Role of Information Technology (IT) in Managing Organizational Change and Organizational Interdependence

Bisallah Hashim I[1], Aleshelonye abbas[2], Bello Bilkisu Mohammed [3]

[1]Computer Dept, University of Abuja, Nigeria. hbisallah@gmail.com
[2]Dept of computer Sc.. Turkish-Nile University, Abuja. yalesh200@gmail.com
[3] Dept of Computer Sc. Kaduna Polytechnic, Kaduna). candiebell2000@yahoo.com

Abstract: This paper sets forth the application of open systems theory for generating propositions regarding the management of organizational change and organizational interdependence by application of IT. The commonly preferred approaches - goal theory, population ecology, systems resource theory and transaction costs theory - are inadequate in providing a "wholistic" perspective of the organizational issues. The article argues that the survival and growth of organizations in an increasingly turbulent environment would depend upon effective utilization of information technology for aligning the organizational structure with environmental preferences and for creating symbiotic inter organizational structures. *We have modified our environment so radically that we must modify ourselves in order to exist in this new environment.* -- Norbert Wiener.

1. Introduction

In a recent survey article in *The Economist*, John Browning (1990) wrote: "Information technology is no longer a business resource; it is the business environment." His statement is not far from truth. Ongoing advances in information technology (IT), along with increasing global competition, are adding complexity and uncertainty of several orders of magnitude to the organizational environment. One of the most widely discussed area in recent business literature is that of new organizational network structures that [supposedly] hold the promise of survival and growth in an environment of ever-increasing complexity (Bradley, Hausman and Nolan, 1993; Byrne, 1993; Davidow & Malone, 1993; Eccles and Nolan, 1993; Jarillo & Ricart, 1987; Malone & Rockart, 1993; Miller, Clemons and Row, 1993; Naisbitt, 1982, 1985; Toffler, 1985). How can IT help the organizations in responding to the challenges of an increasingly complex and uncertain environment? How can IT help the organizations achieve the "flexible" organization structure? These are the topics of discussion in this article.

We are observing a strong trend of convergence of the technologies of computing and telecommunications (McFarlan and McKenney, 1983). Changing technology economics, merging of formerly disparate technologies with different managerial traditions, and the problems of managing each of the phases of IT assimilation in different ways calls for a major reappraisal of the organization structures designed for yesteryears.

IS researchers have expressed time and again that technological change poses the greatest challenge to their research (cf: Teng & Galletta, 1991). Dickson and DeSanctis (1991) mentioned that not much attention has been given to the integration of technology or its use as a coordinating mechanism for organizational units. It is our contention that IT should be studied as an independent variable affecting the organizational structure. Huber (1990) recommends a reassessment of certain components of organization theory which are affected by the tremendous changes that have occurred in the capabilities and forms of communication technologies. This article will attempt to contribute to the development of these issues.

The article describes the open systems theory (Bertalanffy, 1950; Boulding, 1956) as one possible tool for organizational MIS research and practice, using the issues of environmental change, organizational structure and organizational interdependence to illustrate its use. The area of environmental change and organizational IT response is an especially appropriate application area for the open systems theory because, as this article describes, several critical issues can be addressed by the open systems theory. An IS perspective on these issues is given in section 2. A literature survey of the relevant

issues in open systems theory appears in section 3. The open systems theory is then applied to the study of environmental change and organizational response in section 4. Section 5 presents some limitations of the open systems theory perspective and conclusions from this preliminary work.

2. Environmental Change, IT and Organizational Structure

Researchers (Bakos and Treacy, 1986; Cash and Konsynski, 1985; Kling, 1980; Kriebel and Moore, 1982) have studied the impact of information technology at different levels of the organization. Huber (1981, 1988), using organization theory, formulated hypotheses for empirical testing which reflect the impacts of IT on the decision behavior and design of organizations. Bakos (1987) notes that most of the early studies considered IT as the dependent variable for analyzing its adoption by organizations. As reported by him, the results of several empirical studies (Attwell & Rule, 1984; Carter, 1984; Robey, 1981) that attempted to analyze IT's impact on organizations have proved inconclusive.

