology has an effect on people and structures directly touched by it as well as the more macro environment that surrounds those people and structures.

Technology has always been a part of human civilization and has had a role in its evolution. Each technical advancement allowed the society, in which it was developed, to achieve things that it was not able to achieve before (Committee, 1999). To this point, technological advances are part of the natural development of humans and their societies. Advances in knowledge and technical understanding lead to the production and application of new technology which then causes changes in society (Norman, 1981). Historically, many social changes have been determined by technology. The introduction of technology changes the way society functions.

Both social systems and technology influence performance and quality (Barnard, 1999). By addressing the key elements, both social and technical systems are

optimized. A major issue in the implementation of new technologies at corporations is how the changes to organizations are identified and executed. New technology must be integrated into the organizational and technical systems that already exist in an organization.

Technology implementers recognize the need to manage these organizational changes. They also recognize that the changes extend beyond the workplace affecting other areas of society. Failure to effectively manage these changes often results in a less-than-expected return on the technology investment. (Romeo, 2001).

Many technology consultants now include organizational change components to their implementation plans (Goodwin, 2001).

There is a relationship between the real world and what is called the artifact world. The artifact world is the modeling of the physical state in the system's software. For the systems to function properly, the artifact must mirror reality. (Johnson & Woolfolk, 1999). This is sometimes referred to in terms of real and artifact systems or abstracted and concrete systems. In describing abstracted systems, Bailey says "The units of abstracted systems are relationships abstracted or selected by an observer in light of his interests, theoretical viewpoint,

or philosophical bias" (Bailey, 1994, P. 259). And with regard to concrete systems, he says "A concrete, real, or veridical system is a nonrandom accumulation of matter-energy, in a region in physical space-time, which is organized into interacting interrelated subsystems or components" (Bailey, 1994, P. 259). The equilibrium seems to evolve from the theoretical system becoming a real system as the entropy associated with adapting concepts to reality subsides. Changes are required on both sides. Theoretical changes are made in the abstract of the design. Organizational changes require much more effort.

This understanding that a computer system works best if the real world organization and integration are modeled in the system's software. Following this logic, one would conclude that the introduction of new functionality or software modules, in an existing environment, would include the integration of the new systems with the ones that are already in place. Software implementation consultants recognize the importance of this integration when they become involved in a project. Steve Portik, a partner with Pricewaterhouse Coopers says:

> The last few years have seen a significant shift in the integration landscape. In the past interfacing, rather than integration, was the standard means by

> which either custom or purchased products were linked to a company's ERP "mothership". Interfacing was a sometimes perilously way to insert or extract data from the ERP database. Perilous in that, for example, some recent releases of Oracle ERP application had over 2,000 tables to navigate.

> ERP vendors have learned that while their suites continue to expand to include ever more functional scope, their customers are still buying "best of breed" software products to support key business processes. The market expects the ERP vendors to provide an ease of integration into their suite. Ease integration becomes a key differentiator when companies are evaluating upgrades or replacements. In the same manner, the "best of breed" vendors have moved to offering standard connectivity with the leading ERP products, primarily SAP and Oracle, as a requirement to sell to top tier companies (Portik, 2002).

Research indicates that leaders of organizational change consider that 85 percent of all change efforts result in failure (Anderson, Klein, & Stuart, 2000). Organizational change is complex and involves some crucial variables that are often ignored (Anderson et al., 2000).

There are two primary ways that change efforts are set up to fail. The first is that they lack an approach that addresses the whole system. This is what Barry Oshry

refers to as Process blindness (Oshry, 1996). This type of system approach should address collective, external issues such as organizational design, workflow, and policies and procedures (Anderson et al., 2000).

The second way that change efforts are designed for failure is considered the most common. Collective and individual internal issues are ignored. These issues include psychological, spiritual, and cultural issues. Most change efforts focus on skills, behavior, organization design, and policies and procedures.

The problem is that change efforts often focus on problems, not systems. They ignore the need for inner shifts in consciousness and culture that are better addressed using the integrated model approach (Anderson et al., 2000).

