THE DEVELOPMENT OF SIMILARITY IN TECHNOLOGY-RELATED PERCEPTIONS AND BEHAVIORS AMONG TRAINING COHORTS

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ABSTRACT

This research investigates the role of interpersonal dynamics in the development of similar perceptions and behaviors among training cohorts. Network analysis techniques were used to assess the relationship between participation in the same technology training sessions and similarity in training-related perceptions and behaviors. In order to eliminate alternative explanations for homogeneity, organizational level and branch, and demographic characteristics were controlled. Results indicate that matriculation in the same training class promotes similarity in perceptions of the success of a management information system and computer use. Findings remain significant after partialling out the effects of control variables.

The past 30 years has seen tremendous increases in training research (Salas and Cannon-Bowers, 2001). Of particular interest to business scholars is the finding that organizational context matters in regard to the transfer of training, i.e., the extent to which the knowledge, skills, and attitudes created in training programs are applied and generalized. In fact, we often see that training programs serve not only to introduce new techniques to organizational members but also to change their perceptions and behaviors. Changing perceptions and behaviors has been demonstrated to be a function of socialization processes (Burkhardt, 1994). Socialization programs are often intended to develop homogeneity of attitudes, e.g., the development of positive attitudes toward one's job and toward the organization. In such training programs, successful socialization was found to require interaction among the trainees (Evan, 1963). Thus, it is may not simply be the content of the training programs, but rather the interpersonal dynamics that determine the effect of training programs in regard to the transfer of training related attitudes and behaviors.

Facteau et al (1995) and Tracey et al (1995) found that social, peer, subordinates, and supervisors all play a role in transfer. However, most studies investigating the relationship between transfer and social context have only used traditional methods of analysis with data collected from surveys (Salsas and Cannon-Bowers, 2001). In addition, while there are studies that manipulate the survey environment, such research is unable to assess how transfer actually occurs as a function of context. Work being conducted in the field of biology may shed some light on this transfer process. In particular, there is research (Ramachandran, 2000) which addresses the importance of mirroring the behavior and emotions of others during the learning process. Indeed, learning may in fact be a function of the behavior, emotions, and/or attitudes of others (Sylwester, 2002 and Ramachandran , 2000). This finding highlights the importance of the behavior and emotions of others in individual learning. Thus, it is worthwhile to investigate specifically which others interact with individuals and how behavior and attitudes may change as a function of that interaction.

This research purports to build on previous empirically based training by investigating the effects of interaction with others to identify how training processes affect attitudes and behaviors. In order to accomplish this, new methods of analysis will be adopted to enhance the investigation of survey data. In particular, a social network approach using matrix analyses will be used to investigate the development of shared attitudes and behaviors. Specifically, longitudinal analysis will help determine the importance of interpersonal dynamics in the development of homogeneity of perceptions and behaviors following the introduction of a technology training program. The intent here is to determine the extent to which a program focused on developing computer expertise develops shared perceptions about the success of the computer system and similar computer use among trainees.

SOCIALIZATION PROCESSES

Social comparison theory (Festinger, 1978) and social information processing theory (Salancik and Pfeffer, 1978) both propose that individuals rely on those around them to shape their own attitudes, perceptions, and behaviors. This process is especially

salient when there is little objective evidence or other non-social means to evaluate own's own abilities, perceptions, or behaviors (Festinger, 1954). In general, the greater the ambiguity of a situation, the more likely that individuals will rely on those around them to develop their own perceptions about what is real. Within an organization, change heightens the socialization process. Newness breeds uncertainty because individuals lack history and experience in dealing with the new phenomena.

The introduction of a new technology is an increasingly common organizational change. Literature on the adoption of new technology (e.g., Fulk, Schmitz, and Steinfield, 1990; Fulk, Steinfield, Schmitz, and Power, 1987; Burkhardt, 1994; Rice and Aydin, 1991) proposes that social interaction plays an important role in developing perceptions and behaviors toward new technologies. The focus of such research is on continued interaction within the workplace. In an effort to extend such research, this study proposes that the interaction provided within a formal training program also shapes the behaviors and perceptions of those who are trained together.

