Predictors of Employees' Perception of Innovation in Organization Performance: The Case of the Natural Resources Conservation Services (NRCS)

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ABSTRACT

In this paper, we investigate the role of organizational climate factors (work environment) that affect Natural Resources Conservation Service (NRCS) employees' perception of the level of innovative activity following the reorganization of the agency. It is assumed that an employee that perceives that innovation is valued and it plays an important role in the overall performance of the organization is likely to believe that they will be rewarded for innovative behavior, and as a result, will be more likely to direct their effort at becoming more innovative. In this study, data from a random sample of 643 NRCS employees suggest that the NRCS is likely to achieve the greatest gain in employee innovative behavior from improving the level of training and the level of employee involvement in organizational change, and moderate gains from improving team work, communication and leadership.

INTRODUCTION

The concept of organizational innovation is related to putting into practice new ideas or solutions, and the introduction of change, be it technological (in the case of products or processes), commercial, financial or social (related to human resources), administrative or organizational (see Medina et al, 2002) that improve performance (italics our emphasis). In an environment of dynamic complexities, it is important that NRCS (Natural Resources Conservation Service) be receptive to new ideas and organizational changes that will lead to improved performance. Most organizational researchers agree that modern organizations must be flexible enough to constantly adapt in order to survive in today's rapidly changing environment. The literature indicates that the ability of an organization to innovate is a measure of the organization's capacity to effectively adapt to a changing environment (Bommer and Jalajas, 2002; Johnson et al, 2001; Kivimaki et al., 2000). Greenwood and Hinings (1996) suggested that a stagnant organization that cannot innovate to meet evolving environmental conditions will eventually find itself no longer competitive in an increasingly complex and technologically sophisticated economy. For innovation to occur in an organization, the employee's attention ought to be directed towards creating new products, processes, and services that are crucial for the organization's survival (Pervaiz, 1998). A strong climate (organizational processes and
structure that define the work environment) for innovation is what may be required to focus employee attention and create a collective mentality that is supportive of innovation (Van De Ven, 1986). A number of theorists have suggested that the organizational climate may channel and direct both attention and activities toward innovation (eg. Amabile, 1988; Isaksen, 1987; Kanter, 1988). Usually it is assumed that science directly drives innovation; that is, the generation of new knowledge invariably leads to improved performance. But as Caraca et al. (2009) point out, more attention should be given to the role of organizational processes such as leadership, involvement in agency, team work, communication, quality of work life in the workplace in converting science into useful products and services.

In this paper, we investigate the role of organizational climate factors that affect NRCS employees' perception of the level of innovative activity that followed the reorganization of the agency. The intent of reorganization was to improve service to clients. It is assumed that an employee's innovative behavior will be influenced by their perception of an organizational climate that supports innovation. The goal of NRCS is to develop innovative conservation approaches and technologies and design innovative techniques for disseminating these technologies. In order to accomplish this goal, innovation and innovative behavior must become a central part of the NRCS modus operandi.

As in the case of NRCS, extension's goal is to promote the adoption of new and appropriate technologies by farmers and communities as a whole. Many of the problems that extension will address in the post-modern era are unlike the traditional ones that involve the transfer of packaged knowledge and techniques to support improved productivity. Problems such as the increasing incidence of obesity and lifestyle issues, environmental impact of agriculture and resource conservation, social issues such as teenage pregnancies and issues related to changes in demographic structure are complex; and they require a willingness to look beyond the usual sources for ideas about solutions. Solving these problems is not as straightforward as solving productivity problem. Because several stakeholders with different points of view about formulating a solution are usually involved. Consequently, innovative way must be found to integrate cultural, political, social and technical considerations in generating a solution. Innovative approaches that will question existing assumptions and cast a wider net in searching for solutions. As noted earlier, the popular assumption of a direct causal link from basic science to technology to useful products and services and economic development is no longer tenable. The literature as well as the evidence provided in this paper indicate that organizational processes and experienced-based learning are necessary conditions for enabling the innovation needed to convert the knowledge generated by basic science to useful products and services. Considering that extension operates at the nexus of technology development and technology application to practice, extension is well positioned to take advantage of the power of experience-based learning to inspire and drive innovation. Put another way, extension is well positioned to capture the innovative insights that are internal to practice.
Therefore, innovation and innovative behavior must become a central part of extension's modus operandi if extension is to take full advantage of the power of organization processes and experienced-based learning to inspire innovation. This means extension must adopt and refine its organizational structure and processes to create a strong innovative climate (organizational processes and structure that define the work environment). According to Van De Ven (1986), a strong innovative climate is what may be required to focus employee attention and create a collective mentality that is supportive of innovation.

