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Relative ranking of conditions that facilitate innovation implementation in the USA

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This study compared how people working in three different types of organisations in the United States (K-12 schools, higher education, and business) rank the importance of eight conditions that have been shown to facilitate the implementation of innovations. The study also sought to determine if the nature of the innovation (i.e., technology or process innovation) affected the rankings. Technology innovations are those that require the use of a new tool or product such as an innovative communications device or new piece of manufacturing equipment. Process innovations are those that require a new method or system such as a new method for performance evaluations or new budget approval process. A total of 635 participants completed an online instrument to determine their individual ranking of the eight conditions, 315 participants responded to questions specific to technology innovation while 320 responded to process specific questions. Analysis of variance was used to compare differences between the groups. Significant differences were found on five of the eight conditions in the technology sample and on seven of the eight conditions in the process sample. In addition, there were differences within groups based on the nature of the innovation. Change agents must adapt their strategies to account for the different rankings of the eight implementation conditions based on type of organisation and the nature of the innovation. The results of this study provide a framework for understanding and accounting for the group differences. This is the first study to address the prescriptive value of the eight implementation conditions.

Introduction

Change and innovation are considered essential to the success of any organisation. Innovation and change are often equated with competitiveness, forward thinking, and organisational development. Both academic and business organisations seek to adopt and use new technologies and processes as a means of expanding capacity, improving performance, and achieving goals. For all the potential benefits of change, there are also negative aspects. Implementing even a relatively minor change is often a difficult, frustrating, and divisive process that fails to produce the desired results.

A well designed implementation plan is essential to the success of any innovation or organisational change (Smith & Mourier, 1999; Voss, 1992). Only one out of every three change efforts in the business sector will be successful (Murhrcke, 1999). Approximately 75% of companies fail to see a return on investment when implementing an innovation (Day, 1999), while less than half of executives report that change efforts within their organisation were successful (Schiemann, 1992). About 50%

of technology innovations do not achieve their intended goals and more than 40% are abandoned before completion (Griffith, Zammuto & Aiman-Smith, 1999).

Implementation is also a major concern for educational organisations. Berman (1981) reports that the efforts during the implementation phase of the educational change process are the most critical for producing successful outcomes. Berman goes so far as to suggest that successful outcomes are as much a result of the implementation process as the innovation itself. Burkman (1987) notes that in many cases the failure of an innovation is not due to the quality of the product, but results from those responsible for its successful implementation failing to consider variables other than the product itself.

Even after decades of research, the implementation phase remains a misunderstood, but critical, part of change process in both educational and business settings (Ely, 1999). Given that success of an innovation is directly tied to its successful implementation, organisations must not only be aware of variables that facilitate implementation, but need a means for determining which variables are most important to their organisation, given a specific innovation. To fully understand the need for assessing variables, we need first to become familiar with some of the main models and strategies related to change.

Change models and strategies

One of the most widely cited experts in the field of change is Everret Rogers. His main change theories provide useful information and an excellent beginning for examining change models and strategies. For example, Rogers' innovation decision process describes change as a sequential process with five distinct steps, knowledge, persuasion, decision, implementation and confirmation. The change process starts with increasing the group's understanding of the innovation and then moves to the second step during which the group forms a positive or negative attitude about the innovation. These two steps greatly influence the third step, implementation, in which the innovation is either adopted or rejected (Rogers, 1995). During this step the intended users of the innovation are actively using the innovation. The final step involves evaluating the decision to adopt the innovation. In this step the group looks for evidence that will help them to either confirm their adoption as correct or to spur the group to reject the innovation (Rogers 1995).

Rogers also describes a number of other theories and ideas relevant to the change process. Perhaps the two most widely cited of his remaining theories relate to the attributes of an innovation and adopter categories. Briefly stated, Rogers believes potential adopters perceive an innovation in regard to five general attributes: Relative advantage, compatibility, complexity, trialability, and observability. The concept of adopter categories states that potential adopters tend to be normally distributed within an organisation along a continuum of innovativeness from "innovators" to "laggards". Taken together, the concepts of adoptor categories and innovation attributes suggest that the adoption of an innovation results, at least in part, from the interaction between the individual's innovativeness and their perceptions of the innovation. However, the decision to adopt an innovation does not guarantee successful implementation.