The interaction that individuals have during a training program is thus proposed as important in shaping perceptions about the new technology. The importance of interaction during a training session rests on the level of ambiguity associated with the newness of a training session. Often times, the first experience that people have with a new technology is in a formal training program. As such, the training session functions not only to introduce new techniques for using the technology but also as a way to establish perceptions and behaviors related to the new organizational phenomena.

Because individuals have not had the opportunity to form their own opinion prior to training, the individuals who they encounter in their training session serve as significant others who will help them evaluate the new technology and form opinions as to its usefulness or hindrance in their job function. The accessibility of training cohorts and the inaccessibility of other sources of information for perceptual and behavioral development heighten the relevance of training interactions. Thus, interaction in the same training session is proposed to result in the development of shared perceptions following the training program. Specifically, it is hypothesized that individuals who are training cohorts (enrolled in the same training session) will develop similar perceptions about the success of the computer system. Likewise, it is expected that training cohorts will also spend a similar amount of time using the new computer system following matriculation in the same training program. In order to establish that this similarity in perceptions and use is a function of interaction in the training program and not a function of the individuals job, branch, and organizational level will also be controlled. Within the organization under study, individuals who were in the same branch worked on the same projects and shared similar job descriptions. Likewise, individuals at the same organizational level shared similar supervisory responsibilities. Similarity in demographic background will also be controlled. Demographic similarity is considered important in the development of similarity in attitudes and behaviors (Pfeffer, 1983). Thus, similarity in age, sex, tenure, and education will be partialled out of the dependent variables prior to determining their relationship to matriculation in the same training session.

A SOCIAL NETWORK PERSPECTIVE

An analytic and theoretical tool upon which this research is based is social network analysis. A social network can be defined as "a specific set of linkages among a defined set of persons, with the additional property that the characteristics of these linkages as a whole may be used to interpret the social behavior of persons involved" (Mitchell, 1969:2). The use of social network analysis is consistent with a social information processing perspective. In fact, network language runs through early studies of normative and comparative analyses of reference groups (Gartell, 1987; Kelley, 1952; Singer, 1981). For example, Newcomb's research on friendship networks suggests that these networks induce the convergence of norms and attitudes. Similar to Newcomb's research, this study investigates similarity in attitudes and behaviors through the use of network techniques.

This research constructs a network out of training cohorts, by recording who was trained with whom. This training network is then used to analyze not the individuals who are in the training programs, but rather their relationships to each other. Training cohorts are expected to become similar in technology related perceptions and behaviors following training. Network analysis techniques were used to identify the role of training cohort interaction in the development of homogeneity of perceptions and behaviors.

METHOD

Research Setting

The research was conducted on site at a Federal agency responsible for the collection and dissemination of nutritional information. This agency was studied prior to and following the introduction of a management information system (MIS). This distributed information processing system provided word processing and data manipulation functions to all agency employees. Prior to the introduction of this system, computer analyses were contracted to an outside agency. After the installation of the information system, work systems were located throughout the organization and were accessible to all employees. In order to learn how to use the new computer capabilities, all employees participated in agency training programs.

The training course covered information on the information system's operating system and office automation functions such as word processing, mail, spreadsheet packages, statistics, and additional office work station functions. Five groups composed of 14 to 17 people enrolled in the course. The entire training program lasted four eight-hour days.

Procedure

A survey was distributed to all agency employees (n=100) following the training sessions. The response rate was 68 percent. All individuals (n=68) who completed the survey enrolled in the course.

The survey instrument included a series of questionnaire items regarding computer use and perceptions of the success of the computer system. The data collection period was approximately three months following the training program. The collection period was purposely delayed three months following training to ensure adequate computer use and to ensure that the effects of training on the homogeneity of perceptions and behaviors were not simply short-lived.

MEASURES

Computer Use.

This item is a self-reported measure of hours of computer use. Employees were asked to respond to the following question: "During an average work week, how much time do you spend using this computer? _____ hours".

Perceived MIS Success.

