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IDENTIFYING THE ENABLERS AND BARRIERS OF INFORMATION TECHNOLOGY PERSONNEL TRANSITION

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Abstract

This paper reports the initial findings from a National Science Foundation supported study of IT personnel transition. We used the revealed causal mapping method (Narayanan and Fahey 1990) to elicit barriers, enablers, and examples of IT personnel transition. This paper reveals new knowledge and insight into factors that enable and prevent IT personnel transition as organizations evolve. The data is presented in the form of interpretation of revealed causal maps from 83 respondents. The results of this study are the first steps toward developing a theory of IT personnel transition that is distinct from general transition theories.

Keywords: IT personnel, career transition.

INTRODUCTION

Information technology (IT) organizations within companies are experiencing a great deal of change. In-house IT organizations are transitioning from legacy system technology to distributed and advanced technology. Work practices that were ad hoc are being redefined with software engineering discipline. IT professionals who once produced products and services that were “thrown over the fence” to in-house customers are now expected to be full business partners. The implication is that the IT professional is not simply writing code, but is also expected to understand and translate business processes into a technology solution (Markus and Benjamin 1996; Nelson and Coopridge 1996).

All of these organizational changes require individual IT professionals to make significant personal transitions. Since IT personnel are key components in implementing new technology, it is imperative that they value change and choose to actively participate in the transition (Nelson 1990). The study of IT personnel as a separate occupational group has been motivated by the need to further understand IT workers and their work (Orlikowski and Baroudi 1989). The ongoing shortage of skilled IT workers also makes research on the transition and retention of IT workers a timely and important topic (Agarwal and Ferratt 2000; Igbaria et al. 1991; Igbaria and Seigel 1992). This study focuses on the factors that cause IT personnel to transition during their career and how organizations can best support and retain IT workers through these transitions. We present the interpretation of enablers and barriers of IT personnel transition through revealed causal maps.

THEORY AND METHOD

While the characteristics of IT personnel have a legacy in the IS literature, no theory exists that specifies the relationships among these characteristics in the context of IT personnel transition. Prior work in the IT personnel area has focused on attitudes and motivation (Agarwal and Ferratt 2000; Baroudi 1985; Cougar et al. 1979), required skills (Cheney and Lyons 1980; Nelson 1991), and career issues (Crepeau et al. 1992; Igbaria et al. 1991; Reich and Kaarst-Brown 1999; Smits et al. 1993). Many constructs related to transition have emerged from this literature, but no attempt has been made to understand the relationships between these variables and their impact on transition. Additionally, some theories of personnel transition from the management literature exist and can be used to guide the exploration and development of a theory of IT personnel transition (Miner and Robinson 1994; Nicholson 1984). However, these general theories have been applied only in limited contexts (Ashforth and Saks 1995; West et al. 1987) and have constructs that are only partially conceptualized, making it difficult to develop valid measures in the IT domain (Nelson 1990). Therefore, we used revealed causal mapping (RCM) to build mid-range theory of personnel transition in the IT domain. This was accomplished by using frameworks and theories from the general transition literature and the IT personnel literature to guide the qualitative elicitation of IT specific constructs, concepts, and linkages (Narayanan and Fahey 1990). The interviews used open-ended probes and did not specifically mention transition at all. The goal was to lead the respondents to a discussion of transition issues (Rossi et al. 1983). The data elicited in the interviews was then iteratively validated by going back to the respondents and by consulting existing theory for guidance and interpretation. (The details of the RCM method are described in Nelson et al. 2000.)

A total of 83 IT analysts from eight organizations were interviewed for this study. Respondent demographics are shown in Table 1. The interview transcripts were analyzed by identifying causal statements embedded in the answers of the respondents. Each causal statement was then analyzed and concepts were recorded as they were identified from the statements. As new concepts emerged from the transcripts, they were added to the overall list of concepts. The point of redundancy is used to evaluate the convergence of concepts elicited from the respondents (Axlerod 1976) and determine adequacy of sample size. It is the point where the respondents revealed no new constructs, and was calculated to be 30 for this study, demonstrating a more than adequate sample size.