For implementation to be successful, other variables need to be addressed, particularly when implementation affects individuals who were not actively involved in the initial decision to adopt the innovation. Rogers' concepts related to the adoption and

diffusion process are useful in outlining the broad range of those variables. His work comes closer than anyone in providing a single, comprehensive, macro level model of change. However, his work provides little information about the specific actions that occur in the implementation step, and does not provide any guidelines for how organisations can work to facilitate the implementation of innovations. Both business and education have change models and strategies that inform the implementation of innovations in their field.

Business change models

Kotter (1996) presents an eight-step strategy for producing successful change. Kotter organises the eight steps into three groups with each group designed to overcome a set of change errors. The first group of steps (i.e., establishing urgency, creating a guiding coalition, developing a vision and strategy, communicating the change vision) is designed to create a change environment and to overcome the existing status quo. The second group of steps (i.e., empowering broad based action, generating short term wins, consolidating gains and producing more change) is designed to generate new methods of operating to support the implementation. The final step, anchoring new approaches in the culture, involves the process of institutionalising the change and making it a part of the organisational culture.

Klien and Sorra (1996) describe several variables that influence implementation of innovations or change. They refer to variables such as the existing skills and knowledge of employees, reinforcing the use of the innovation, the removal of implementation barriers (i.e., providing training and opportunities to practise, financial and infrastructure resources, leadership support, changes in policies and practices to encourage use of the innovation), and developing a climate for implementation. The "implementation climate" interacts with the "innovation value fit" or the perceived fit of the innovation with the organisations existing values. (p. 1062). The degree of fit and interaction between these two factors determines the level of implementation success.

The innovation process model proposed by Vrakking (1995) has four main phases, generation of ideas, initiation phase, implementation, and incorporation. In the implementation phase, several actions by the organisation can influence the implementation process. Some of these include training, employee involvement in the design and development of the innovation, communication from upper management on the need to change, and support from lower level management.

Education change models

The *Concerns Based Adoption Model* (CBAM) (Hall & Hord, 1987), perhaps the most widely cited educational change model, describes a process that organisations must progress through when implementing an innovation. The process involves seven stages that an organisation moves through sequentially, with each level having a corresponding level of use. These stages are awareness, informational, personal, management, consequences, collaboration, and refocusing. Each step in the process emphasises either the individual's experience with the innovation, the impact of the innovation, or the group's evaluation of the innovation. The CBAM shares many similarities with Rogers' innovation decision process.

Havelock and Zlotolow (1995) present a seven step model that change agents can use to facilitate change. The *CREATER* model focuses the change agent's efforts on particular strategies designed to overcome obstacles related to the each of the seven steps from "Caring" to "Renew." The CREATER model provides a guide for developing implementation plans or change strategies by providing change agents with a series of steps and strategies that allow them to develop relationships, identify problems, resources and solutions, and assist in the implementation of the solution.

Stockdill and Morehouse (1992) relate successful implementation of technological innovations to five factors. These include allowing the educational need to drive the selection of technology; recognising that the technology must match the needs of the user as well as their skills and attitude; that the technology must match the academic content; the general attributes of the technology as assessed by Rogers five attributes; and organisational variables such as "staff," "linkages," "equipment," "expertise," "rewards," and the "attitudes and values of the individuals" (Stockdill & Morehouse, 1992, p. 57).

Burkman's (1987) *User Oriented Instructional Development* process describes four types of support that assist in the implementation of new products. These supports address specific rewards and process for encouraging the use of the product, changes in policies and procedures that communicate the backing of the product by powerbrokers, provision of specific training for indented users, and resources that support the implementation of the product (Burkman, 1987).

More recently, the *RIPPLES* model has been introduced and provides an instrumentalist perspective to the implementation of technology in higher education. The model identifies seven components (i.e. resources, infrastructure, people, policies, learning, evaluation, and support) that must be attended to when implementing technology (Surry, Ensminger & Haab, 2005). Although the model was developed to explain technology implementation in higher education, the seven components are applicable to a variety of academic settings.

Implementation of innovations

The models for business and education all tend to emphasise both human and organisational variables to varying degrees. Ely (1990, 1999) presents a concise and comprehensive set of eight environmental or human conditions that facilitate implementation. These conditions are relevant for the implementation of technology or process innovations (Ely, 1990, 1999). The following section will present each of the conditions and indicate the relationship each has to the previously presented models and other research identifying specific variables related to implementation. The order of presentation of these conditions in no way reflects the relative importance or value of the condition. All play an important role in the process with many having interactive effects with one another.