The increasing global interdependencies and the accelerating pace of change demand more flexible and adaptive organizations (Malone and Crowston, 1991). Malone and Smith (1984) have defined organizational flexibility in terms of "vulnerability" and "adaptability." Effective implementation of IT would decrease vulnerability by reducing the cost of expected failures and enhance adaptability by reducing the cost of adjustment. Rockart and Short (1989) attribute the ever increasing need for managing interdependence to competitive pressures that included globalization, time-based competition, increased market risk, and a greater emphasis on customer service and cost reduction. Bennis (1974: 22) notes that "the organization's response to the environment will continue to be the crucial determinant for its effectiveness." Since postindustrial organizations will be faced with increasing environmental complexity and turbulence, organizations' needs to process information and make decisions will be substantially increased (Huber, 1984). The capabilities and flexibilities of computer-communication systems make them increasingly relevant to organizations by being able to respond to any specific information or communication requirement (Holt, 1992: 40).

IT as a Solution to Environmental Change: The cost of IT has plunged since the 1960s resulting in enormous investments in IT applications that have stimulated increasingly complex organizational change (Benjamin and Levinson, 1993). Benjamin and Blunt (1992) anticipate that technology cost-performance improvements will sustain this trend over the next decade. Presently, IT amounts to nearly one-half of US firms' annual capital expenditures and increasingly affects how firms organize, do business, and compete (Keen, 1991).

IT may be considered as comprising of five basic components - computers, communications technology, work stations, robotics, and computer chips (Morton, 1988). In this article, "IT" is considered to be synonymous with the definition of *"advanced information technologies"* provided by Huber (1990):

"(a) devices that transmit, manipulate, analyze, or exploit information;

(b) in which a digital computer processes information integral to the user's communication or decision task; and

(c) that have made their appearance since 1970 or exist in a form that aids in communication or decision tasks to a significantly greater degree than did pre-1971 forms."

IT is becoming all pervasive and is having impact on all industries -- in service as well as in manufacturing. It is affecting workers at all levels of organizations (Daft, 1992: 112-150, 283-314) -- from the executives to assembly hands and clerks. IT is increasingly becoming an integral component of all types of technologies -- craft, engineering, routine, and nonroutine (Daft, 1992). Drucker (1985) has very rightly defined organization as "a structure in which information serves as the axis and as the central structural support."

IT and New Organizational Structures of Interdependence: Benjamin and Levinson (1993) emphasized that for IT-based change to be effective, technology, business processes, and organization need to be adapted to each other. Comparing the present information revolution with the Industrial Revolution, Malone and Rockart (1993) indicated that the latest changes in IT would lead to the evolution of new technology-intensive organizational structures. They project that the advances in IT would result in dramatic decline in the costs of "coordination" which would lead to new, coordination-intensive business structures. Rockart and Short (1989) suggest that IT would enable the firms to respond to the "new and pressing competitive forces" by providing for "effective management of interdependence." Interorganizational relations, that are based upon trust and conditions of unstructured authority (Litwak and Hylton, 1962) would be created using newer types of coordination mechanisms. Malone and Crowston (1991) believe that in light of these new possibilities there is need to reassess our current theories of organizations, of markets, and of management.

Open Systems Theory and Environmental Change

Why Open Systems Theory? The open systems approach has been chosen to study the above issues because it has been commended for its potential

usefulness in "synthesizing and analyzing complexity" (Simon, 1969) in "live" organizations. Comprehension of a system cannot be achieved without a constant study of the forces that impinge upon it (Katz and Kahn, 1966). Leavitt, Pinfield and Webb (1974) also recommended an open- systems approach for studying contemporary organizations which now exist in a fast-changing and turbulent environment. Ramstrom (1974) propounds increased emphasis on systems thinking to comprehend the increased interdependencies between the system and its environment, and between the various parts of the system. Classical and neoclassical organization theories have been found wanting because of their emphasis on organizations as fragmented and closed social systems acting independent of external forces (Baker, 1973). Scott (1961) argued that "the only meaningful way to study organization is to study it as a system" and had observed that the distinctive feature of modern organization theory was in its conceptualization of an organization as an open system. Though several empirical studies have been done for analyzing the impacts of IT at individual level, there is no conclusive evidence if these results would be consistent at the organizational *system* level. "Whether individual performance implies organizational effectiveness?" still remains a moot issue.