Table 1. Descriptive Statistics of Respondents

	Mean (n = 80)	SD
1. Experience with current project (years)	5.80	6.10
2. Tenure with company (years)	10.77	8.61
3. Age (years)	41.25	9.16
4. Gender	Female n = 36 Male n = 48	
5. Education:		
High School (%)	15.00%	
Associates degree	16.25%	
Undergraduate degree	46.25%	
Graduate degree	16.25%	
Post-Graduate degree	2.50%	
Not reported	3.75%	

Through the RCM validation process, six major constructs emerged from analysis of over 4,900 causal statements. The larger constructs were then broken down into sub-constructs to allow for greater clarity and explanatory power. Table 2 summarizes the major constructs and their respective sub-constructs. Each sub-construct is then made up of individual concepts that were elicited from respondents.

In addition to identifying major constructs relating to IT personnel transition, each causal statement was labeled as a barrier, enabler, or example of transition, an organizational contribution, or other. Past research has identified both enablers and barriers of change as separate issues, and called for a deeper look specifically at barriers (Beer et al. 1990). Two causal maps are presented: enablers (Figure 1) and barriers (Figure 2). These maps represent the most frequently mentioned linkages among the elicited sub-constructs.

Table 2. Constructs and Sub-Constructs of IT Personnel Transition

CONSTRUCT	SUB-CONSTRUCT
I. Personal Competencies	Cognitive Abilities General IS Related Abilities Technical Competencies Business Competencies Social Competencies Knowledge
II. Environment	Technical Environmental Factors Business Environmental Factors General Environmental Factors IT Field Environment Job Environment
III. IS Support/Direction	Personnel Policies Management Support Corporate Support/Direction
IV. Motivation	Motivators
V. Outcomes	Technical Performance of the IS Group Personal Outcomes Organizational Outcomes
VI. Attitude	Attitudes