Dissatisfaction with status quo refers to an emotional discomfort resulting from the use of current processes or technology that is perceived as inefficient, ineffective, or not competitive. This affective state is either self induced, results from organisational failure, or from leadership campaigning for the need to change (Ely, 1990, 1999; Surry & Ely, 2001). This condition is similar to relative advantage (Rogers, 1995), establishing a sense of urgency (Kotter, 1996), organisational values (Klien & Sorra, 1996), and matching product to users needs and values (Burkman, 1987). The "policies"

component of the RIPPLES model discusses the need for institutions to put into place policies that compel the use of technology by organisational members (Surry, Ensminger & Haab, 2005). Others have citied concepts similar to dissatisfaction with the status quo (e.g. Herson et al., 2000; Pajo & Wallace, 2001; Vrakking, 1995).

Adequate resources refers to the availability and accessibility of resources needed to implement the innovation. Resources includes the existing infrastructure as well as an organisation's finances, hardware, software, materials, personnel, and support structures (Ely, 1999, 1990). Burkman (1987) discusses the importance of locating of the necessary equipment, materials, and facilities in order to support the implementation of a new instructional product. Klien and Sorra (1996) identify infrastructure resources as part of their factor climate for implementation. Havelock and Zlotolow (1995) emphasise change agents acquiring the necessary resources for implementation. "Resources", specifically financial resources, is a major component of the RIPPLES model, as is "infrastructure" - the existence of the needed hardware and software to support the technology integration. Additionally, the RIPPLES model stresses the need for personnel to assist the technology integration efforts as part of the "support" component (Surry, Ensminger & Haab, 2005). Other researchers who have identified resources as an important part of implementation include Benson and Palaskas (2006), Buchan and Swann (2007), Dhanarajan (2001), Ebersole and Vorndam (2003), Okumus (2001), and Pajo and Wallace (2001).

Rewards and incentives refers to either intrinsic or extrinsic rewards that result from using the innovation. These rewards can vary significantly from user to user. Additionally, the innovation itself may be perceived as reward or the anticipated outcomes from the use of the innovation may serve an incentive (Ely 1999, 1990). Burkman (1987) discusses the use of rewards as part of "moral support" during implementation (p. 450). Stockdill and Morehouse (1992) identified rewards as a significant factor in "organisational capacity" (p. 57). The RIPPLES model discusses the use of linking technology to tenure, and merit systems as part of its "policies" component. Others citing this condition as part of implementation include Jost and Schneberger (1994), Klein and Sorra (1996), Okumus (2001), and Smith and Mourier (1999).

Knowledge and skills refers to users possessing or acquiring the needed skills and knowledge to employ the innovation. This condition also reflects users' feelings of self efficacy about using the innovation with training being a necessary part of the implementation plan (Ely 1990, 1999). The complexity of the innovation will affect implementation in that it will often require more training or skill development on the part of the users (Rogers 1995). Kotter (1996) emphasises the development of competencies in order to facilitate the change process. Varkking (1995) identifies training as part of the implementation phase. Surry, Ensminger and Habb (2005) describe knowledge and skill development as an aspect of the "people" component of the RIPPLES model. Other researchers have linked knowledge and skills or training to successful implementation (e.g. Benson & Palaskas, 2006; Dalton, 1989; Dhanarajan, 2001; Ebersole & Vorndam, 2003; Herson et al., 2000; Okumus, 2001; Pajo & Wallace, 2001).

Adequate time refers to the willingness of companies to provide paid time for users to learn the new skills or procedures in order to use the innovation, as well as the users' willingness to devote time to develop these new skills (Ely, 1990, 1999). This also represents the individual's belief that, with time, they can successfully adapt to the

change. It is important to note that adequate time does not reflect a set chronological time span for implementation, but instead addresses the idea that users must be provided time to develop a sense of familiarity and comfortableness with the innovation. Klein and Sorra (1996) mention opportunity to practise or use the innovation as critical to implementation. Inadequate or insufficient time is recognised as a barrier to implementation of technology in higher education (Ebersole & Vorndam, 2003; Pajo & Wallce 2001).