Open Systems Theory & Hypotheses about Environmental Change: It was Bertalanffy (1956) who had propounded the notion that closed system theory cannot apply to what he called "open systems," which characterize living entities, including individuals, groups, and organizations. To conceptualize an organization as an open system is to emphasize the importance of its environment, upon which the maintenance, survival, and growth of an open system depend. A systems approach to organizations begins with the postulate that they are open systems which, of necessity, engage in various modes of exchange with their environment (Katz and Kahn, 1966). The open systems approach to complex organizations emphasizes the consideration of the relationship between a system and its environment as well as what goes on within the system (Hall, 1977). Baker (1973) notes that organizations are changed in the course of interacting with and adjusting to their environment and also change that environment. Since environmental dependency inhibits the organization's ability to function autonomously, it must manage such dependency to survive as an independent entity (Kotter, 1979). Organizations typically manage environmental dependency by establishing and maintaining resource exchanges with other organizations (Levine and White, 1961).

IT-Organizational Interdependence Understood Through Open Systems Theory

Three sets of propositions are offered.

(A) IT's Role in Managing Organizational Change

(A-1) Environment-Goals-Structure

(A-2) Organic Structure

(A-3) Differentiation & Integration

(B) IT's Role in Managing Organizational Interdependencies

(C) The IT Paradox

(A)   IT's Role in Managing Organizational Change

(B)

(C)   (A-1)   IT   and   Environment-Goals-Structure

Churchman (1968) defined environment as those factors which not only are outside the system's control but which determine in part how the system performs. Uncertainty is the difference between the amount of information required to perform the task and the amount of information already possessed by the organization (Galbraith, 1973:5; Schoderbek, 1967).

Proposition 1: Turbulent environment drives organizations to use IT for monitoring the preferences of the environment.

System theorists have recognized the importance of "feedback" for the survival of the system (Miller, 1955) and for maintaining a "steady state" or "homeostasis" (Katz and Kahn, 1966). Organizations are *purposive systems* that learn of the impending threats by scanning. *Scanning* is the process by which the organization acquires information for decision making. The modes (surveillance and search) of scanning are primarily determined by the external environmental stimuli and are determined by the magnitude and by the direction of the discrepancy between the goal and its realization (Schoderbek, Schoderbek & Kefalas, 1980). While surveillance is useful for information-gathering process, search is oriented toward finding a satisfactory solution to a specific problem. Complex systems require complex controllers (Ashby, 1956). IT will provide the "complex controller" to the increasingly complex organization. The information systems of an organization need to evolve to remain consistent with the changing organizational structure (Daniel, 1961). Referring to the obscurity of causal laws of turbulence, Aldrich (1979: 73) argued that scanning could provide the firm with the desired "competitive edge."

Proposition 2: Turbulent environment drives organizations to use IT for translating the information on environmental preferences into goals.

Continuously changing environment requires organizations to continuously reassess their goals (Thompson and McEwen, 1958). Effective structuring requires a consistency among the design parameters and contingency factors (Mintzberg, 1979). Maniha and Perrow (1965) have demonstrated that organizations' goals can be generated by external forces, such as other groups seeking to use the organization to further their own ends.

Proposition 3: Turbulent environment drives organizations to use IT to align their structure with environmental preferences.