**Conceptual Framework**

Schneider and Bowen (1995) defined the climate of an organization as the perceptions incumbents share about what is important in the organization. They explained that employees develop their sense of climate through their experiences on the job and their perceptions of the kinds of behaviors management expects and supports. It is this perception of organizational climate, which influences important employee behaviors towards policies and organizational processes. And as Payne and Pugh (1976) suggest, climate consists of workers' feelings, attitudes, and behavioral tendencies as measured by their perception. Thus, employees' perception of innovation in an organization can be a benchmark for the level of innovative capacity of organizations.

In the NRCS context, the development and adoption of innovative conservation approaches and technologies are important performance indicators. The model below indicates that an employee's innovative behavior will be influenced by their perception of an organizational climate that supports innovation. Bagozzi's (1992) model is applied to explain the impact of perception on behavior (see Figure 1).

![Figure 1: Bagozzi (1992) Model (Adopted)](image)

Bagozzi's (1992) model of attitude intentions and behavior suggests that employees' behaviors are influenced by how they react to their work environment, as they perceive it. Therefore, the attitude of employees towards the level of innovativeness will depend on organizational processes that support a climate of innovativeness. The Bagozzi model proposes that attitude appraisal elicits an affective response; this response in turn triggers an intention to act, which consequently leads to behavior. In the case of NRCS, it is expected that employees' appraisal of the new organizational processes (following reorganization) that facilitate innovation will trigger an affective response in employees. Employees' affective response may lead to a positive or negative feeling about the level of innovation in the organization. A positive attitudinal appraisal is likely to initiate intentions in employees to
behave in accordance with their positive evaluation of the role of innovation in enabling the organization's performance. For instance, they may perceive that innovation is valued and it plays an important role in the overall performance of the organization, in which case they are likely to believe that they will be rewarded for innovative behavior, and as a result they will be more likely to direct their effort at becoming more innovative. There is general support for this link between perception of organizational climate, innovation and behavior in the literature; for example, Bowen 1995; Kelley, 1992; Shadur, Kienzle, and Rodwell, 1999; and Scharitzer and Korunda, 2000 have argued that organizational climate operates through employees' perceptions to influence their behavior. Although a positive attitude (intention to act) does not always lead to behavior, a favorable attitude increases the probability of action with respect to the object of the attitudinal appraisal.

Innovation and Organizational Characteristics

The Bagozzi’s model suggests that innovative behavior in an organization requires the presence of some organizational characteristics that nurture an innovative climate. Among the characteristics noted in the literature are participative management procedures (Bharadwaj and Menon, 2000); project teams (Monge et al., 1992); leadership, individual problem solving style and work group relationships (Scott and Bruce, 1994); employee satisfaction (Pugh et al., 2002; Jakobson and Rauch, 2005); communication (Rosen, Loevy and Hall 2006) and training (Galia and Legros, 2003).

Methodology

Data for this study was drawn from a mailed national random survey of 1000 NRCS employees. The total number of responses was 749. This represents a response rate of 75% for the survey. A total of 643 responses were analyzed due to missing values. The survey sought to elicit perceptions of NRCS employees on the impact of Agency changes on the work place environment including employees' perception of the level of innovation in the organization following reorganization. The survey covered employees from the national, regional, state and field offices of the agency. It also included workers of all grade levels. A five-point likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used to measure the opinion of workers on 13 different variables (dimension) believed to affect the organizational climate and effectiveness of the agency. The overall opinion of an employee on each variable was measured by several questions.