This variable measured the extent to which a worker believed that the agency's computer information system implementation was successful. A six item seven-point Likert-type scale was developed to measure this construct. A sample item is "The introduction of automation was a success in our work area." A sample reverse item is "I believe our office was better off before the introduction of our computer system." An index was formed by averaging the scores on the six items. Cronbach's alpha for these items was .84.

Training Network.

A training network was created by developing a binary matrix composed of a 1 for each i and j if i and j were enrolled in the same training session and a 0 if they were in different training sessions.

Branch Similarity.

The organization under study was structured into four separate branches. A matrix was developed based on similarity in organizational branch. A 1 represented that i and j were in the same branch, whereas a 0 represented that i and j were in dissimilar branches.

Level Similarity.

There were 5 supervisory levels within this organization. Level 1 refers to a nonsupervisor, level 2 is a work group supervisor, level 3 is a branch supervisor, level 4 is a department supervisor, and level 5 is the agency director. A level similarity matrix was constructed such that a 1 represents similarity in supervisory level and a 0 represents dissimilarity for every i and j.

Demographic Similarity.

Demographic variables under study included sex, age, job tenure, and education. Vectors composed of data on each demographic variable were converted into dissimilarity matrices. The technique used to covert vectors into dissimilarity matrices is discussed in the analyses section.

ANALYSES

This research tests whether or not being enrolled in the same training session is related to similarity in computer-related behaviors and perceptions. This is accomplished through the use of network analysis techniques, specifically, by determining the significance of the relationship between two matrices. Network data cannot be

analyzed using standard statistical tests because of autocorrelation problems. In particular, the error terms are autocorrelated within the rows and columns of the matrices. The quadratic assignment procedure (QAP) (Baker and Hubert, 1981; Hubert, 1983; and Krackhardt, 1988) is a nonparametric test developed to overcome autocorrelation problems which determines whether or not two matrices are significantly related to each other. The training network matrix was correlated with computer use and perceived MIS success dissimilarity matrices using the QAP routine available in UCINET (MacEvoy and Freeman, 1987).

A dissimilarity matrix is a matrix composed of difference scores. Specifically, a vector composed of hours of use for each individual was converted into an hours of use dissimilarity matrix composed of absolute difference scores ($|i - j|$). Similarly, a perceived MIS success dissimilarity matrix was developed from a vector of values for perceived MIS success.

In order to control for the effects of similarity in branch and organizational level, matrices composed of branch and level dissimilarity measures were partialled out of the computer use and computer perceptions dissimilarity matrices before using the QAP procedure. The same procedure was followed to control for the effects of similarity in demographic background, i.e., age, sex, tenure, and education.

RESULTS

Table 1 is a correlation matrix of the variables under study. Perception of MIS success is correlated with hours of use ($p < .01$). Hours of use is negatively correlated with sex ($p < .05$). Men use the compute more often than women. Perception of MIS success is negatively correlated with age ($p < .001$) and negatively correlated with tenure ($p < .05$). As expected, tenure and age are correlated ($p < .001$). Sex is negatively correlated with level ($p < .05$). Although this organization primarily consists of women, men tend to occupy higher levels within the organization. Level is also correlated with education ($p < .05$).

Table 2 lists the matrix correlations of dependent and control variables. Similarity in sex is related to similarity in hours of use ($p < .001$). As indicated in the correlation matrix in Table 1, males use the computer more than females. Similarity in age is related to similarity in perceived MIS success. As indicated in the previous correlation matrix, younger people held more positive perceptions regarding the success of the MIS installation.

Table 3 presents the results of the QAP routine for the training data. The relationship between the hours of use dissimilarity matrix and the training network matrix was significant ($p < .05$). This relationship remained significant at $p < .05$ even when controlling for branch and level similarity, interaction, and age, tenure, and education dissimilarity. When controlling for sex dissimilarity, the relationship was significant at $p < .01$. Results were similar for computer perceptions. The relationship between the perceived MIS success dissimilarity matrix and the training network matrix was significant ($p < .05$) both before and after controlling for branch and level similarity and demographic dissimilarity.