The very efforts of the organization to maintain a constant external environment produce changes in organizational structure (Katz and Kahn, 1966). Scott (1987) argued that organizational structure and goals are driven by the preferences in the environment. The structure is determined by the information- processing capacity requirements of the organization (Galbraith, 1977: 36) which in turn are governed by the IT being used. Aldrich (1972), Perrow (1967), Walker (1962) and Woodward (1958, 1965) have attributed structural differences to the organization's technology. Mintzberg (1979: 221) had suggested that the organization's environment and technology are the independent (contingency) variables that determine the structural variables of the organization.

Fowles (1987), in his narrative on the history of organizational communications technologies contends that the phenomenal expansion of organizations can be largely attributed to advances in the technologies of organizational communication. Yates (1987) argued that in absence of technological communication organizations could have evolved differently. Preliminary econometric analyses of the overall U.S. economy for the period 1975-1985 further confirms that the increased use of IT is correlated with decreases in firm size and vertical integration (Brynjolfsson, et al., 1989).

(A-2) IT and Organic Structure

Proposition 4: Turbulent environment drives organizations to make more use of IT for increasing their "organic" characteristics.

"Organic" firms are better equipped to sustain themselves in turbulent environment (Burns and Stalker, 1961). A dynamic environment will drive the structure to an organic state despite other forces (Mintzberg, 1979); the more complex the environment, the more decentralized the structure. Introduction of IT (automation) at the "operating core" level transforms a bureaucratic administrative structure into an organic one (Mintzberg, 1979: 265). Effectively, automation of routine tasks (Woodward, 1965) eliminates the source of many of the social conflicts throughout the organization.

Law of requisite variety (Ashby, 1956) implies that the rate of change of organizational systems must correspond to the rate of change of environmental systems, i.e., organizations with complex environmental interactions would develop complex structures (Becker and Neuhauser, 1975: 71) like adhocracies or networks. Adhocracy is suitable for a dynamic and complex environment, when the firm has sophisticated technical systems and the focus is upon consistently offering differentiated products (Mintzberg, 1979) for retaining the customers. Future organizations would be "networks" (Keen, 1991) characterized by adhocracies with flexible systems of projects and teams (Drucker, 1988; Malone and Rockart, 1993; Mintzberg, 1979) brought together quickly to accomplish specific tasks (Ramstrom, 1974; Rockart & Short, 1989; Toffler, 1985). Some existing organizations have already "farmed out" their operations by establishing them as separate organizations or contracting them out to other organizations (Mintzberg, 1979).

Proposition 4a: Turbulent environment drives organizations to use IT for empowering workers at all levels.

Growing availability of telecommunications has offered technologies like distributed systems and client-server architecture (Keen, 1991) that facilitate the process of empowerment of the lower levels (Mintzberg, 1979: 183). In the "informated" (Zuboff, 1988) organization, workers would be "empowered" by virtue of access to necessary information to perform higher-level tasks. Ramstrom (1974) has argued that tactical decisions relating to "soft" information would be delegated to the "grass-roots" where there is easy access to relevant information concerning the immediate environment, at the same time providing these levels with the information generated within the system by means of "cheap" (with internal coordination costs becoming negligible) internal information systems.

Proposition 4b: Turbulent environment drives organizations to use IT for increasing the spans of control.

Information technologies, by facilitating the standardization of coordination (Malone and Crowston, 1991), would facilitate larger spans of control or work units (Mintzberg, 1979: 139) which would be characterized by extensive lateral communication and self- contained authority structures.

Proposition 4c: Turbulent environment drives organizations to use IT for increasing lateral communications.

Selective use of lateral decision processes for situations involving task uncertainty increase the information processing capacity of the organization

(Galbraith, 1973: 18; Ramstrom (1974). Bringing the points of decision down to the points of action (where the information originates) reduces the information overload on the managers. Since specification of "procedures" in complex situations (Becker and Neuhauser; 1975) creates inefficiencies, organizations in turbulent environments would use more IT resource for delegating the decision-making to workers ("empowerment"). Increased use of groupware (Wilke, 1993) for lateral coordination will spell the demise of middle-management (Bluementhal, 1963; Leavitt and Whisler, 1958, 1970).