The concept of equilibrium is explored in a study in the Journal of Management Information Systems (1999) which suggests that the full potential of information technologies, in particular commercial software packages, are not likely to be realized unless both the information technology and the organizational context are addressed in the software implementation project. It is important to manage the relationship between information technology and

organizational change (Lassila, 1999). The article states that:

> Underutilization and nonuse of information technology, especially software, frequently results in failure to meet objectives and frustration on the part of senior managers. This may be true even when the technology is functioning exactly as planned. Research has shown that, regardless of the features available, users mediate software impacts through avoidance, resistance, or adaptation (Lassila, 1999, P. 64).

Purpose

As companies address business issues by implementing new technologies, they must mitigate the risks associated with failures that could have an adverse effect on the business. New business processes that require organizational changes and technical integrations must be analyzed to determine the cost and benefit of introducing these changes to the organization. The degree of technical integration and organizational change in some ways determine the amount of entropy that will be generated until an equilibrium state is reached when the new

processes and technology become deep rooted in the new organizational structure.

Organizational restructuring and software integration are both methods for creating open and integrated systems in an organization. The systems approach to technology implementation addresses both. Failure to do so can create closed systems that do not meet the operational expectations of the implementation.

The purpose of this study is to analyze the effects of organizational change, management support, and technical integration on an organization's ability to reach the business goals set forth for the implementation project.

This research identifies companies that have implemented new E-Procurement systems and study the results of these implementations. The achievement of expected results will be compared to the existence of change management efforts, visible management support, and software integration in the individual system implementation projects.

The questions being researched are:

Do increased change management activities in an E-Procurement system implementation increase the level to which the system meets the expectations of the business?

Hypothesis:

H0: Change Management does not affect the level to which E-Procurement systems will meet business expectations.

H1: Change management increases the level to which E-Procurement systems will meet business expectations.

Does the integration of E-Procurement software into existing business systems increase the level to which the system meets the expectations of the business?

H2: Software Integration does not affect the level to which E-Procurement systems will meet business expectations.

H3: Software Integration increases the level to which E-Procurement systems will meet business expectations.

Does visible management support in an E-Procurement system implementation increase the level to which the system meets the expectations of the business?

Hypothesis:

H4: Management support does not affect the level to which E-Procurement systems will meet business expectations.

H5: Management support increases the level to which E-Procurement systems will meet business expectations.

Method

Forty nine locations of an US based Fortune 200 company that had implemented E-Procurement systems were identified. This system is an internet-based transaction and catalog engine for procuring Maintenance, Repair, and Other (MRO) items for the business. MRO items are those things, bought by a business, that are not considered raw materials or components that go into the business's products. Examples of MRO items are toilet paper, cleaning supplies, and office supplies. The implementation project manager was interviewed to help identify appropriate survey questions. The project manager also identified a list of individual location site-leaders to whom the survey would be sent. The site-leaders were able to measure the effectiveness of the implementations by examining standard business reporting numbers for cost reductions, headcount, supplier rationalization, and overall purchasing efficiencies.

The objectives, in the implementation of this system, were to decrease the purchase price of the items, reduce

the number of suppliers of the items, reduce the number of people performing procurement tasks, and improve the overall efficiency of purchasing transactions through process improvement and automation.

A web-based survey was conducted among these forty-nine locations using a software tool called 2-Way. This software package allows the user to conduct an anonymous survey over the internet. The results are recorded in a secured central database.

The survey contained questions designed to determine if the implementation project included change-management activities, software integration activities, and whether management supported the project. Also included were questions designed to measure the effect the project had on measurable business improvement objectives such as headcount reduction, cost reduction, supplier reduction, and overall process improvement.

Of the forty-nine locations surveyed, twenty-nine responded for a response rate of 59%. Of those that responded, three were incomplete and only twelve actually had established the measurements necessary to accurately ascertain the effect of the software implementation on business performance items used in this study. Of those locations with the proper measurements, 100% used a

business system that was a candidate for integration with the E-Procurement software. Appendix 1 contains the survey.

Results

Table 1 contains the individual results for the survey. The first test analysis was done to determine the statistical significance of the descriptive variable change management on the dependent variables. A one-way anova table was used to do this test. Using a standard distribution of data, a significance factor of .05 or less is deemed significant for a given comparison of variables. Table 2 contains the results of these tests using the software package SPSS to do the calculations. For those variables that were deemed statistically significant, descriptive statistics were calculated giving mean, and standard deviation. Table 3 contains the results of these calculations.

