Abstract

The information technology industry is characterized by high employee turnover. Previous research on employee turnover has focused on elucidating the antecedents of turnover and suggesting staff retention strategies. However, little research has been devoted to studying how the undesirable effects of IT turnover can be mitigated. As a result of turnover, information system development (ISD) teams face the danger of losing knowledge through personnel departure and difficulties when new members with different experience enter. This study views employee turnover in ISD project teams from the perspective of organizational forgetting. We propose a theoretical model that assesses the negative effect of member turnover on ISD project performance and suggest possible mechanisms for mitigating such effect based on the framework of organizational forgetting. 151 project teams were surveyed and results showed that turnover weakens ISD project performance. However, the use of succession planning, knowledge repository, and employee orientation program to manage different types of organizational forgetting can effectively mitigate the detrimental effects of turnover. Implications for research and practice are discussed.

Keywords: Organizational Forgetting, Information Systems Development, Knowledge Management, Employee Turnover.
INTRODUCTION

The information technology (IT) industry is characterized by high rate of employee turnover. For example, in the United States, total annual turnover of information technology professionals in terms of hiring and separation is as high as 30% (Bureau of Labor Statistics 2007). Being the main source of IT skills and competencies, turnover of IT personnel is dysfunctional to organizations, causing increased cost in personnel training, work disruption, and delay in critical information system projects (Irani and Love 2000). Recognizing the detrimental effects of turnover, research on the determinants of turnover and retention strategies is growing (e.g., Ahuja et al. 2007, Jiang and Klein 2002, Thatcher et al. 2002). However, little is known about employee turnover in the context of information system development (ISD) project teams and how its negative effects can be mitigated.

Employee turnover has been identified as a significant source of software project risk that needs to be minimized (Barki et al. 2001). ISD project typically lasts from months to years and employee mobility during this period is inevitable. Unplanned turnover has deleterious effect on project memory through the departure of IT personnel and business knowledge brokers (Argote 1999). It may also adversely affect the project when new members fail to unlearn incompatible practices developed in previous job position. Hence, other than understanding the effect of turnover on project performance and formulating retention strategies, it is also necessary to identify mechanisms to buffer the impact of turnover when it occurs. Specifically, we seek to answer the following research questions 1) Through what mechanisms can the detrimental effect of member turnover on ISD project performance be mitigated? 2) What is the relative effect of these mechanisms? In this paper, we propose that the framework of organizational forgetting, which focuses on intentional and accidental loss of knowledge in organizations (de Holan and Phillips 2004, Newman and Sabherwal 1996), provides a suitable theoretical understanding of the phenomenon. This study contributes to research by providing a theory-guided understanding of the effect of turnover on project and organization memory and helps practitioners manage it by identifying specific empirically-tested practices.

1 CONCEPTUAL BACKGROUND

1.1 Turnover in Teams

Employee turnover refers to the rotation of workers around the labour market, between firms, jobs, and occupations (Carley 1992). In this study, we define employee turnover to be the movement of workers in and out of an ISD project team during the course of the project. Members may leave the team to join other units within the same organization, or leave the organization entirely. Likewise, new team members may join from other units within the organization, or be completely new hires from outside the organization. Previous studies have found that turnover has ill effects on team performance but employing effective management strategies can control its influences (e.g., Rao and Argote 2006, Shaw et al. 2005).

1.2 Organizational Forgetting

In this study, we propose that the effects of employee turnover on project memory can be better understood through the framework of organizational forgetting. The framework suggests that organizations need to ensure that they retain strategic knowledge while unlearning obsolete knowledge (de Holan and Phillips 2004). Valuable knowledge in organizations may be unintentionally lost when existing memory decays over time or when new knowledge is not captured in time. At the same time, inability to unlearn or forget obsolete knowledge and routines traps organizations in the past and can become an impediment to learning (Othman and Hashim 2004).
Specifically, the framework categorized organizational forgetting along two dimensions: the first differentiates between accidental and intentional forgetting, and the second distinguishes between existing and new knowledge. Together, they form a matrix that highlights four processes of forgetting, namely memory decay, failure to capture, unlearning, and avoiding bad habits (see Table 1).