Participation refers to the involvement that stakeholders have in the decision making process to adopt and implement an innovation. Participation may take the form of user group representatives if it is difficult to get feedback from all potential users (Ely 1990, 1999). This condition helps to develop ownership of the innovation and increases the stakeholders' interests in a successful implementation. Varkking (1995) states "participation in the design phase is in fact the first step of implementation" (p. 35). The RIPPLES model includes participation as part of the "people" component through its suggestion that faculty be a part of the decision making processes when it comes to technology implementation (Surry, Ensminger & Haab, 2005). Others stress participation by intended users or employees during innovation or change design as well (Dirks et al., 1996; Herson et al., 2000; Meyers et al., 1999; Sims & Sims, 2002; Smith & Mourier, 1999).

Commitment refers to the visible support by the upper level leaders or powerbrokers in an organisation. The key to this condition is how the users perceive the powerbrokers' commitment to the implementation of the innovation. Simple verbal endorsement of the innovation by leaders and powerbrokers does not constitute commitment (Ely, 1990, 1999). Visible forms of commitment include such things as personal communication, development of strategic implementation plans, changes to organisational policies, dedication of resources, and active involvement in the implementation of the innovation. Kotter (1996) discusses building a guiding coalition of powerbrokers that share the common change goal. These members must have key characteristics such as power, expertise, credibility, and leadership. Bishop-Clark and Grant (1991) describe "top down implementation as powerbrokers developing plans and committing resources" (p. 321). Dhanarajan (2001) lists lack of commitment from university administrators as a barrier to implementation. Others who have emphasised the importance of powerbrokers in the change process include Buchan and Swann (2007), Conger (2000), Jost and Schneberger (1994), Meyers et al. (1999), and Varkking (1995).

Leadership refers to the level of ownership and support given by the leaders who will manage the daily activities of those implementing the innovation. (Ely, 1990, 1999). The enthusiasm of these leaders directly affects the motivation of the users of the innovation. Immediate supervisors must provide support and encouragement, answer questions, address concerns, and serve as role models for using the innovation. Kotter (1996) indicates that supervisors must actively support the change and communicate their support to employees. Kelin and Sorra (1996) note the value of leadership support implementation. Support, or championing of the innovation by supervisors, is often cited as a critical part of the change process (e.g., Buchan & Swann, 2007; Ebersole & Vorndam, 2003; Meyers, et al., 1999).

Surry and Ensminger (2003) attempted to measure the relative importance of Ely's eight conditions across two occupational groups (education and business) using scenario based questions. Their results showed significant differences between the two

groups on four of the eight conditions: dissatisfaction with the status quo, time, participation, and commitment. This study supported the concept of using the eight conditions as a framework for assessing the relative ranking of the conditions for a particular group and using that information to develop organisation specific implementation plans.

Ensminger, Surry, Porter and Wright (2004) compared the relative ranking of the eight conditions for three broadly defined occupational groups (higher education, K-12 education, and business-industry). The results of their study indicated that each group perceived the relative importance of the eight conditions differently. They also found differences in the relative ranking of the conditions based on several demographic variables such as age, gender, ethnicity, and technical ability. This again supported the hypothesis that the eight conditions could be used as a framework to determine the relative ranking of the conditions, called an "implementation profile", for a specific population. Once an organisation's implementation profile was determined, an implementation plan could be tailored to account for the profile. The study described in this paper was designed to build upon and expand the findings of the two prior studies.

Method

The purpose of this study was to determine whether members of different occupational groups perceived the importance of eight implementation conditions differently, and to determine the relative ranking of the conditions for each group. The researchers identified potential participants through online list groups that represented three occupational groups, business and industry, K-12 education, and higher education. Identified list groups were randomly assigned to either the process form or the technology form group. Participants were recruited from these list groups and provided with a URL to either the online version of the technology form or the process form of the Implementation Profile Inventory (IPI).

Participants

Data were collected from 756 participants. Because the purpose of the study was to compare three occupational groups (business-industry, K-12 and higher education), those participants who reported their occupation as being outside of this sampling parameter were removed from the data sets prior to analysis. The total sample used for statistical analysis was 635. A total of 315 participants participated in the technology sample and a total of 320 participated in the process sample.