The descriptive variable change management was compared to the four dependent variables. Headcount – reduction showed a significance of .27, which demonstrates low significance. MRO-Objectives showed a significance of .71, which demonstrates low significance. Supplier-objectives showed a significance of .78, which indicates

low significance. Efficiency-improvement showed a significance of .50, which indicates low significance. These results tend to support the H0 hypothesis which states that Change Management does not affect the level to which E-Procurement systems will meet business expectations.

The descriptive variable ERP-integration was compared to the four dependent variables. Headcount –reduction showed a significance of .74, which demonstrates low significance. MRO-Objectives showed a significance of .89, which demonstrates low significance. Supplier-objectives showed a significance of .09, which indicates low significance. Efficiency-improvement showed a significance of .05, which indicates significance. These results tend to support the H3 hypothesis which states that ERP-Integration does not affect the level to which E-Procurement systems will meet business expectations.

The descriptive variable Management-support was compared to the four dependent variables. Headcount –reduction showed a significance of .30, which demonstrates low significance. MRO-Objectives showed a significance of .68, which demonstrates low significance. Supplier-objectives showed a significance of .34, which indicates low significance. Efficiency-improvement showed a

significance of .80, which indicates low significance. These results tend to support the H4 hypothesis which states that Management Support does not affect the level to which E-Procurement systems will meet business expectations.

For the purposes of this paper, the secondary analysis was restricted to the integration variable, since it was the only one that showed significance. Three of twelve locations had integrated the new purchasing software with their legacy business systems. Of those that had done the integration, the mean for improving overall efficiency was 2.89 with a standard deviation of 1.17. The mean for those without integration was 1.33 with a standard deviation of .58.

Discussion And Conclusion

This paper focuses on the effect that software integration has on the implementation of technology in large corporations. The focus of study discussed here is the implementation of an E-Procurement system.

The survey results indicate a strong correlation between E-Procurement implementation projects that have software integration activities and those that do not.

Item cost, headcount levels and supplier count seem to be unaffected by organizational change, management support, or software integration factors. Overall efficiency appears to be affected by software integration. Supplier count and item cost could be factors more affected by negotiation prowess than any of the ones mentioned here. Headcount reductions, it seems could follow process efficiency improvements over time. All of the locations surveyed had been implemented within a two-year period. This may not have been enough time for efficiencies to translate into workforce reductions.

The efficiency improvements for those locations with integration scored a survey result of 2.89. While this is far below a 4.0 result, which would have indicated agreement with the efficiency improvement statement, it is much higher than the 1.33 result for those locations without software integration. Also, the highest response for the locations without integration was a 2, while the highest score with integration was a 5. This does seem to indicate better potential for those locations whose computer operates as open, integrated systems instead of closed, isolated ones. This integrated model more accurately defines the actual operation of an organization within the software system than one where individual

software modules have no ability to communicate data between the systems that need it.

Based on current research and the new approaches to systems implementation, software integration is becoming an important part of a technology implementation project. Implementation success and the realization of expected results may well depend on how the new system or module integrates to the existing software allowing the aggregation of the two software systems to operate as one integrated system. It appears that, in the research done for this paper, software integration plays some role in meeting business expectations with new software modules.

The project chosen for study in this paper may, however, have other issues that are impeding success. One would think that management support and change management efforts would show some correlation to success in a corporate environment. The literary review done in association with this project suggests some relevance. An additional study, using another organization, should be done to verify the results presented here.

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Table 1

Individual Survey Results

	resultid	r	organiza	useerp	aribaint	manageme	measurea	meethead	meetmroo	meetsup	improvem
1	1	*	1	2	2	2	1	1	1	1	2
2	3	*	2	1	1	2	1	2	2	2	2
3	4	*	2	2	2	2	2	2	2	2	2
4	5	*	1	2	2	2	1	1	3	3	3
5	6	*	2	2	1	2	1	3	4	3	2
6	7	*	1	2	1	2	1	3	4	4	4
7	8	*	1	1	1	2	1	2	2	2	2
8	9	*	2	2	2	2	2	3	2	2	3
9	11	*	1	2	2	2	1	4	2	2	4
10	12	*	1	2	1	2	2	1	2	2	2
11	13	*	1	2	2	2	1	4	4	2	5
12	14	*	2	2	1	2	2	4	4	1	1
13	15	*	1	2	1	1	1	2	2	2	2
14	16	*	1	2	1	1	1	2	2	2	2
15	18	*	1	2	2	2	2	2	4	4	4
16	19	*	1	2	2	1	2	2	1	2	2
17	20	*	1	2	2	2	1	1	1	2	2
18	21	*	2	2	2	2	2	1	4	4	5
19	22	*	2	2	2	2	2	2	2	2	2
20	23	*	1	2	2	1	2	3	4	3	2
21	24	*	1	2	1	1	1	1	1	2	4
22	25	*	1	2	1	2	2	1	2	2	1
23	26	*	1	2	1	1	1	3	1	4	2
24	27	*	2	2	2	1	2	3	4	4	4
25	28	*	2	2	2	2	2	2	2	2	2
26	29	*	1	2	1	1	1	3	2	4	4