<table>
<thead>
<tr>
<th>Existing Knowledge</th>
<th>Accidental Forgetting</th>
<th>Intentional Forgetting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory Decay</td>
<td>Unlearning</td>
<td></td>
</tr>
<tr>
<td>Failure To Capture</td>
<td>Avoiding Bad Habits</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1. Forms of Organizational Forgetting (de Holan and Phillips 2004)*

Accidental forgetting is associated with the unintentional loss of valuable knowledge, which reduces organization’s competitiveness. Two forms of accidental forgetting are memory decay and failure to capture. *Memory decay* occurs when well-established knowledge is accidentally lost. Unintentional loss through memory decay usually has harmful and costly effects for organizations. For example, IT personnel may take away important knowledge about the ISD project such as customer preferences when they leave the project team. The second type of accidental forgetting, *failure to capture*, refers to organization’s failure to codify new knowledge before it can become firmly established in organization’s memory. Newly learned technical knowledge may be gone with the departure of IT personnel before it can be captured by the team.

Intentional forgetting, as opposed to accidental forgetting, can have positive outcomes. Two forms of intentional forgetting are unlearning and avoiding bad habits. *Unlearning* involves reducing or eliminating pre-existing knowledge or habits that would otherwise present barriers to new learning (Newstrom 1983). In the context of ISD, existing routines may need to be unlearnt in order to benefit from a new technology or work process and it is sometimes done through dismissal of existing IT personnel. In *avoiding bad habits*, organizations deny to learn undesirable routines, practices, ideas, and values that produce dysfunctional outcome. When new members are brought into an ISD project team, they may bring with them their own work practices and habits that are incompatible with the current project or the organization. Hence, it is important to purposefully remove this knowledge before it is embedded into project and organization memory.

Based on the organizational forgetting framework, different strategies for managing forgetting in ISD projects were identified from literature. They were incorporated into the proposed model and discussed below.

### 2 PROPOSED MODEL AND HYPOTHESES

The proposed research model is presented in Figure 1. The model posits that team member turnover negatively affects ISD project performance, but its detrimental effect can be attenuated by adopting various human resource and project management mechanisms to manage different forms of organizational forgetting. Specifically, memory decay can be managed by practising job rotation and succession planning, failure to capture new knowledge can be prevented by using knowledge repositories and exit processing procedures, and intentional forgetting of obsolete or undesirable knowledge and routines can be facilitated by organizing employee orientation and mentoring programs.

In addition to the constructs discussed above, past studies have found that project novelty (Tiwana 2003), project complexity (Xia and Lee 2005), project team size, and project duration (Guinan et al. 1998, Henderson and Lee 1992) have significant effect on ISD project performance. Hence, they were included as control variables in the proposed model.
2.1 Effect of Team Member turnover on ISD Project Performance

Member turnover has been found to have negative effect on team performance in many studies (e.g., Glebbeck and Bax 2004). In ISD projects, turnover has been identified as a significant risk that can affect project success (Barki et al. 2001). It can result in inadequate deployment of an organization’s IS resources and cause work disruptions that may increase the time and cost needed to complete the proposed systems (Igbaria and Guimaraes 1999). Therefore, we hypothesize that:

$H1$: The level of member turnover in an ISD project team negatively affects the ISD project performance.

Past studies indicated that certain human resource and project management practices can buffer the effects of turnover (e.g., Shaw et al. 2005). This provides support to our other hypotheses on the moderating effects of mechanisms to manage forgetting, as detailed below.

2.2 Managing Accidental Forgetting of Existing Knowledge - Memory Decay

Memory decay can be prevented by building knowledge redundancy. Team members form natural stores of tacit knowledge known as “transactive memory” (Nonaka 1994, Wegner 1987). To ensure that this memory survives employee turnover, other members in the ISD project team must become sufficiently knowledgeable to assume the role to be vacated. This should be carried out while the exiting member is still in the team. Two common practices for building redundancy are job rotation and succession planning.

*Job rotation* refers to the alternation of tasks or responsibilities among project team members. Hut and Molleman’s (1998) study on production teams in an industrial firm has shown that rotation of workers may be desirable in order to keep teams open to change, stimulate organizational learning, and facilitate the dissemination of experiences. Job rotation allows the development of a pool of people knowledgeable enough to step into an existing job with ease. Because of this learning prior to turnover, another member is able to cover the work of the exiting member temporarily and minimize possible disruptions. Hence, we propose that:

$H2a$: The practice of job rotation will weaken the effect of member turnover on ISD project performance.