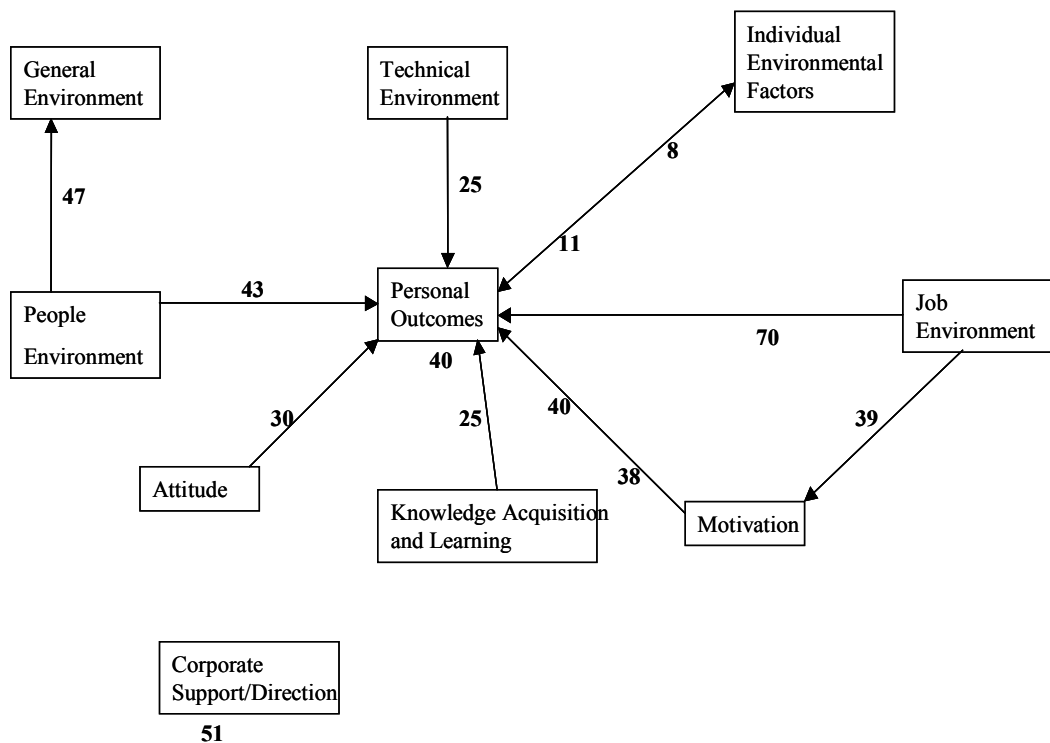


Figure 1. Enablers of IT Personnel Transition

ENABLERS OF IT PERSONNEL TRANSITION

The enablers' map (Figure 1) represents linkages between concepts that support IT personnel transitions. Only relationships that were elicited 20 or more times are shown on the enabler and barrier maps. The numbers on the maps represent frequencies, since this is a qualitative method. The numbers in the center of the lines represent the frequency with which two concepts were linked together in a single causal statement. Numbers on the ends of lines represent how often a concept was linked to itself, through multiple sub-concepts.

The central enabling sub-construct revealed was personal outcomes. While past research has focused on outcomes such as job satisfaction and organizational commitment (Igbaria and Guimaraes 1993; Nelson 1990; Nicholson 1984), our data reveals additional personal outcomes that are also relevant to IT personnel. Table 3 lists the most frequently mentioned concepts of personal outcomes.

Table 3. Personal Outcomes: Identified Concepts and Definitions

Concept	Respondents' Perception of Concept
Transferable Skills	Skill which can be applied and adapted to meet changing technology environments
Recognition/Appreciation	Recognition, praise, and approval by management in regard to employee's job function and performance
Personal Learning	The extent to which the employee learns new technology skills and practices in the workplace
Transition to Management	The ease with which an employee can transition into a management position within their organization
Job Satisfaction	Employee's indication of overall satisfaction with job function and job requirements

The most common transition-enabling sub-construct revealed in our analysis is job environment, which includes the concepts of job autonomy, job flexibility, job challenge, physical environment, and individual workload. Job environment was often linked to the respondent's job satisfaction: *"I enjoy the company. It is a quiet and pleasant environment and the work we're doing is very challenging. It can be fun, it is not boring."* This statement supports the findings that job challenge and a stimulating work environment contribute to overall job satisfaction. While this has been shown to be true in other studies of IT personnel (Cougar et al. 1979; Igbaria and Guimaraes 1993; Smits et al. 1993), this study revealed that *having fun* is an important component of IT personnel transition. Having fun appears to be strongly related to both the challenge of the job and an individual's desire to continue learning and growing. The respondents described the concept of playing with technology, rather than having fun in a social sense, as an important part of a fun job environment. This may be one of the factors distinguishing IT personnel transition from general personnel career transition.

The RCM reveals that job environment is also linked to the motivation sub-construct, which in turn leads to personal outcomes enabling transition. One of the most frequently mentioned concepts contributing to the motivation of an IT employee is accomplishment. This would indicate that the majority of our respondents are intrinsically motivated and possess a need to achieve. An employee exhibiting this need to achieve is defined as one who is constantly setting challenges for themselves, who has a high locus of control (they influence their own outcomes), and who is concerned with personal achievement rather than with the tangible rewards of success. While the need for a high level of personal accomplishment has been identified in other studies as a characteristic of IT personnel (Baroudi 1985; Igbaria et al. 1991; Igbaria and Seigel 1992), this study reveals how this accomplishment need links to the transition of IT personnel.

Another important element linked to personal outcomes for IT personnel is the attitude sub-construct. Frequently mentioned concepts that help define attitude include the employee's acceptance of change, their attitude toward change, their attitude toward new technology, and their perception regarding communication with management. An example of the link between attitudes and a personal outcome is: *"four years ago we went to a world-class competition. I really bought it. I really liked it—it's what changed my job, my priorities. I used to be more defensive and I learned to be more customer-oriented."* Attitudes toward change are especially critical for IT employees in today's environment, where technology continues to change at a rapid rate and organizations embrace new business models, such as world class competition and e-business.