Technology sample
The participants in the technology sample were comprised of three occupational groups (K-12, higher education, business and industry). The K-12 technology group (n=124) consisted of 104 females, 18 males, and 2 who did not report gender. Forty participants in the K-12 technology group had undergraduate degrees, 62 possessed master's degrees, 12 possessed educational specialist degrees, eight had doctoral degrees. The predominate ethnic group was Caucasian, which represented 91.6% of the group. Minority populations made up 6.4% of the group and 1.6% did not report their ethnicity.

The higher education technology group (n=126) consisted of 84 females and 41 males; one respondent in this group did not report gender. The educational make up of the

group was diverse, 13 held undergraduate degrees, 53 possessed master's degrees, 7 held educational specialist degrees, and 53 held doctoral or professional degrees. Caucasians represented 85.7% of the group population with minority groups representing 12.8% of the population, 1.6% of the population did not report their ethnicity.

The business/industry technology group (n=65) consisted of 37 females, 26 males, and 2 who did not report their gender. Seven reported their highest degree earned being a high school diploma or equivalent, 26 hold undergraduate degrees, 20 held master's degrees, and 11 held doctoral or professional degrees. Caucasians represented 84.6% of the population while non-Caucasians represented 13.8% of the population, 1.5% did not report their ethnicity.

Process sample
The participants in the process sample were also comprised of three occupational groups (K-12, higher education, business and industry). The K-12 process group (n=135) consisted of 108 females, 24 males, and 3 participants who did not report their gender. Three reported their highest educational degree as high school diploma or equivalent, 27 held undergraduate degrees, 70 held master's degrees, 18 held educational specialist degrees, and six held doctoral or professional degrees. African Americans represented 20% of the group, Caucasians represented 68.9%, non-Caucasians represented 6.6 % of the group, and 4.4 % did not report their ethnicity.

The higher education process group (n=109) consisted of 67 females, 41 males, and one participant did not report gender. Three participants reported their highest degree earned as a high school diploma or equivalent, 19 held undergraduate degrees, 52 possessed master's degrees, one held an educational specialist degree, and 34 held doctoral or professional degrees. Caucasians represented 89.9 % of the group, while minority groups comprised the remaining 10.1 percent.

The business process group (n=76) consisted of 34 females and 40 males; two did not report gender. Three reported having a high school education or equivalent, 22 possessed master's degrees, 3 held educational specialist degrees, and 10 held doctoral or professional degrees. Asian/Pacific islanders comprised 18.4% of the group, Caucasians made up 69.7% of the group, other minority group comprised 6.6% of the group, and 5.3% of the group did not report their ethnicity.

While this article only presents data analysis that utilises the occupational group variable, the other demographic data indicate that the technology and process samples had similar demographic characteristics and appear to be homogenous. Future research should be conducted to examine differences in implementation profiles that may be found for demographic variables other then occupational group (e.g., age, gender, technical proficiency).

Research instrument

Online versions of the technology form and process form of the Implementation Profile Inventory (IPI) (Surry & Ensminger, 2004) were used to collect data. The range of reliability coefficients for the eight condition scores for the technology form was r = .59 to r = .86 with the average being .73. The range of reliability coefficients for the process form was r = .41 to r = .89, with an average coefficient value of .63 (Porter, Surry & Ensminger, 2003).

Results

Technology form results

Analysis of the results from the technology form indicates that the three occupational groups perceive the conditions differently. Table 1 shows the mean and standard deviations for the three occupational groups on the technology form. The one way analysis of variance (ANOVA) for the conditions scores for the three occupational groups indicated significant difference for five of the eight conditions. These were resources, F (2, 312) = 14.91, $p < .01$, eta squared = .09; skills and knowledge, F (2, 312) = 3.92, $p = .02$, eta squared = .03; participation, F (2, 312) = 5.22, $p < .01$, eta squared = .03; time, F (2, 312) = 11.35, $p < .01$). eta squared = .07; commitment, F (2, 312) = 6.41, $p < .01$, eta squared = .04.

