

**An Examination of the Relationship between Managerial
Innovativeness and Adaptation to Change and Managerial Use
of Information Technology**

By

**Donald A. Forrer, D.B.A.
Assistant Professor
Troy State University – Florida Region**

**Terry A. Anderson, Ph.D.
MPA Program Director
Troy State University
Graduate Chair, Arts and Sciences
Troy State University – Florida Region**

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ABSTRACT

The intense usage of computers incorporated into the work place during the 1980s and 1990s forced managers to change their traditional methods of management. Since different individuals will likely create different solutions to similar problems, management's approach to end-user computing could produce a vast difference in productivity. This raises the question of whether the manager's use of end-user computing is related to his level of innovativeness. To determine and measure potential success of managers, it is necessary to construct a method to measure the level of management innovativeness (Kirton, 1976).

This research thus examines the relationships surrounding a manager's level of innovativeness and the utilization of end-user computing. The study utilizes five independent variables measured by 16 indicators of managerial innovativeness and tests them against seven dependent variables that measure computer use.

The subjects for this study were approximately 140 managers in the United States Army Personnel Command (PERSCOM). The organization consists of active duty military and civilian managers. Results indicate several significant findings in the area of managerial attitudes towards change and generation of change in business ideas. The amount of change generated by managers related significantly with several aspects of end-user computing.

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The intense usage of computers incorporated into the workplace during the 1980s and 1990s forced managers to change their traditional methods of management. Since different individuals will likely create different solutions to similar problems, management's approach to end-user computing could produce a vast difference in productivity. This creates a need to address the manager's use of end-user computing by measuring the effects of Managerial Innovativeness. To determine and measure potential success of managers, it is necessary to construct a method to measure the level of Managerial Innovativeness (Kirton, 1976). This research thus examines the relationship between Managerial Innovativeness and their Utilization of End-User Computing.

Today's managers must supervise personnel, providing computer utilization guidance to achieve and demand maximum output. However, individual managers may lack the knowledge required to determine efficient computer information system utilization. Additionally, managers are required to purchase technology when they have limited expertise in that arena. The level of Innovativeness may determine if managers effectively influence change in organizations. Downs and Mohr (1976) contended that technical innovations require a completely different decision process than administrative decisions.

Reliable research indicates that managers have adapted to change for generations. End-user computing is relatively new to the business world and prior research is limited. Reacting to changes efficiently by using end-user computing innovations will be a challenge for future managers (Mintzberg, 1990). End-user computing is in its infancy for most applications, prompting managers to determine if they should delegate tasks or be a hands-on leader. However, expanding end-user computing capabilities are numerous and remaining a hands-on manager could jeopardize productivity.

Recent research based on 16 small businesses indicates that while innovation characteristics are important determinants of the decision to adopt technology, they are not the sole determinant of the extent of technology adoption. Thong (1999) determined that factors such as innovativeness, technology knowledge, relative advantage, compatibility, size, and complexity all played an important role in the decision to adopt new technology.

This research focuses on characteristics of managerial innovativeness and their relationship to end-user computing. The problem addressed in this research is whether managerial innovativeness significantly influences end-user computing in the organization. Koen and Kohli (1998) addressed the concept of Innovation through research on 34 engineering projects and determined that idea generation came from variables linking the degree and source of Innovation in managers. The empirical data suggest that Innovativeness determined the source of creative ideas within the project team.

Management demands the study of Innovation to improve operations and productivity. Van De Ven (1986) describes four problems related to Managerial Innovativeness. First, there is the human problem of managing attention. The more successful an organization is, the harder it is for management to focus employee attention on new ideas or opportunities. Second, the problem of managing ideas exists. This problem includes the adoption of innovations. Third, the problem of managing a part-whole relationship, or to manage an idea as it develops over time. Finally is the problem of institutional leadership, where management must create a structure conducive to innovation. These four problems warrant a further examination of innovation as it applies to end-user computing.

According to Van De Ven (1986), the above stated problems remained overlooked while researchers focused on one kind of organizational model for innovation. Research on internal organizational innovation (Normann, 1977), new business start ups (e.g., Cooper, 1979), diffusion of an innovation (Rogers & Kincaid, 1981) or a technological innovation (Utterback 1974) have provided insights to management problems, but fail to address the whole problem. Leavy (1999), determined that the innovativeness of key individuals and teams in the company is a requirement for competitive capabilities in the area of technology.