*Succession planning* refers to the job shadowing of key positions, or the hiring of “second-in-command” personnel to become knowledgeable on key job tasks in case of turnover (Stovel and Bontis 2002). By observing the work of the exiting team member, the “successor” acquires crucial knowledge needed to take over the member’s tasks and ensures continuity in ISD project.

$H2b$: The practice of succession planning will weaken the effect of member turnover on ISD project performance.
2.3 Managing Accidental Forgetting of New Knowledge - Failure to Capture

New knowledge developed by ISD team members at work but not formally incorporated into project memory is at risk of loss during turnover (de Holan et al. 2004). Also, valuable expertise brought into the team by new members may fail to become embedded in the project’s knowledge stock. To mitigate these problems, new knowledge must be actively captured from both incoming and departing members. Two practices that can facilitate this are knowledge repository and exit processing.

Knowledge repository is a system that assists in the capturing of knowledge in organization (Rus and Lindvall 2002). Examples of knowledge that can be stored in an ISD project include version control, system design, and user requirements. Lynn et al. (2000) proposes that recording, reviewing, and filing of essential knowledge determines how well teams can learn and ensures that newly invented knowledge is not lost permanently when members leave. Accordingly, we hypothesize that:

H3a: The use of knowledge repository will weaken the effect of member turnover on ISD project performance.

Exit processing involves the gathering of information from exiting team member about the relationships and responsibilities associated with his or her job that are otherwise not noted in formal job description (Stovel and Bontis 2002). By identifying this knowledge, project manager can incorporate them into job description or reassign the roles and responsibilities to other team members, thereby minimizing possible disruption to the project. Therefore, we hypothesize that:

H3b: The use of exit processing will weaken the effect of member turnover on ISD project performance.

2.4 Managing Intentional Forgetting

Other than capturing existing and new knowledge from team members, it is also important for ISD project team to unlearn obsolete knowledge and avoid the institutionalization of bad habits. Obsolete knowledge is often removed by dismissal of employees (Stovel and Bontis 2002). Compared to separation, hiring of new members poses greater need for organizations to manage intentional forgetting as new members often bring with them incompatible or undesirable practices from their previous organizations. To facilitate intentional forgetting, two types of mechanisms that can be implemented at the point of member entry are orientation and mentoring.

Orientation refers to a program that aims to facilitate new employee’s acquisition of attitudes, behavior, and knowledge needed to become a fully participating member of the team (Wanous 1992). This can take the form of workshops, walkthroughs, and team-building exercises. Orientation can facilitate intentional forgetting by ensuring that newcomers adjust to the team by discarding incompatible knowledge and learning the team’s modulus operandi. Hence, we hypothesize that:

H4a: The practice of orientation will weaken the effect of member turnover on ISD project performance.

Mentoring relationship between an existing member and a new employee can facilitate the diffusion of tacit knowledge (Droege and Hoobler 2003). Such relationships can be either informal or formal. Informal relationships develop among existing and new members without dictation from top management. In contrast, formal mentoring refers to assigned relationships, often associated with organizational mentoring programs designed to promote employee development (Blake-Beard 2001). Mentoring can benefit new team members by facilitating intentional forgetting. More experienced members would be able to guide new members around incompatible or obsolete practices. Hence, we hypothesize that:

H4b: The practice of mentoring will weaken the effect of member turnover on ISD project performance.
3 RESEARCH METHODOLOGY

3.1 Operationalization

In this study, the unit of analysis is the ISD project. The proposed research model was assessed empirically using data collected in a survey of ISD projects. A step-by-step process recommended by Churchill (1979) was used to develop the instrument used in the survey. The first step involved consulting past literature to conceptualize and specify each construct’s domain as discussed in preceding sections. Next, items that could capture the domain specified were gathered from previously validated scales where appropriate. The sorting routine proposed by Moore and Benbasat (1991) was incorporated into the process to preliminarily verify the content validity of the proposed instrument. Three rounds of sorting were conducted with the final round’s average Kappa score and overall placement ratio of items within the targeted constructs being 1.00, indicating satisfactory content validity. Most items were measured using seven-point Likert scales.