DISCUSSION

The results indicate that individuals who are trained together develop similar behaviors and perceptions. Specifically, being in the same training session was an important determinant of homogeneity in perceived MIS success and computer use. These findings indicate that it is worthwhile to examine relational data, not simply attributional data when investigating the effects of training. Traditional research focuses on the attributes of the training course, including instructor, material, equipment, etc. Here it was found that being together in the same training program affects the transfer of training. The training content was the same for all individuals, the same material, instructors, and equipment were used. Thus, results indicate that above and beyond the content provided, the interaction that takes place between training cohorts is important in developing training related perceptions and behaviors. Follow-up interviews with several trainees (after completion of the questionnaires) verified that people interacted with fellow trainees during the training sessions.

These findings lend additional support to the tenants of social comparison theory and social information processing theory. These theories have been extended to the area of training research in order to illuminate how individuals are affected by matriculation in the same training course. Individuals compare themselves with others in order to develop their own attitudes and behaviors. This finding is also consistent with biological mirroring research (Sylwester, 2002 and Ramachandran, 2000) which addresses the importance of mirroring the behavior of others.

People developed homogeneity in perceptions and behaviors despite being from different branches or

at different supervisory levels within the organization. Thus, training sessions may break formal structural barriers to interaction such as dissimilarity in departmental grouping or supervisory level. As demonstrated by this research, training sessions may also contribute to the development of similarity in groups composed of dissimilar demographic backgrounds, e.g. age, race, gender.

Generally, similar demographic background contributes to similarity in perceptions and behaviors (Pfeffer, 1983). The results of this study indicate that similarity in sex was related to hours of use and similarity in age was related to perceived MIS success. The reverse of these trends are also true, i.e., that dissimilar demography can contribute to dissimilar attitudes and behaviors. These relationships can affect organizational design. For example, Tolbert's (1988) work identified the role that similarity in background characteristics played in the ease of institutionalization of new employees. Organizations with homogeneous employees did not have as many formal structures to ensure socialization as did organizations with dissimilar employees. In general, new employees were not as easily encultured into an organization where coworkers had dissimilar backgrounds. Because of the continued increase in demographic diversity in organizations, ways must be sought to develop a shared organizational culture despite diversity. Future research should investigate the role that training cohorts play in overcoming diversity to develop shared attitudes, perceptions, and behaviors over time. Additional studies which adopt a relational perspective can aid in the examination of cohort analysis.

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Table 1

Correlation Matrix

Variable	Mean	SD	1	2	3	4	5	6
1. Hours	10.65	9.85						
2. Success Per.	2.83	1.15	.40**					
3. Sex	81% Female		-.30*	-.20				
4. Tenure	10.36	7.79	-.13	.27*	-.08			
5. Educ.	53% MS/PhD		-.10	.14	-.22	-.04		
6. Level	88% Nonsup.		-.10	.11	-.28*	-.10	.29*	
7. Age	41.93	10.34	-.20	-.44***	-.03	-.62***	.11	.16

*p < .05; **p < .01; ***p < .001

Table 2

Quadratic Assignment Matrix Correlations for Dependent and Control Variables

	Level	Branch	Age	Sex	Tenure	Education
Hours of Use	-1.36*	-.81	.49	3.34***	-.38	.03
Perceived Success	-.46	.74	2.41**	-.80	1.09*	1.08

Note: Values are Z-scores for Hubert's quadratic assignment gamma measures of association.
*p <.05, one-tail.
**p <.01, one-tail.

Table 3

Quadratic Assignment Results for Training Network

	No Control	Partial Out Branch	Partial Out Level	Partial Out Age	Partial Out Tenure	Partial Out Sex	Partial Out Education
Hours of Use	1.93*	1.96*	1.80*	1.91*	1.93*	2.26**	1.93*
Perceived Success	1.76*	1.79*	1.71*	1.69*	1.76*	1.72*	1.82*

Note: Values are Z-scores for Hubert's quadratic assignment gamma measures of association.
*p <.05, one-tail.
**p <.01, one-tail.