Dependent Variable

The focal independent variable in this study is employee perception of the level of innovation at NRCS. The level of employee's opinion on innovation was measured by three questions. These questions were designed to inquire if the reorganized work environment rewards innovation, makes reinvention an important priority and provides training for new technology (See Table 1). Reliability analysis of statements measuring the perception of innovation yielded a Cronbach's alpha of 0.63.
Creativity and innovation are rewarded
NRCS has made reinvention and important priority
Employees are provided with training when new technologies and tools are introduced

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creativity and innovation are rewarded</td>
<td>2.77</td>
<td>1.02</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>NRCS has made reinvention and important priority</td>
<td>3.16</td>
<td>1.01</td>
<td>1.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Employees are provided with training when new technologies and tools are introduced</td>
<td>2.81</td>
<td>1.17</td>
<td>1.00</td>
<td>5.00</td>
</tr>
</tbody>
</table>

Note: 1 = Strongly Disagree to 5 = Strongly Agree

Factor analysis was used to create a new composite variable from responses to the three statements on the perception of innovation. In spite of the fact that the statements measure different aspects of innovation separately, factor analysis enables the identification of an item or a group of items that is a better measure of innovation. The results of factor analysis are presented in Table 2. One factor had an eigenvalue > 1.

Table 2: Results of Principal Component Factor Analysis: Perception of Innovation, n=643

<table>
<thead>
<tr>
<th>Component</th>
<th>Total</th>
<th>% of Variance</th>
<th>Cumulative %</th>
<th>Total</th>
<th>% of Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.733</td>
<td>57.759</td>
<td>57.759</td>
<td>1.733</td>
<td>57.759</td>
<td>57.759</td>
</tr>
<tr>
<td>2</td>
<td>0.688</td>
<td>22.927</td>
<td>80.686</td>
<td>1.733</td>
<td>57.759</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.579</td>
<td>19.314</td>
<td>100.000</td>
<td>1.733</td>
<td>57.759</td>
<td></td>
</tr>
</tbody>
</table>

Kaiser-Meyer-Olkin Measure of Sampling Adequacy: 0.642. Bartlett's Test of Sphericity: 237.016 (sig. 0.000)

The total variance explained was 57.76%. The Kaiser-Meyer-Olkin (KMO) was 0.642 and the Bartlett's test of sphericity was significant (p<0.001). Therefore, factor analysis is an appropriate technique for summarizing the data in this instance. The estimated factor score of the new variable was used to capture employees' perception of innovation. A new binary variable was created by assigning zero to employees with negative factor scores and one to the employees with positive factor scores. 52.7% of the employees have a positive perception of innovation, while 47.3% have a negative perception (Table 3). The binary variable obtained was used as a dependent variable in the binary logistic model.
Independent Variables

Table 3: Negative and Positive Factor Scores for Perception of Innovation

<table>
<thead>
<tr>
<th>Description</th>
<th>Frequency</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>304</td>
<td>47.3</td>
</tr>
<tr>
<td>Positive</td>
<td>339</td>
<td>52.7</td>
</tr>
<tr>
<td>Total</td>
<td>643</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Independent Variables

Table 4 provides a description of dimensions used to measure independent variables

Table 4: The Dimensions used to Measure Independent Variables

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Statements</th>
</tr>
</thead>
</table>
| Leadership            | - Managers communicate the organization's mission, vision and values  
- Employees have an understanding of the organization's mission, vision and values  
- In reference to your job: overall, how satisfied are you with the job being done by your immediate supervisor/team leader?  
- Program administrative demand on the field over the last three years has: increased |
| Involvement in agency change | - I understand the different roles and responsibilities of most positions in the agency's technical infrastructure  
- Administrative convergence will enable me to do my job more effectively  
- Management is responsive to employees' concerns about organizational changes  
- Employees benefit from structural changes in the organization (e.g., improved quality of work life, advancement opportunities, etc.) |
| Teamwork              | - A spirit of cooperation and teamwork exists in my immediate work unit  
- Teams are used to accomplish organizational goals, when appropriate  
- At the place I work, my opinions seem to count  
- Employees in different work units participate in cross-functional teams to accomplish work objectives  
- Employees are rewarded for working together in teams (e.g., performance ratings, cash awards, certificates, public recognition) |
| Communication         | - Employees are kept informed on issues affecting their jobs  
- Managers keep employees informed about the organization's conditions and operations, as well as choices it faces (e.g., budget cuts, downsizing, etc.)  
- There is communication among various levels of the organization  
- The information that employees need and find helpful is provided in a timely manner |
Factor analysis was also used to determine the most important statements from Table 4 above which affect the NRCS employees' perception of innovation. Statements with the highest factor loadings in each dimension were used as predictors in the binary logistic model. These statements are presented in Table 5. The results show that the KMO measure for each dimension was greater than 0.5 and the Bartlett’s tests of sphericity was significant (p<0.001), indicating that it was appropriate to use factor analysis for summarizing all dimensions. Following factor analysis, a reliability test produced a cronbach alpha of 0.78, indicating that all the predictors used in the binary logistic model were measured with a reasonable degree of reliability.