Table 1: Mean score and standard deviations for technology form

Condition	K-12		Higher education		Business	
	Mean	SD	Mean	SD	Mean	SD
Dissatisfaction with status quo	7.15	3.99	8.17	4.01	8.22	3.96
Skills and knowledge *	9.06	3.85	7.89	3.46	7.98	3.53
Resource **	10.06	3.09	8.79	2.82	7.36	3.14
Time **	8.02	3.16	6.08	3.35	6.63	3.32
Rewards	7.10	3.62	7.77	3.73	7.14	3.64
Participation **	7.02	4.17	8.27	4.19	8.98	4.59
Leadership	4.74	3.00	4.96	3.18	4.94	3.50
Commitment **	2.85	2.85	4.07	3.51	4.48	3.92
* significant at $p \leq .05$ ** significant at $p \leq .01$						

Post hoc comparisons using the Bonferroni's correction were conducted on the five significant conditions. Results of post hoc comparisons showed that the K-12 group valued the condition resources significantly more ($p \leq .01$) than either the higher education group or the business group. Additionally, the higher education group valued resources significantly more ($p \leq .05$) than the business group. The results indicate that the K-12 group considers the availability of resources as more important to the implementation of a technology based innovation that do either the higher education or the business groups.

Overall, the condition of resources was the most valued condition among those in the K-12 group and the higher education group while it was fourth overall for the business group (see Table 2). Business settings are often thought of as having more abundant technological resources than educational settings. This may explain the difference between the scores and importance that the K-12 and higher education placed on resources. This result supports previous research on technology innovations in academic settings that indicated resources were a critical component to implementation (e.g., Bauder 1993; Dalton, 1989; Ebersole & Vorndam 2003; Herson, et al., 2000; Ravitz, 1999; Rogers, 2000).

Post hoc comparison for the condition skills and knowledge resulted in a significant difference, $p \leq .05$ between the K-12 and the higher education group. The K-12 group appeared to value this condition more than the higher education group. Skills and knowledge ranked second for the K-12 group and was ranked fourth for the higher education group (see Table 2). Where it appears both groups value this condition when

implementing a technology innovation, those in K-12 settings consider the condition more important than do those in higher education and business settings. These findings support earlier research on implementation of technologies in K-12 settings (e.g., Bauder, 1993; Dalton, 1989; Ebersole & Vorndam, 2003; Herson, et al., 2000; Ravitz, 1999). Individual group comparisons for the condition participation indicated a significant difference between the K-12 group and the business group ($p \leq .05$). This result suggests that the business group valued involvement in the decision making process for technology implementation more than did the K-12 group.

Table 2: Ranking of the eight conditions for each group by importance.
Technology form

K-12	Higher education	Business-industry
Resources	Resources	Participation
Skills and knowledge	Participation	Dissatisfaction
Time	Dissatisfaction	Skills and knowledge
Dissatisfaction	Skills and knowledge	Resources
Participation	Reward	Reward
Reward	Time	Time
Leadership	Leadership	Leadership
Commitment	Commitment	Commitment

Prior research indicates the importance of employee participation when implementing technology innovations in business settings (e.g., Dirks et al., 1996; Sims & Sims, 2002; Varkking, 1995). Additionally, post hoc comparisons between the three groups for the condition time resulted in significant difference between the K-12 and the higher education group, $p \leq .01$, as well as the business group $p \leq .05$. Time ranked as the third most important condition for the K-12 group, but was sixth for both the higher education group and the business group. This indicates that time to become familiar with and develop the skills to implement technology is critical for the K-12 group. Those in K-12 may not feel that adequate time to develop skills and become familiar with technology is provided and they are responsible for the using personal time to develop skills and determine how to integrate technology into the curriculum. Earlier research on implementation of technologies in K-12 settings also supports the value of time (e.g., Bauder, 1993; Dalton, 1989; Ebersole & Vorndam, 2003; Herson, et al., 2000; Ravitz, 1999).

The business group rated commitment as more important to implementation that did the higher education group or the K-12 group. These differences were significant for both for the K-12 group ($p \leq .01$) and for the higher education group ($p \leq .05$). Commitment ranked as the least important condition for the all three groups. Although there were significant differences between the scores on this condition, it appears that all three groups consider powerbroker support as the least essential to the implementation of technology innovations.