The model used in this research is not the product of one single behavioral theorist. Rather, it is an integration of theories heavily influenced by the work of Rogers (1982), Kirton (1961), Vroom (1964), and Ettlie, Bridges & O'Keefe (1984). Additionally, theorists such as Taylor, Mintzberg and Maslow offer insight to the innovation process. To facilitate understanding, a brief discussion of each theorist will be presented separately and conclude with an attempt at synthesis.

Two acknowledged theorists in innovation are Michael Kirton and Everett M. Rogers. Kirton's *Adaption-Innovation Theory* contends that some people characteristically adapt while some

characteristically innovate (Kirton, 1961). Kirton's Adaptive-Innovative Inventory (KAI) uses behavioral indicators of adapters and innovators to determine which managers are adaptive or innovative. Kirton uses characteristics of innovators and adapters described in KAI to evaluate the constructs and determine which category fits each manager (Kirton, 1976).

Kirton's Adaption-Inventory uses three categories to identify each characteristic of the manager. The first category contains traits that identify the creative person such as Rogers' (1959) creative loner. The second category is methodical Weberianism, the precise, reliable and disciplined person envisaged by Weber (1948) as needed in organizations. The third category, "Mertonian Conformist", mirrors Merton's (1957) description of a person who respects authority and rules. This category fits well into a bureaucracy.

The *Adaptive-Reactive Theory* created by Osborn and Hunt (1975a,b) addresses system analysis in areas such as end-user computing where systems approach dictates tasks. This model incorporates macro-variables such as environmental constraints or organizational behavior as antecedents of leader behavior. The theory is based on leadership inputs creating production outputs in a systematic method.

Another acknowledged theorist in the field of innovation/adaptation is Everett M. Rogers. According to Roger's *Diffusion of Innovation Theory*, the manner in which managers communicate an innovation directly affects the innovativeness of the employees (Rogers, 1982). Rogers describes an innovation as an idea, practice, or object perceived as new by the unit of adaptation. The innovation-decision process used by managers is the mental process that the manager passes from knowledge of an innovation to forming an attitude toward the innovation among employees. How employees perceive the characteristics of an innovation determines the rate of adoption. Rogers describes five attributes of innovations as: 1) relative advantage, 2) compatibility, 3) complexity, 4) trainability, and 5) observability (Rogers, Rekha-Rogers, 1976). Research supporting Rogers' (1982) *Diffusion of Innovation Theory* contends that when the manager is the adapting unit, communication is generally the central point in the innovation adaptation process.

The *Strategy-Structure Theory* deals directly with systems such as end-user computing that require radical change in most organizations to be successful. According to Ettlie, Bridges & O'Keefe (1984), unique strategy and structure require radical innovation, especially process adaptation. Traditional strategy and structure support product introduction and process adoption. Their tested model suggests that the strategy-structure causal sequence is differentiated by radical rather than incremental innovation.

This research study utilizes five independent variables measured by 16 indicators of managerial innovativeness and tests them against seven dependent variables that measure computer use. Subjects in this study were approximately 140 managers in the United States Army Personnel Command (PERSCOM). By combining the work of Rogers, Ettlie, Bridges, O'Keefe, and Kirton in the area of innovation, this research evaluates the independent, dependent and control variables and hypothesizes that, by using the computer as an innovation, managerial use of end-user computing is a function of managerial innovativeness.

H₁: There is a significant relationship among the indicators of innovativeness included as independent variables in the study.

According to Ettlie and O'Keefe (1982), significant literature assumes there is a positive relationship between the independent variables (Larsen, 1989). The *Strategy-Structure Theory* indicates that radical change versus gradual change could cause different reactions to the management initiative. Additionally, Kanter (1983) and Allen (1984) agree that the five independent constructs relate positively.

According to Dr. Larsen's (1989) research, the individual level control variables of Age and Organizational Tenure are not related positively to any independent variables that measure innovativeness. However, the individual control variable Education is positively related to the five independent variables. Kohn and Schooler (1983), Rogers (1982), and Larsen (1989), supported this research.

Hypothesis 1 measured the relationship between seven measurements of individual innovativeness. Pearson product-moment correlation coefficients were determined to determine the existence of multicollinearity. The variables included in this analysis and the correlation and associated probability levels are displayed in Table 1. The table clearly indicates significant relationships between Managerial Generation of Change in Business Ideas and their Attitudes Toward Change, Degree of External Dependency, and Boundary Walking. The research indicated that managerial propensity for change related significantly to their project description.