Previous research has demonstrated that employee attitudes directly correlate with organizational commitment and job satisfaction (Baroudi 1985; Schappe 1996). This suggests that positive employee attitudes result in an increased level of commitment to the organization. Such commitment can then lead to employee support for organizational change, and positively affect the individual's willingness to continually transition (Ajzen and Fishbein 1980; Karahanna and Straub 1999).

As illustrated in Figure 1, knowledge acquisition and learning is another sub-construct directly relating to personal outcomes and serving as a transition enabler. Concepts contributing to a respondent's sense of learning include continual learning, diverse work experiences, and mentoring. One respondent commented, *"I graduated two years ago from college and I'm still learning a lot of the new technologies. I go home and study at night and I'm doing the things that I can to get where I need to be."* This statement indicates that the employee understands the need for continual learning and is likely to pursue opportunities to acquire knowledge. Because skill acquisition is an important factor enabling IT personnel to transition effectively within an organization, it may be concluded that technology employees who value knowledge acquisition, such as the respondent quoted above, will be most likely to positively contribute to a transition event (Nicholson 1984).

Another transition enabling sub-construct that emerged in this study is technical environmental factors, which include concepts such as employees' access to technology, system reliability, and new technology environment. One respondent stated; *"I think everybody has a chance to do something they enjoy. ...I think every single one of us doing computer operator stuff when I got here are now doing something completely different, we have been given the opportunity."* This comment suggests that organizations can assist employees during a transition event by offering them a variety of opportunities to work with emerging technologies.

The people environment that surrounds an IT employee is a sub-construct strongly linked to both personal outcomes and the respondents' feelings about the concept of general work environment. Past research not specifically targeted at IT personnel shows that companies may facilitate intra-organizational communication and contribute to personal outcomes by enabling employees to work in teams (Allen and Brady 1997). However, our interview data suggests that although the people environment is important in producing positive outcomes for IT employees, they are often accustomed to working independently and prefer to do so. It is common for them to gain knowledge and experience by experimenting on their own with new software, hardware, or programming skills, linking to the playing with technology concept discussed earlier in this paper. Consequently, without relevant training, technology personnel may not respond positively to working in groups. As a result, a group work environment could prove counterproductive for those technology employees who exhibit little understanding of team dynamics, team structure, and the value of collaboration.

General environmental factors appears as another significant enabling sub-construct illustrated in the RCM. Concepts most frequently mentioned in relation to this sub-construct include the pace of change within the organization, the availability of knowledge, the availability of resources, and the employee's perceived pressure to change.

BARRIERS TO IT PERSONNEL TRANSITION

Beer et al. (1990) refers to barriers that block organizational learning as "silent killers." In the context of IT personnel transition, providing transition enablers is not enough to increase the rate of successful transition. Managers must not only attempt to enable transition, they must also address barriers.

Figure 2 illustrates the most frequently mentioned barriers to IT employee transition. This barriers map indicates that attitude is the central significant sub-construct hindering this process, in contrast to personal outcomes being the central sub-construct in the enablers map.

Anxiety and frustration are commonly identified in the literature as impacting role transition (Nicholson 1984). However, our data reveals two additional attitudes that influence IT professionals: resistance to change and a desire for stability. Concepts that define change resistant attitudes are listed in Table 4.

One respondent summed up their change resistant attitude by simply stating, *"radical change is disturbing."* Our results show that resistance to change is often linked to frustration with the amount or pace of change, not necessarily change itself. This conclusion was derived from answers to general questions regarding how respondents felt about change. Researchers did not directly ask about pace or amount of change. In addition, organizations are experiencing a great deal of structural and competitive change, often brought about by those very technologies created and supported by IT personnel. Consequently, an IT employee who is resistant to change may find limited employment opportunities in the future.