As in previous studies (e.g., Stovel and Bontis 2002), employee turnover (TVR) was measured in terms of the percentage of member joining and leaving the ISD project team during the course of the project. Constructs representing the mechanisms for managing organizational forgetting were assessed by the extent to which each practice was carried out during the project. Specifically, job rotation (JBRT) was assessed with three items adapted from Hut and Molleman’s (1998) scale of job enlargement/ redundancy. Succession planning (SCPL) and exit processing (EXPC) were measured with items developed based on Stovel and Bontis’ (2002) definition and description of these practices. Items measuring the use of knowledge repository (REP) were adapted from Choi and Lee’s (2003) scale of explicit and tacit knowledge management methods and Lynn et al.’s (2000) scale of knowledge recording. Employee orientation (ORT) was assessed with four items developed based on Wanous’s (1992) definition and description of the construct. The practice of mentoring (MTR) was measured with three items adapted from Choi and Lee’s (2003) scale of explicit and tacit knowledge management methods. Items assessing ISD project performance were adapted from Henderson and Lee’s (1992) scale of team performance and Tiwana’s (2003) scale of software development project’s process and conceptual newness. Items measuring project complexity (COMP) were adapted from Xia and Lee’s (2005) scale of complexity of ISD projects. Project team size (SIZE) and duration (DUR) were measured in terms of the total number of team members and months taken to complete the project respectively (Guinan et al. 1998, Henderson and Lee 1992).

3.2 Data Collection and Descriptive Analysis

To identify ISD projects, we contacted 300 members of IT professional associations. Projects that satisfy three criteria were identified. First, only projects that were completed within five years of the survey were included to minimize recall error. Second, each project should have lasted for at least 12 months so that there was reasonable and adequate time for turnover, if any, to occur. Third, the project manager should have been with the team since the beginning of the project to ensure that he or she was sufficiently involved in the project to provide accurate information about the team’s turnover. In cases when a project manager was involved in more than one project that satisfied these criteria, he or she was asked to respond to the survey based on the most recent project. 151 project managers agreed to participate, yielding a response rate of 50.3%. The projects’ profile is shown in Table 2. Most teams were in the computer industry (58.9%) and were relatively small, consisting of less than ten members (68.9%). The most common ISD methodology used was the waterfall model (61.6%).

The descriptive statistics of ISD team member turnover in our sample are shown in Table 3. It can be observed that in terms of separation, more team members leave the organization completely rather than remaining as an employee in other units within the organization. Any undocumented knowledge possessed by these members would be difficult to retrieve. This highlights the need to constantly
capture project knowledge to guard against unexpected turnover.

In terms of origin of new members, it was observed that they were more often from within the organization than new hires. On average, an ISD project team would experience about one case of member turnover in each phase of the project, and about two cases during the project initiation and development phases.