(A-3) IT and Differentiation-Integration
Proposition 5: Turbulent environment drives organizations to reduce their "dimensions" by focusing on core competencies by leveraging their use of IT.
Proposition 5a: Turbulent environment drives organizations to use IT to reduce differentiation and integration to focus on increased specialization.

Organizations structure themselves to minimize coordination costs (Galbraith, 1970) and group together similar activities to achieve the benefits of process specialization (March and Simon, 1958). Environmental uncertainty or "task predictability" is the basic independent variable influencing the design of the organization (Galbraith, 1970; Perrow, 1967; Thompson, 1967). Faced with increased uncertainty, organizations can reduce the need for information processing by decreasing the "diversity of outputs" (Galbraith, 1973). Reduced differentiation and integration (Lawrence and Lorsch, 1967) of activities would decrease the coordination effort involved thus reducing the information processing requirements. Reduced coordination costs with IT would result in the substitution of IT for human coordination (Malone and Rockart, 1993). Greater specialization would be achieved by focusing on few core competencies.

(B) IT's Role in Managing Organizational Interdependencies
Proposition 6: Turbulent environment drives organizations to actively seek interorganizational (interfirm) relations to leverage their core competencies.

Cooperation, especially in the international context, will be necessary to gain a competitive advantage in the future (IBM, 1990; Cummings, 1980). To survive in an increasingly competitive environment, firms would form alliances that would bring together their core competencies to create the "best of all" products (Byrne, 1993; Drucker, 1988).
Proposition 6a: Turbulent environment drives organizations to reduce environmental complexity and uncertainty by seeking interdependencies (complex relationships) with other organizations in the environment.

Proposition 6b: Turbulent environment drives organizations to use more IT-effort to establish coordinating mechanisms with other firms.

To survive in the fast-changing environment the "adaptive organization" would be more like a shifting "constellation" (Mintzberg, 1979; Toffler, 1985) that has [IT] "linkages" (Pinfield, Watzke and Webb, 1974) with independent and semi- autonomous organizations. Use of interorganizational linkages such as EDI (electronic data interchange) would enable new forms of organizations and reduce the coordination costs of increasingly market-driven organizations (Malone and Crowston, 1991). Increasingly, electronic linkages are becoming the necessary condition of doing businesses with larger firms (Keen, 1991).

Using an analogy to the study of community chests conducted by Litwak and Hylton (1962), we observe that in the increasingly global competition, the firms are competing for the common customers' "fund" and the increase in one firm's revenue would come at the expense of other firm's loss [of customers]. Coordination, being a function of interdependency, should grow in periods of increased competition for "funds." (For a typology of interorganizational configurations based upon interorganizational control, see Lehman, 1975.)

The IT Paradox
Proposition 7: Increasingly turbulent environment would feed the need for further [and greater] advancements in IT which would further increase turbulence.

Business needs are incessantly driving the demands for increased capabilities of IT. In turn, increasingly advanced IT is being utilized in more and more sophisticated ways by the businesses to outdo competition (Rockart & Short, 1989). IT, which is being deployed as a solution to the increased complexity and uncertainty of the environment, has paradoxically contributed to the situation by "compressing time and distance." In absence of the present day advances in IT, would we be talking of globalization or time-based competition? Perhaps, not. The pace of complexity is increasing fast. Hopefully, the advances in technology would be able to keep up with the environmental changes.

Discussion and Summary of Propositions

For researchers as well as practitioners, open systems theory provides a 'wholistic' perspective of the organizational issues which involves all the interactions in the environment- organization interaction matrix. Moreover, L22 (the 'turbulent environment') is increasingly significant because most organizational change is externally induced. "Survival of the fittest" is a function of the fitness of the environment (Terreberry, 1968). Organizational

adaptability is a function of the ability to learn and to perform according to changes in the environment. Complexity and rapidity of change in 'external connectedness' (L22) results in increasingly unpredictable change in the organization's transactional dependencies (L12, L21). Adaptability exists to the extent that a system (L11) can survive externally induced (L22) change in its transactional interdependencies (L21, L12) in the long run. To confront increasing environmental turbulence, organizations are seeking to increase their transactional interdependencies (L21, L12).