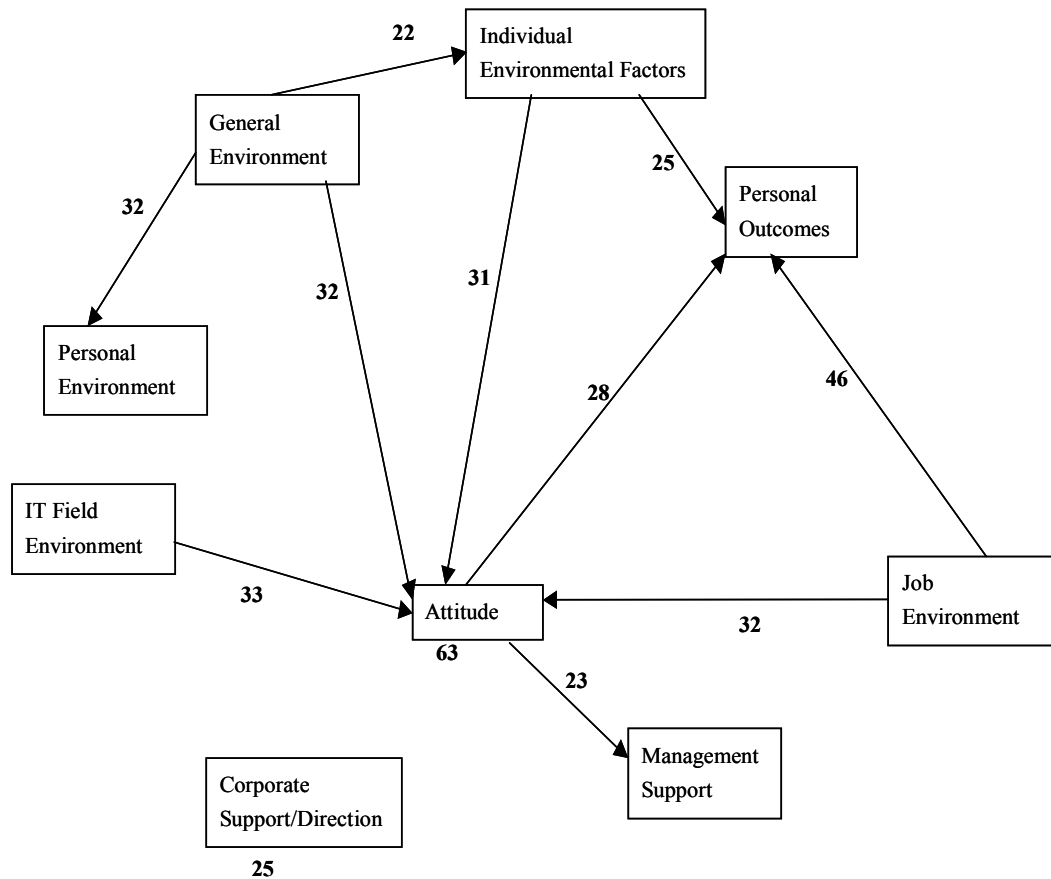


Figure 2. Barriers to IT Personnel Transition

Table 4. Attitudes: Identified Concepts and Definitions

Concept	Respondents' Perception of Concept
Anxiety	The amount of stress the employee feels in regard to a changing environment
Frustration	Feelings of futility and unimportance in the change process, failure to understand the need for change, employee's failure to understand how management expects them to change
Resistance to Change	Not wanting to alter current routines and functions to accommodate change
Desire for Stability	Comfort with enduring practices

Another sub-construct with significant linkages to resistant attitudes is individual environmental factors. Concepts discussed in relation to this sub-construct were family, job experience, career goals, and time, as exemplified by one respondent's comment: "It is really time [that is a barrier] more than anything. I am also a full-time student so it is hard to commit to something that you may have to work overtime for and have to schedule around school. There are only 24 hours in a day." Many respondents expressed that they had little free time and that they felt overworked. This finding is not surprising, as many IT organizations have difficulty filling job openings and are often short staffed (Moore 2000).