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Statements</th>
</tr>
</thead>
</table>
| Training                | - Employees receive training and guidance in providing high-quality customer service  
                        | - Employees receive the training they need to perform their jobs (e.g., on-the-job training, conferences, workshops, etc.)  
                        | - Over the last three years, the agency has devoted enough resources to effectively train employees |
| Quality of workplace    | - In the past 2 years, I have been given more flexibility in how I accomplish my work  
                        | - I feel I receive appropriate assistance from different levels of the organization  
                        | - Supervisors/team leaders take steps to minimize work related stress  
                        | - I rate the overall quality of work being done in my work group/office as high |

Table 5: Statements Derived from Factor Analysis and Indicators of Appropriateness of Applying Factor Analysis Technique to Summarize Dimensions

<table>
<thead>
<tr>
<th>Variable Name</th>
<th>Statements</th>
</tr>
</thead>
</table>
| Leadership              | Managers communicate the organization's mission, vision and values  
                        | Management is responsive to employees' concerns about organizational changes  
                        | Teams are used to accomplish organizational goals, when appropriate  
                        | Employees are kept informed on issues affecting their jobs  
                        | Employees receive the training they need to perform their jobs  
                        | I feel I receive appropriate assistance from different levels of the organization |

Binary Logistic Model
A binary logistic regression model was used to estimate the factors which influence employees' perception of innovation. The binary logistic regression model for employees' of the role of innovation in the performance of the agency is specified as follows:
The binary logistic regression model was estimated using the maximum likelihood estimation (MLE) procedure of the SPSS program. The overall model is statistically significant: model 2 (8, 643) = 249.056 with a p-value of .000. This indicates that the full model is a better predictor than a model with the intercept alone, and it is statistically reliable in distinguishing between employees with a favorable perception of the importance of innovation in the organization's performance and those with an unfavorable perception. The Hosmer-Lemeshow test was used to evaluate the goodness-of-fit of the model. The resulting test statistic was 2 of 6.113 which was insignificant (p=.635). If Homer-Lemeshow goodness-of-fit test statistics has a p-value >0.05, we fail to reject the null hypothesis (H: there is no difference between the observed and the model predicted values of the dependent variable). In this study, this implies that the model fits the data well at a statistically acceptable level. Consequently, the model is able to classify 77% of those who have positive perception of the role of innovation in organization performance and 71.4% of those who have a negative perception. Another test statistic, the Nagelkerke $R^2$ is 0.43, indicating that the model is able to explain 43% of the variance in employees' perception of the role of innovation in the organization's performance.
Table 8 shows the logistic regression coefficient, standard error, Wald test, p-value and odds ratio for each of the predictors. The binary logistic model reveals that seven estimated coefficients, including the intercept, are statistically significant employing a 0.01 criterion of statistical significance. Two coefficients – quality of workplace and gender – are not statistically significant. The estimated coefficients of leadership, involvement in agency change, teamwork, communication and training have the expected positive signs and consistent with findings in the literature. Also the size of the estimated coefficients is more than twice the size of their corresponding standard error indicating that changes in these independent variables will have a significant impact on the dependent variable. Additionally, in Table 7, seven of the eight exponential coefficients (odds ratios) exceed 1. When coefficients are greater than 1, there is a greater likelihood that employees' perception of innovation will increase as the level of these organizational processes improve.

Together, these results suggest that the estimates are dependable and they are useful in predicting employees' perception of the role of innovation in the organization's performance. The positive sign on all the estimated coefficients reveals that the higher an employee's perception on any of the explanatory variables, the more likely it is for employees to have a favorable view on the role of innovation in the organization's performance following restructuring.