This pattern indicates that when innovativeness level increases or decreases, it causes other

variables measuring Innovativeness to increase or decrease. However, no decisive pattern indicates that this is the case throughout all indicators of Innovativeness. The remaining variables have no significant correlations. Though the results are inconclusive, multicollinearity appears to be minimal.

Table 1: Correlations Among 7 Indicators of Business Innovativeness.

| Innovativeness Measures | (ATT) | (GC) | (PC) | (JSE) | (DED) | (BW) | (IMP) |
|--|---------------|--------------|---------------|---------------|---------------|--------------|---------------|
| Attitude toward change (ATT) | 1.0 (118) | .28* (43) | -.12 (118) | -.08 (118) | .12 (118) | .26* (71) | .18* (108) |
| Generation of Change – Business Ideas (GC) | .28* (43) | 1.0 (43) | -.20 (43) | .05 (43) | -.01 (43) | .33* (39) | .31* (43) |
| Professional Conduct (PC) | -.12 (118) | -.20 (43) | 1.0 (120) | -.10 (120) | .01 (120) | -.13 (71) | .05 (110) |
| Part of Job-time Spent Externally (JSE) | -.08 (118) | .05 (43) | -.10 (120) | 1.0 (120) | .06 (120) | -.08 (71) | .06 (110) |
| Degree of External Dependency (DED) | .12 (118) | -.01 (43) | .01 (120) | .06 (120) | 1.0 (120) | .33* (71) | -.07 (110) |
| Boundary Walking (BW) | .26* (71) | .33* (39) | -.13 (71) | -.08 (71) | .33* (71) | 1.0 (71) | .07 (68) |
| Importance to External Users (IMP) | .18* (108) | .31* (43) | .05 (110) | .06 (110) | -.07 (110) | .07 (68) | 1.0 (110) |

*p < .05 () = N

This research does not support the research hypothesis that there is a significant relationship among the indicators of Innovativeness included as independent variables in the study.

Table 2 indicates Education's relationship to Innovativeness in the variables Professional Conduct, Job-Time Spent Externally, and Importance to External Users. Tenure is related to Innovativeness in the variable Professional Conduct. Age has no significant relationship with Innovativeness. There is no pattern to the correlations that would indicate that the control variable would have a cumulative significant relationship based on the research conducted.

Table 2: Correlations Among 7 Indicators Of Business Innovativeness And Individual Level Control Variables.

| Innovativeness Measures | AGE | TENURE | EDUCATION |
|--|--------------------|-------------------|--------------------|
| Attitude toward change (ATT) | -.10 (113) | -.01 (117) | .05 (116) |
| Generation of Change - Business Ideas (GC) | -.03 (43) | -.01 (43) | .02 (43) |
| Professional Conduct (PC) | .06 (115) | .19* (119) | .15* (118) |
| Part of Job-time Spent Externally (JSE) | .06 (115) | .05 (119) | -.16* (118) |
| Degree of External Dependency (DED) | -.18* (115) | .05 (119) | -.05 (118) |
| Boundary Walking (BW) | -.02 (69) | -.01 (71) | .15 (70) |
| Importance to External Users (IMP) | .09 (107) | .01 (110) | .19* (110) |

* p < .05 () = N

Multiple regression was used in this study to test hypotheses 2 through 5. Only the statistics that show significance are listed.

H₂: There is a significant relationship between managerial innovativeness and their use of end-user computing applications and support functions.

Osborn and Hunt (1975a,b) used their *Adaptive-Reactive Theory* to develop a model that tested how the transformation of ideas can be increased in rate and intensity. The importing and introduction of ideas by innovative managers can be increased if management increases reinforcement and support for these actions. Selecting highly motivated (innovative) individuals can cause an increase in the energy level of managers.

According to Larsen (1989), there will be a significant difference in the usage of computer applications and computer support functions based on managerial innovativeness. Danziger (1985) stated that the computer is sometimes ominous and threatening to managers. This causes managers to stay with proven methods of problem solving rather than be the office innovator. Kirton's (1984) *Adaption-Innovation Theory* indicates that managers have a tendency to reject new ideas and methods until a critical event occurs that causes the manager to react to the situation. Additionally, innovative managers excluded from the accepted group due to innovative behavior find the tendency to encounter resistance when introducing an innovative idea.