In this article, the issues of organizational change and organizational interdependence have been used to illustrate some potential contributions of open systems theory. Tentative propositions outline research questions and hypotheses that might assist in solving some of the problems encountered by organizations. The propositions might be summarized as follows:

Proposition 1 asserts that faced with increasing environmental change, organizations will scan their environments more intensely and IT can be effectively used for this purpose. Proposition 2 and 3 argue that the feedback from the environment will be used to plan the organizational goals and the organizational structure by making effective utilization of IT. Proposition 4 contends that faced with increasingly turbulent environment, organizations will devise more organic structures by application of IT. Proposition 5 states that in the increasingly turbulent environment organizations would leverage their core competencies by deploying IT. Proposition 6 argues that organizations would use IT-enabled coordination-mechanisms for linking with other organizations in a turbulent environment to leverage their core competencies. Proposition 7 contends that increasingly complex and uncertain environment drives the increase in IT capability, and the use of newer IT capabilities further increases the turbulence.

5. Limitations and Conclusions
Limitations of Taking an Open Systems Theory Perspective

In terms of empirical research on organizations, the open systems theory has had negligible impact. Though the open systems model has been widely used to label and legitimize organizational studies, it has seen little use as a research guide. The organizational researchers have not been able to exploit the potential contributions of this theory in empirical research (Ashmos & Huber, 1987: 610). Few researchers have the tools or the ability to take into account all the various components that must be included in even a relatively simple open systems model (Hall, 1977:59).

To appraise the effectiveness of an organization with the aid of systems theory one must measure its performance with respect to the four systemic processes - inputs, transformations, outputs and feedback effects - as well as their interrelationships. Measurement of the various forms of organizational inputs and outputs is pretty much undeveloped. Moreover, unlike the preoccupation with achieving equilibrium condition, the organizational system is seeking to maximize or minimize one or more values, whether they be profit, cost, influence (Evan, 1993). The more commonly accepted approach for organizational research is the goal approach which considers goal achievement or the degree to which an organization attains its goals. As an exception, Evan (1993) has demonstrated the operationalization of the four systemic processes in a study of interorganizational relations among hospitals using the systems theory approach. He suggests the possibility of developing organizational effectiveness measures without directly and explicitly identifying their goals but indirectly by measuring dimensions of inputs, transformations, and outputs of an organization. The problems encountered in defining an organization's goals can be avoided by indirectly deriving the goals by using Evan's approach. In sum, open systems theory presents a "wholisitc" approach to the research of organizational problems, but the researchers will need to be more creative with the operationalization of the goals. Further, they would need to conduct a more systematic inquiry of the various properties of open systems enumerated by Miller (1965: 193-237) and Katz and Kahn (1966).

Summary

Ramstrom (1974) notes that the future organizations would be facing a shortage and a redundancy of information. To solve the problems of "information-glut" arising from the evermore affordable information and communication technologies that provide for evermore high-capacity, fast, long-distance transmission, organizations would need to introduce methods for "selective dispersion of information" to their various parts. Work tasks would be grouped in organizational units created around a common program for information processing. Improvements in telecommunications will make it easier to control [which will be primarily a matter of information exchange] organizational units dispersed over different parts of the world. Advances in telecommunications [such as videophone], coupled with diminishing costs, would result in increased distance-communication. Indirect communication would be preferred for well-structured information for reutilized, "preprogrammed" decision processes.