Table 7: Binary Logistic Regression Results (Dependent variable: Employees' Perceptions of Innovation)

<table>
<thead>
<tr>
<th>Variable</th>
<th>β</th>
<th>SE β</th>
<th>Wald’s χ²</th>
<th>p</th>
<th>Odds ratio (e^β)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept*</td>
<td>-7.044</td>
<td>0.684</td>
<td>106.033</td>
<td>0.000</td>
<td>0.001</td>
</tr>
<tr>
<td>Leadership*</td>
<td>0.274</td>
<td>0.104</td>
<td>7.016</td>
<td>0.008</td>
<td>1.315</td>
</tr>
<tr>
<td>Involvement*</td>
<td>0.528</td>
<td>0.120</td>
<td>19.316</td>
<td>0.000</td>
<td>1.695</td>
</tr>
<tr>
<td>Teamwork*</td>
<td>0.317</td>
<td>0.113</td>
<td>7.870</td>
<td>0.005</td>
<td>1.373</td>
</tr>
<tr>
<td>Communication*</td>
<td>0.312</td>
<td>0.103</td>
<td>9.206</td>
<td>0.002</td>
<td>1.367</td>
</tr>
<tr>
<td>Training*</td>
<td>0.646</td>
<td>0.100</td>
<td>41.807</td>
<td>0.000</td>
<td>1.908</td>
</tr>
<tr>
<td>Quality</td>
<td>0.068</td>
<td>0.107</td>
<td>0.410</td>
<td>0.522</td>
<td>1.071</td>
</tr>
<tr>
<td>Experience*</td>
<td>0.182</td>
<td>0.064</td>
<td>8.172</td>
<td>0.004</td>
<td>1.200</td>
</tr>
<tr>
<td>Gender</td>
<td>0.182</td>
<td>0.242</td>
<td>0.566</td>
<td>0.452</td>
<td>1.200</td>
</tr>
</tbody>
</table>

* Refers to significance at 1% level

More specifically, the results indicate that the organization is more likely to achieve improvements in employees' perception of the role of innovation in organizations performance and by extension employees' innovative behaviors if the levels of training, involvement in agency change, team work communication, leadership, and experience of workers improve, given the exponential coefficients shown in Table 7. For example, for each one point increase in the level of training, involvement in agency, teamwork,
communication and leadership measured on a five point scale, there is a likelihood of increases in employees' positive perception of the role of innovation and likelihood of employee innovative behavior by 90%, 69%, 37%, 36% and 31% respectively. Additionally, the more experienced the employees are, the more likely they will have positive perception of innovation. The quality of life in the workplace is expected to contribute positively to employees' perception of innovation. The sign of coefficient for quality of life in the workplace is positive, but not significantly different from zero at a 0.01 probability level. The estimated coefficient of gender is insignificant, meaning that gender has no effect on the positive perception of innovation.

CONCLUSION

The projected increase in world population to 8 to 10 billion by 2050 and the consequent demand for food and ecological services, plus the well documented deleterious impacts of current conventional production practices make conservation of natural resources base a critical imperative. The Natural Resource Conservation Service (NRCS) is charged with promoting the conservation of natural resources to ensure that the U.S. natural resource base will be able to meet future demand for food and ecological services. Given traditional approaches to problem solving, most observers expect science and basic research to play a direct and pivotal role in the development and implementation of effective conservation practices needed to support sustainable production of food and ecological services. The assumption here is that there is a direct causal link from basic science to technology to useful products and services and economic development. However, Caraca et al. (2009) and Kline and Rosenberg (1986) show that this assumed direct causal link is no longer tenable. These authors and others, as well as the evidence provided in this paper indicate that organizational processes and experienced-based learning are necessary conditions for enabling the innovation needed to convert the knowledge generated by basic science to useful products and services. Innovative organizations are able to adapt to the demands of their operating environment. But to be innovative, an organization must nurture and inspire innovative employee behavior by designing an organizational climate that creates a perceptual field that signals to employees what is important and enables them to act on their perceptions. As discussed above, a positive attitudinal appraisal initiates intentions in employees to behave in accordance with their positive evaluation of the role of innovation in enabling the organization's performance (Bowen 1995; Kelly, 1992; Shadur, Kienzle, and Rodwell, 1999; and Scharitzer and Korunda, 2000). In this paper, the evidence suggests that the NRCS is likely to achieve the greatest gain in employee innovative behavior from improving the level of training and the level of employee involvement in organizational change, and moderate gains from improving team work, communication and leadership. Although the data refers specifically to the NRCS in the U.S., given the relatively strong support shown in the literature for the climate-employee innovative behavior
connection, the results of this study may have implications for extension agencies, given the challenges of improving the quality of rural life and small farm productivity, maintaining and enhancing the capacity of the natural resource base to meet the challenges of food production and the demand for ecological services in the future.

References