Table 2

Independent Factor = Organizational Change

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MeetHeadCountReductions	Between Groups	1.152	1	1.152	1.353	.272
	Within Groups	8.514	10	.851		
	Total	9.667	11			
MeetMROObjectives	Between Groups	.193	1	.193	.137	.719
	Within Groups	14.057	10	1.406		
	Total	14.250	11			
MeetSupplierObjectives	Between Groups	8.571E-02	1	8.571E-02	.079	.785
	Within Groups	10.914	10	1.091		
	Total	11.000	11			
ImproveMROEfficiency	Between Groups	.771	1	.771	.475	.506
	Within Groups	16.229	10	1.623		
	Total	17.000	11			

Independent Factor = ERP Integration

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MeetHeadCountReductions	Between Groups	.111	1	.111	.116	.740
	Within Groups	9.556	10	.956		
	Total	9.667	11			
MeetMROObjectives	Between Groups	2.778E-02	1	2.778E-02	.020	.892
	Within Groups	14.222	10	1.422		
	Total	14.250	11			
MeetSupplierObjectives	Between Groups	2.778	1	2.778	3.378	.096
	Within Groups	8.222	10	.822		
	Total	11.000	11			
ImproveMROEfficiency	Between Groups	5.444	1	5.444	4.712	.055
	Within Groups	11.556	10	1.156		
	Total	17.000	11			

Independent Factor = Management Support

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
MeetHeadCountReductions	Between Groups	1.000	1	1.000	1.154	.308
	Within Groups	8.667	10	.867		
	Total	9.667	11			
MeetMROObjectives	Between Groups	.250	1	.250	.179	.682
	Within Groups	14.000	10	1.400		
	Total	14.250	11			
MeetSupplierObjectives	Between Groups	1.000	1	1.000	1.000	.341
	Within Groups	10.000	10	1.000		
	Total	11.000	11			
ImproveMROEfficiency	Between Groups	.111	1	.111	.066	.803
	Within Groups	16.889	10	1.689		
	Total	17.000	11			

Table 3

Descriptive Statistics For Significant Variables Significance Equal To Or Less Than .05 Integration Equals NO

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ImproveMROEfficiency	3	1	2	1.33	.58
Valid N (listwise)	3				

Descriptive Statistics For Significant Variables Significance Equal To Or Less Than .05 Integration Equals Yes

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
ImproveMROEfficiency	9	2	5	2.89	1.17
Valid N (listwise)	9				

Appendix 1

Survey

This survey is intended to be filled out by the Implementation Site Leaders of facilities that have implemented stand-alone e-purchasing modules past 3 years. It is a confidential survey intended for use in a doctoral study of organizational change. If you would like the results of this survey, please send a e-mail request to mluckett@waldenu.edu.

Did your implementation include resources for organizational change management activities?

Y N

Does your location use an ERP and/or other business system?

Y N

Is the new E-procurement module integrated into these other business systems?

Y N

Management showed strong visible support for the system implementation.

Y N

Measurable business objectives were established for improvements expected to result from the system implementation.

Y N

1. Strongly Disagree
2. Disagree
3. Not Applicable
4. Agree
5. Strongly Agree

1. Using the system, the company has been able to meet its objectives for headcount levels.

   1 2 3 4 5

2. Using the system, the company has been able to meet its objectives for MRO Item cost reductions.

   1 2 3 4 5

3. Using the system, the company has been able to meet its objectives for supplier rationalization.

   1 2 3 4 5

4. Overall, the company has been able to improve MRO Purchasing efficiency using the system.

   1 2 3 4 5

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