Organizations encourage adaptive behavior rather than innovative behavior to minimize risk. This is especially true for large organizations (Kirton, 1984). According to Weber, Girth & Mills, (1970), the aim of large bureaucratic structure are precision, reliability and efficiency. According to the three listed authors, large corporations exert pressure on managers to be methodical, prudent and disciplined (Kirton, 1984). The addition of computers to the work place and its processes causes corporations to review corporate policy regarding managerial Use of End-User Computing.

Hypothesis 2 explores usage patterns and importance ratings in three areas: 1) Direct Computer Use, 2) Indirect Computer Use, and 3) Use of Supportive Structures (Larsen, 1989).

Table 3: Direct Computer Use

| | t-value | Sig t | Beta | SE Beta |
|-----------------------------|-----------------|---------------------|----------------|----------------|
| Professional Conduct | -2.243 | .0310* | -.345969 | .154247 |
| | R-square | Adj R-square | F value | Sig F |
| | .1197 | .959 | 5.031 | .031* |

The significant *t*-value for Professional Conduct, comprised of : 1) Journals Read, 2) Membership in Professional Associations, and 3) Professional Meetings Attended, as a measure of Innovativeness reveals a significant relationship with Direct Computer Use. The negative Beta indicates that the level of managerial Professional Conduct is negatively associated with their Direct Computer Use. The significant *F*-value for the entire regression model supports this and the *R*² indicated that approximately 10% of the variance was in the accountable population.

The scale used to measure Computer Use indicated that the low score received the most importance. The scale used to measure Professional Conduct indicated that positive answers also receive the lowest score. This indicates that professionally active managers are less likely to directly use computers than managers less professionally active.

There were no significant findings in the variable measuring Indirect Computer Use or the Use of Support Functions. Thus only the portion of the research hypothesis that there would be a significant relationship between the level of Managerial Innovativeness and Direct Computer Use is supported.

H₃: There is a significant relationship between Generation of Change in End-User Computing and Use of End-User Computing.

Victor Vroom's (1964) *Expectancy Theory* is based on the assumption that motivation is a function of choices of behavior. Computer usage frequency is a management choice that bears examining. End-users can maintain minimum production levels while still maintaining management's confidence. An expectancy is the likelihood that an event will occur. Some expectancies are related to performance. Vroom (1964) describes *effort-performance* expectancy which refers to a person's expectations as to the amount of effort expended and the attainment of certain goals. Another expectation is the *performance-outcome* expectancy which reflects the individual's expectations about performance levels required to attain a certain performance goal (Vroom, 1964).

Vroom and Yetten (1973) state that participation will depend on the situation and the

innovativeness of the leader. Farrow and Bass (1973) felt that personality has more effect on participation. Frequency of participation may hinge on contingent factors. In the area of end-user computing, the frequency of participation could be the deciding factor in the increase of productivity.

Analysis of the relationship between the Innovativeness variables (Attitude Toward Change and Generation of Change) and the Computer Use variables (Number of Hours Used, Perceived Importance, and Types of Use) produced no significant findings. Hence, this research fails to support the research hypothesis that there is a significant relationship between Generation of Change in End-User Computing and Use of End-User Computing.

H₄: Managerial Innovativeness will have a significant relationship with the amount of Computer Change Generated by Managers.

The *Bass-Valenzi Model* (Bass & Valenzi, 1976) indicates that a manager's style, whether directive, consultative, participative, or delegative depends on the perception of the task. System inputs and outputs depend on leader perception based on variables such as organizational, group and task inputs that produce productive outputs. The *Bass-Valenzi Model* suggests that leaders will be directive if they perceive power in the situation (Bass, 1976). Leaders will delegate if they perceive that subordinates have power (Bass & Valenzi, 1976). Generation of Change in End-User Computing depends on managers being directive in nature.

Researchers such as Bryson and Kelley (1978), Peabody (1976) and Van De Ven (1976) concluded that variables such as process-focused, individual, structural and environmental are consequential when understanding organizational change.

Hypothesis 4 tested the relationship between Managerial Innovativeness and Generation of Change for End-User Computing.