The sub-construct of IT field environment, or changes in the general IT discipline outside of the organization, also relates to negative attitudes and creates additional barriers to IT personnel transition. Frequently mentioned concepts within IT field environment include rate of change, job market, continual change, and the complexity and variety of emerging technologies. Because IT changes jobs and organizations by enabling them to do things they couldn't previously do, it might be assumed that most IT workers would view themselves as change agents, and would have a high tolerance for a faster pace of change. However, prior research shows that technology changes can make some IT employees feel vulnerable, fearing that they may look incompetent if they don't immediately understand the new technology (Markus and Benjamin 1996). This insecurity could provide insight into why many of our respondents expressed negative attitudes toward change.

Management support is another sub-construct linked to attitude on the barrier map. Concepts mentioned were support for training, management communication, management technical knowledge, and management style. Prior research indicates that by reducing the perception of uncertainty during a transition, an organization will support creativity and innovation among its employees, thereby improving workplace attitudes (Hoyt and Gerloff 1999). Communication and feedback from management is one way to reduce perceived ambiguity during a change process. These actions may improve employees' change resistant attitudes that result from an apparent lack of management support.

Other sub-constructs indicated by the RCM as barriers to IT personnel transition are job environment, personal outcomes and general environmental factors. It is interesting to note that these sub-constructs are also present on the map of transition enablers. This indicates that the same linkages have the potential to impact IT personnel transition both positively and negatively. The dual nature of these concepts further proves the importance of understanding not only those factors that serve as enablers to transition, but also those that present barriers to change.

A COMPARISON OF THE BARRIER, ENABLER, AND TRANSITION MAPS

The enabler, barrier, and transition maps have several constructs in common:

- attitude
- personal outcomes
- general environment
- job environment
- corporate direction and support

This commonality suggests that both environment and personal factors have an overall affect on an IT professional's ability to transition to new technologies, business environments, and job roles.

A striking difference in the maps is that attitude is the central sub-construct in the barrier map, but the personal outcomes sub-construct occupies the central role in enabling and generating transitions. This difference suggests that even though many people do not like change, emphasizing the benefits of change from the individual's point of view can influence their willingness to change. Individuals want to know: "what's in it for me?" Understanding the personal benefits of change can help IT professionals overcome resistance to change and move toward a successful transition.

Each of the maps has one sub-construct not shared with the other maps. The management support sub-construct is unique to the barrier map and is linked to attitude, indicating that a lack of perceived support from management contributes to negative attitudes and resistance toward change. Typical comments from the interviews mention a lack of communication from management about action regarding organizational changes. Interviewees felt that management did not inform them of upcoming changes and did not seek out or value their input when making decisions about the future. One respondent stated, *"Of course, if you understand the reason for change, it helps. If you see it coming, it helps. My main resistance is when I feel blind-sided."*

Interviewees also expressed the desire to be valued and appreciated by managers: *"We have all kinds of training available that I haven't taken the time to learn, but we're constantly being told we're not needed, that our skills are legacies, our systems are no longer needed, and there's zero respect for our business knowledge."* The outcome of these perceptions is negative emotions such as fear, anxiety, frustration, and anger that lead to negative attitudes.

Based on comments from the interviews, employees appear to expect a minimum level of management support. This need for support may function as a “hygiene factor” where more management support may not enable people to transition more effectively, but the lack of management support will certainly act as a barrier in transitioning (Herzberg et al. 1959).

The IT field environment is also linked to attitude on the barrier map. Concepts relating to the IT field environment sub-construct mentioned the amount of change and pace of change in the IT field. For many IT workers, when the amount or pace of change is overwhelming, their attitude reflects a negative view toward change and a resistance to change.

The enabler map has three sub-constructs not shared with the barrier map: knowledge acquisition, technical environment, and motivation. The knowledge acquisition sub-construct links to personal outcomes, suggesting that IT professionals view knowledge acquisition as important in achieving personal outcomes such as success, job satisfaction, learning, and transition to new job roles.