The design of the organizational structure should take into account and take advantage of the information and information- processing supports which could be designed, and in the not- distant future will be inexpensive. The technology itself is neutral,

but it can greatly increase humanity's woe or welfare, depending on how well it is used. What is missing is the full recognition of the strong interactions between this technology and organization design, and the consequent need to take a systems approach to the joint design of organizations and their information support systems (Holt, 1992).

Unlike the systems theory view of organizational constructs, the most common approach taken by empirical researchers has been in terms of goal achievement or the degree to which an organization attains its goals. This poses a problem of identifying or postulating the goals, manifest and latent, of an organization. Some researchers seek to avoid the goal approach and argue in favor of the "resource" approach. While there is much merit in emphasizing the crucial importance of resources - or in, systemic terms, of input processes and input goals - it ignores the other three systemic processes. On the other hand, the economist's bias of measuring outputs in relation to inputs overlooks the other systemic processes that eventually effect the organization's overall survival or growth. Clearly, the systems approach has its advantages. Moreover, the problems encountered in defining an organization's goals can be avoided by indirectly deriving the goals - by positing the three generic goals of input, transformation, and output (Evan, 1993).

References

1. Adler, L., "Symbiotic Marketing," *Harvard Business Review*, 44 (November 1966), 59-71.
2. Aldrich, H.E., *Organizations and Environments*, Prentice- Hall, Englewood Cliffs, New Jersey, 1979.
3. Aldrich, H.E., "Technology an Organizational Structure: A Reexamination of the Findings of the Aston Group," *Administrative Science Quarterly*, 17 (March, 1972), 26-43.
4. Ashby, W.R., *An Introduction to Cybernetics*, Chapman and Hall, London, 1956.
5. Ashmos, D.P. & Huber, G.P., "The Systems Paradigm in Organization Theory: Correcting the Record and Suggesting the Future," *Academy of Management Review*, 12, 607- 621.
6. Attwell, P., & Rule, J., "Computing and Organizations: What We Know and What We Don't Know," *Communications of the ACM*, 27, 12, (December, 1984).
7. Baker, F., *Organizational Systems: General Systems Approaches to Complex Organizations*, Irwin, Homewood, IL, 1973.
8. Bakos, J.Y., "Dependent Variables for the Study of Firm and Industry-Level Impacts of Information Technology," in J.I. DeGross and C.H. Kriebel (Eds.), *Proceedings of the Eighth International Conference on Information Systems*, Pittsburgh, Pennsylvania, (December 6- 8, 1987), pp. 10- 21.
9. Bertalanffy, L. von, "General Systems Theory," *General Systems*, 1 (1956), 1-10.
10. Blau, P.M. & Scott, W.R., *Formal Organizations*, Chandler, San Francisco, CA, 1962, 194-221.
11. Bluementhal, S.C., "Breaking the Chain of Command," *Business Automation*, (November, 1963), 20-27.
12. Bradley, S.P., Hausman, J.A., & Nolan, R.L., "Global Competition and Technology," in S.P. Bradley, J.A. Hausman & R.L. Nolan, *Globalization Technology and Competition: The Fusion of Computers and Telecommunications in the 1990s*, Harvard Business School Press, Boston, MA, 1993, 3-31.
13. Browning, J.,"Information Technology: The Ubiquitous Machine," *The Economist*, (June 16, 1990), p. 5.
14. Cash, J.I., & Konsynski, B.R., "IS Redraws Competitive Boundaries," *Harvard Business Review*, 63,2, (March- April 1985), 134-42.
15. Churchman, W., *The Systems Approach*, Delacorte Press, New York, 1968.
16. Cordell, A.J., "The Uneasy Eighties: The Transition to an Information Society," *Computers and Society*, 16, 4, (Winter 1987), 12-18.
17. Crozier, M. *The Bureaucratic Phenomenon*, University of Chicago Press, Chicago, 1964.
18. Cummings, T.G. "Interorganization Theory and Organization Development," in T.G. Cummings (Ed.), *Systems Theory for Organization Development*, John Wiley & Sons, Chichester, Great Britain, 1980, 323-338.

8/15/2016