Process form results

The results of the data analysis for the process form indicate that the three groups perceive the importance of the eight conditions differently. Table 3 shows the mean and standard deviations for the three occupational groups on the process form. The one way analysis of variance (ANOVA) for the conditions scores for the three occupational groups indicated significant difference for seven of the eight conditions. These were dissatisfaction with the status quo, F (2, 317) = 5.50, $p < .01$, eta squared =

.03; resources, F (2, 317) = 14.50, $p < .01$, eta squared = .08; participation, F (2, 317) = 8.92, $p < .01$, eta squared = .05; commitment, (F (2, 317) = 13.98, $p < .01$, eta squared = .08; time, F (2, 317) = 19.09, $p < .01$, eta squared = .11; leadership, F (2, 317) = 7.57, $p < .01$, eta squared = .05; and rewards, F (2, 317) = 4.26, $p = .02$, eta squared = .03. Table 3 shows the process form mean score and standard deviation for each condition by group.

Table 3: Mean scores and standard deviations for process form

Condition	K-12		Higher education		Business	
	Mean	SD	Mean	SD	Mean	SD
Dissatisfaction with status quo **	10.06	3.29	11.41	2.86	10.79	3.42
Skills and knowledge	5.97	3.38	5.61	3.73	5.36	3.44
Resource **	8.93	3.06	7.12	2.89	7.07	3.05
Time **	8.47	3.12	6.40	3.34	5.93	3.12
Rewards *	4.10	3.76	3.11	2.93	2.86	3.14
Participation **	6.49	3.54	8.40	3.74	7.97	3.91
Leadership **	5.49	2.96	6.30	3.14	7.22	3.42
Commitment **	6.50	2.88	7.63	3.36	8.80	2.96
* significant at $p \leq .05$ ** significant at $p \leq .01$						

Post hoc comparisons using the Bonferroni's correction were conducted on the seven significant conditions. For the condition dissatisfaction with the status quo the higher education group mean was significantly greater than the mean score for the K-12 group. Although statistical significance was determined between the two groups, the question remains of the practical value of the significance given that all three groups consider dissatisfaction with status quo as being the most important condition when implementing a process innovation. The results suggest that all three groups want to be sure the current process or program is ineffective prior to deciding to implement a new process or program.

For the condition resources, the K-12 group mean score was greater than both the higher education group ($p < .05$) and the business group ($p < .01$). Resources ranked second in overall importance for those working in K-12 while for those working in higher education and business it ranked fourth and fifth, respectively (see Table 4). Similar to the technology form results, those working in K-12 are often asked to implement new programs but are not provided with adequate resources to successfully meet the implementation goals.

For the condition participation, the K-12 group's mean score was significantly lower than the means scores for higher education group and the business group ($p < .01$). For the K-12 group the overall importance of participation ranked fifth, while the higher education group and business group rated the overall importance of participation as second and third respectively. These results are similar to the findings on the technology form and seem to support more the cultural aspects of these environments, with individuals in both environments seeking direct involvement in the change process.

For the condition commitment, the business group ($p < .01$) and higher education group ($p < .05$) means were significantly higher than the mean score for K-12. Additionally the mean score for the business group was significantly greater than the higher education group ($p < .05$). This indicates the business group considered

commitment to be an important condition when implementing process innovations, placing this condition second in overall importance while the K-12 group ranked the condition fourth and the higher education group ranked it third (see Table 4). Although the rankings vary little between the three groups, the significant difference between the means score suggests that the perceived value of commitment by each group may differ more than is suggested by the overall ranking. The results seem to suggest that visible indication of powerbroker support is critical to implementation of process innovations for those in business settings and those in higher education with those in business placing a greater significance on the condition than the other two groups.

Table 4: Ranking of the eight conditions for each group by importance.
Process form

K-12	Higher education	Business-industry
Dissatisfaction	Dissatisfaction	Dissatisfaction
Resources	Participation	Commitment
Time	Commitment	Participation
Commitment	Resources	Leadership
Participation	Time	Resources
Skills and knowledge	Leadership	Time
Leadership	Skills and knowledge	Skills and knowledge
Reward	Reward	Reward

For the condition time, the K-12 mean score was significantly different from the mean scores of both the business and the higher education groups ($p < .01$). The K-12 group considered time to be the third most important condition. This suggests that those in K-12 settings consider having adequate time to become familiar and comfortable with process innovations is critical. However, this is often not the case in K-12 settings where change is often introduced at the start of an academic year and teachers must implement the change immediately without fully understanding the innovation or having the necessary time to adapt their practice to the innovation. Time was ranked fifth for higher education and sixth for business.