Table 4: Importance of Change Generation

| | t-value | Sig t | Beta | SE Beta |
|----------------------------------|-----------------|---------------------|----------------|----------------|
| Job-Time Spent Externally | -2.106 | .0420* | -.327175 | .155351 |
| | R-square | Adj R-square | F value | Sig F |
| | .1070 | .0829 | 4.435 | .042 |

In hypothesis 4, Job-Time Spent Externally as a measure of Innovativeness related significantly with the dependent variable Importance of Change Generation in End-User Computing. The negative Beta indicated that the Innovativeness variable Job-Time Spent Externally associated negatively with importance of Change Generation in End-User Computing. The R^2 indicated that approximately 10% of the variance is accounted for. The significant t - and F -values indicate that Job-Time Spent Externally related significantly to the importance to external users.

The scales used to measure both variables indicated that the lower score received the most importance. Results indicated that managers Spending Job-Time Externally will place more emphasis on the importance of the Generation of Change in End-User Computing.

This research supports the research hypothesis that Managerial Innovativeness will have a significant relationship to the amount of Computer Change Generated by Managers.

H₅: Managers who are innovative and who actively encourage generation of change in end-user computing will engage in more networking throughout the larger part of the organization.

Hypothesis five deals extensively with the different variables of change management. According to Zaltman, Duncan & Holbeck, (1973) an organization is more likely to innovate when the environment is moving rapidly, rather than slowly. Such is the case with End-User Computing. Seeking to control corporate environment rather than merely adjust to it makes an organization more innovative (Rogers, Rehka Agarawala-Rogers, 1976).

According to Kurt Lewin if someone wants to understand an organization, he should try to change it (Rogers, Rehka, Agarawala-Rogers, 1976). Innovativeness in managers reflects the research of Rogers

(1982) and his *Diffusion of an Innovation Theory*. Communication among peers and subordinates is paramount to innovative thinking among managers.

Table 5: Coalition Building

| | t-value | Sig t | Beta | SE Beta |
|-----------------------------|-----------------|---------------------|----------------|----------------|
| Professional Conduct | 3.244 | .0025* | .445995 | .137474 |
| | R-square | Adj R-square | F value | Sig F |
| | .2281 | .2073 | 10.937 | .002* |
| | t-value | Sig t | Beta | SE Beta |
| External Dependency | 2.293 | .0278* | .315190 | .137474 |
| | R-square | Adj R-square | F value | Sig F |
| | .3265 | .2891 | 8.726 | .001* |

Table 6: Boundary Walking

| | t-value | Sig t | Beta | SE Beta |
|-----------------------------|-----------------|---------------------|----------------|----------------|
| Generation of Change | 2.188 | .0350* | .338529 | .154692 |
| | R-square | Adj R-square | F value | Sig F |
| | .1146 | .0907 | 4.789 | .035* |

Hypothesis 5 examines the relationship between Innovativeness and Managerial Tasks (Boundary Walking, Coalition Building, Cost in Dollars, External Funding, Value, and Importance to External Users). The results produced significant findings in two variables as both Coalition Building and Boundary Walking produced significant *t*- and *F* -values. The positive Beta indicated that Managerial Innovativeness is positively associated with Change Generation on the larger part of the organization.

Professional Conduct and External Dependency related significantly to Coalition Building. Generation of Change in business ideas related significantly to Boundary Walking. The scales used to measure all included variables used the lowest number to indicate the most importance. Research results indicated that innovative managers are likely to have a significant relationship with the larger part of the organization.

The R^2 indicated that Professional Conduct constitutes approximately 23% of the variance, while External Dependency adds approximately 10% more to Coalition Building. Generation of Change constitutes approximately 10% of the variance.

The research hypothesis that managers who are innovative and who actively encourage generation of change in end-user computing will engage in more networking throughout the larger part of the organization is thus supported.

This research found significant relationships among several indicators of Innovativeness included as independent variables in this study. Results included significant relationships between managers' attitude towards change and generation of change in business ideas, and managers' perception of the importance of boundary walking, and importance of end-user computing to external users. Attitude towards change among managers in PERSCOM is related significantly to the amount of change generation in the organization. Attitude towards change also significantly related to the amount of boundary walking (working with other organizations), and the importance placed on external users of end-user computing.

The survey utilized in this research is currently being administered to managers in the Orlando Florida area. The results will be compared and contrasted when this paper is presented. Additionally, this research will serve as a prelude to research on the effects of innovation on measuring performance of managers' in relation to Return on Investment (ROI) for technology.

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