The value that IT professionals place on continual learning is apparent in one respondent’s statement:

That was probably the most exciting part of my career and it was right after I started here. I was working as an operator. [The company] had purchased a PC and I was going to school at the time and bought a PC and took it home and tore it apart to see how it worked. From then on, when my manager asked if a couple of us would be interested in doing that type of work, I said that’s what I wanted to do. I learned to do it when we took some classes. ... We kind of just worked into it. I haven’t quit going to school yet.

The technical environment is also important to enabling transition. Respondents like to work with new technology and the latest tools: “I like new technology—emerging technology.” Managers must balance the workers’ desire for the latest technology with the organization’s need to support current systems that may be based on legacy technologies. As in-house IT organizations move from a development role to more of an installation and maintenance role, managers will need to find ways to satisfy their employees’ fascination with the latest technology, while at the same asking them to support older technologies. One company in the sample provided new technical gadgets such as hand-held devices that were not directly related to the IT workers job. These technical gadgets gave the workers exposure to new technology and made their job more interesting.

Motivation appears to be more important as an enabler of transition than a barrier. IT personnel are motivated by challenge and enjoy a sense of personal accomplishment. For some IT workers, challenge motivates them toward the next transition: “[I enjoy] the general challenge of the project. When this is over, I’ll probably look for something else that’s equally as challenging a situation.” Managers should identify the workers who are strongly motivated by challenge when looking to implement new technologies. These workers often have a positive attitude toward change, enjoy learning, and learn quickly.

Comparing and contrasting the three RCMs helps identify areas where managers can focus efforts to help IT personnel transition successfully, and identifies specific concepts that have unique roles as barriers or enablers to transition. Understanding that attitude is a common barrier to change allows managers to overcome resistance by utilizing strategies that address the concepts that make up the attitude sub-construct. One possibility is to solicit employee input into IT and business decisions while communicating to employees how changes will benefit both the company and them personally. In addition, managers could positively affect personnel attitudes by allowing employees to choose the type of training they receive and provide new job role opportunities to those who actively acquire new technical and business knowledge.

This study also revealed that many IT professionals described themselves only in terms of their technical skills. They identified their corporate contributions as their expertise with a specific system, or with a particular programming language. In general, they appear to discount their transferable skills, such as project management, problem solving, teamwork, and business domain knowledge. These skills and abilities are usually accumulated over time, working on a variety of projects, often with different groups of people. Transferable skills will assist IT personnel in the transition process, since these skills are not dependent on any particular technical environment. This may not be surprising to anyone who has read a position announcement for an IT job. These advertisements almost exclusively solicit specific technical skills, with other skills only listed as an occasional afterthought (Todd et al. 1995). The next phase of this project will include an update the findings of Todd et al. to determine whether the situation has changed over the last 10 years since their study.

CONTRIBUTIONS

This paper is a first report of a large-scale study of IT personnel transition. This study contributes to the literature on IT personnel by identifying the relevant constructs affecting IT personnel transition. The constructs and sub-constructs are presented as causal maps representing two categories: enablers and barriers. The maps were evoked using revealed causal mapping. We find that the relationships among the sub-constructs differ between the two groups and that the central concepts are also different. Personal outcomes is a central enabling sub-construct, while attitude is the central barrier sub-construct. This finding is important to researchers interested in IT personnel issues because past research has focused on enabling factors rather than barriers to motivation, training, or retention. In addition, numerous IT domain specific concepts have been identified that impact personnel transition beyond those found in the general transition literature.

While IT personnel transition is an individual level phenomenon, this study also reveals that environment, and both managerial and corporate IT support and direction are sub-constructs that influence the ability of individuals to transition.

The data from this study yields a starting point for a more precise definition of previously theorized concepts and the development of appropriate and valid measures of old and new concepts. It is the first step in building a domain specific theory of IT personnel transition. The next phase of this study takes the revealed causal maps of IT personnel transition and develops a survey instrument to further validate the constructs discussed in this paper using confirmatory factor analysis.

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