The post hoc comparisons for the condition leadership indicated that the mean score of the business group was significantly higher than the means score of the K-12 group. The business group placed relatively more importance on leadership, ranking it fourth overall, while the higher education group ranked it sixth and the K-12 group ranked it 8th. This finding seems to reflect the nature of the organisations in that supervisors in business settings typically are directly involved in the use of the innovation along with other end product users.

The post hoc comparison for the condition rewards indicate that the K-12 group considered rewards to be more important that did the business group. The results indicate the K-12 group values incentives or rewards for implementing new process as more important that do those in business settings. However, all three groups consider this condition to be the least important of the eight and any significant difference between the groups may have not direct practical or observable impact.

Discussion and recommendations

Discussion

The results of this study support previous findings on the conditions associated with implementation. Results of this study indicate that the three occupational groups do view the conditions differently, as reported by previous research (e.g., Ensminger et al., 2004; Surry & Ensminger, 2003). Additionally, previous research specific to technology innovations (Ensminger et al., 2004) showed an almost identical rank order of the importance of the conditions for all three occupational groups. This suggests that these conditions are consistently the most important for these occupational groups, when implementing a new technology. The results also indicate that the type of innovation impacts the perceptions of the eight conditions, with the educational group having the most consistent group profile of the three groups. However all three groups consider dissatisfaction with the status quo as the most critical condition for fostering the implementation of process changes. This suggests that process innovations are perceived as more disruptive and require a stronger negative affective state with the current methods of operation before implementing a new process of program. The findings from this study show that the three occupational groups place emphasis on different conditions and that the type of innovation can influence the perception of these conditions. These results suggest the "one size fits all" approach to implementation planning is limited, and that tailoring implementation plans based on the occupation group and type of innovation will be more successful.

Recommendations

Based on the results of this study, we have developed several recommendations for change agents and future researchers. From a practical standpoint, the results of this study suggest that organisations that are introducing an innovate technology or process should carefully consider and account for the relative importance of each of the eight implementation conditions. Implementation profiles, the relative rank of the eight conditions, were shown to differ significantly between occupational groups and depending on whether the innovation was a technology based or process based innovation. Given the highly contextualised nature of change, it is likely that implementation profiles even differ from one organisation to another within an occupational field. This suggests that generic implementation strategies will be less effective in fostering the integration of new tools and practices than strategies that are tailored to the unique circumstances of an organisation. Change agents are encouraged to assess the importance of the each condition prior to implementing new technologies and processes, in essence generating implementation profiles of organisations by assessing members' perceived importance of these conditions. These implementation profiles can serve as a starting point for tailoring an implementation plan by ensuring that conditions identified as most important are adequately addressed within the plan. Additionally, periodic checks during the implementation processes that assess changes in the organisational profile, or that assess how well members think important conditions are being attended to, can provide information for adjusting the implementation plan to meet member's concerns.

Future research in this area should focus on the affect of specific implementation strategies for each condition. For example, if participation is found to be the most important condition for members of an organisation, what modes of participation are

most effective in facilitating implementation? Additional research in this area could also focus on differences in the relative importance of the eight conditions based on demographic variables such as age, gender, ethnicity, or educational experience. Also, while this study showed there were differences between occupational groups and that the occupational groups differed between process and technology based innovations, the underlying causes for these differences remain unknown. Future researchers could employ qualitative designs, such as case study, to explore the reasons for the differing implementation profiles. Finally, because a majority of participants in this study were from the United States, it would be useful to determine if the relative importance of the conditions differed from country to country.

Conclusions

The emphasis being placed on change and innovation requires that those responsible for implementing new technologies, processes and programs not only select quality innovations but also consider the environmental and human factors associated with implementation. Additionally, the results of this study show that the three occupational groups do value the conditions differently. This suggests that those who work as change agents need to view these three occupational settings as different and develop strategies that address the key conditions. The findings also suggest that the innovation itself (i.e., technological versus process) impacts the rankings of these conditions. This requires that the change agent consider the type of innovation as having a significant impact on implementation.

Not only must change agents be aware of the theories and strategies related to change but they must also have a more contextualised understanding of their specific organisation. By measuring the value of these eight conditions, change agents can develop specific implementation plans designed to address the most valued conditions first, thereby building momentum for the change while addressing the remaining conditions later in the change process.

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