Comparing the role of members joining or leaving the ISD project reveals that IT programmers had the highest mean (on average, 3.6 turnovers during the project), followed by project managers and business professionals (about 1.5 turnovers during the project). These roles are more knowledge intensive and members in these positions often hold critical project knowledge. Changes in these positions are likely to have unsettling effect which in turn may affect project performance.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percentage</th>
<th>Characteristic</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Industry Sector</td>
<td></td>
<td></td>
<td>Project Team Size</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Banking and Finance</td>
<td>7</td>
<td>4.6</td>
<td>Less than 10</td>
<td>104</td>
<td>68.9</td>
</tr>
<tr>
<td>Computer Industry</td>
<td>89</td>
<td>58.9</td>
<td>10 to 19</td>
<td>26</td>
<td>17.2</td>
</tr>
<tr>
<td>Defence</td>
<td>4</td>
<td>2.7</td>
<td>20 to 29</td>
<td>9</td>
<td>6.0</td>
</tr>
<tr>
<td>Education</td>
<td>16</td>
<td>10.6</td>
<td>30 to 60</td>
<td>5</td>
<td>3.3</td>
</tr>
<tr>
<td>Electronics</td>
<td>2</td>
<td>1.3</td>
<td>More than 60</td>
<td>7</td>
<td>4.6</td>
</tr>
<tr>
<td>Logistics</td>
<td>4</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturing</td>
<td>10</td>
<td>6.6</td>
<td>1 to 2 years</td>
<td>123</td>
<td>81.5</td>
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<tr>
<td>Medical</td>
<td>2</td>
<td>1.3</td>
<td>2 to 3 years</td>
<td>18</td>
<td>11.9</td>
</tr>
<tr>
<td>Research and Development</td>
<td>2</td>
<td>1.3</td>
<td>3 to 4 years</td>
<td>5</td>
<td>3.3</td>
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<tr>
<td>Semiconductor</td>
<td>3</td>
<td>2.0</td>
<td>4 to 5 years</td>
<td>2</td>
<td>1.3</td>
</tr>
<tr>
<td>Telecommunications</td>
<td>8</td>
<td>5.3</td>
<td>5 to 10 years</td>
<td>3</td>
<td>2.0</td>
</tr>
<tr>
<td>Transportation</td>
<td>4</td>
<td>2.7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project Methodology</td>
<td></td>
<td></td>
<td>Project Duration</td>
<td></td>
<td></td>
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<tr>
<td>Agile</td>
<td>28</td>
<td>18.5</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Big Bang Approach</td>
<td>3</td>
<td>2.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iterative</td>
<td>15</td>
<td>9.9</td>
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<td></td>
<td></td>
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<tr>
<td>Prototyping</td>
<td>12</td>
<td>8.0</td>
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<tr>
<td>Waterfall</td>
<td>93</td>
<td>61.6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2. Profile of ISD Projects (N=151)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Departing Team Members</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Leaving Organization</td>
<td>2.09</td>
<td>3.12</td>
<td>9.72</td>
</tr>
<tr>
<td>Staying Within Organization</td>
<td>1.42</td>
<td>2.12</td>
<td>4.50</td>
</tr>
<tr>
<td>Entering Team Members</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newly Hired</td>
<td>1.56</td>
<td>2.21</td>
<td>4.86</td>
</tr>
<tr>
<td>From Within Organization</td>
<td>3.35</td>
<td>3.85</td>
<td>14.80</td>
</tr>
<tr>
<td>Turnover By Project Phase</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initiation</td>
<td>2.17</td>
<td>2.87</td>
<td>8.21</td>
</tr>
<tr>
<td>Design</td>
<td>1.28</td>
<td>2.22</td>
<td>4.92</td>
</tr>
<tr>
<td>Development</td>
<td>2.11</td>
<td>4.16</td>
<td>17.30</td>
</tr>
<tr>
<td>Implementation</td>
<td>1.56</td>
<td>2.66</td>
<td>7.05</td>
</tr>
<tr>
<td>Enhancement</td>
<td>1.27</td>
<td>2.20</td>
<td>4.85</td>
</tr>
</tbody>
</table>

Table 3. Descriptive Statistics of ISD Team Member Turnover
DATA ANALYSIS AND RESULTS

All multi-item constructs were estimated by averaging the scores of items measuring the construct (Gefen and Straub 2000). Their reliabilities and validities were then assessed, followed by moderated multiple regression. Regression was chosen over other data analysis techniques such as structural equation modelling because it has less problems with regard to over fitting models (Gefen and Straub 2000).

4.1 Tests for Reliability and Validity

The Cronbach’s Alpha for each construct and correlations among constructs are shown in Table 4. It can be observed that all constructs possess satisfactory reliability as their Cronbach’s Alphas exceeded 0.70 (Nunnally 1978). Factor analysis with varimax rotation was also conducted to assess construct validity. Nine factors with eigenvalue greater than one were extracted, matching the proposed constructs and control variables measured with multi-item scale (turnover, team size, and project duration were excluded as they were measured with single item). Kaiser-Meyer-Olkin measured 0.83 and all item loadings on stipulated constructs were greater than the recommended threshold of 0.5 (Kaiser 1974). Thus, we concluded that the construct validities of all constructs were adequate.

The degree of multicollinearity between all independent variables was assessed by examining the variable inflation factor (VIF). All VIF values (ranged from 1.05 for the mentoring construct to 1.61 for the team member turnover construct) were found to be well below the suggested maximum of 10 (Neter et al. 1989). Therefore, we concluded that bias due to multicollinearity was unlikely.

We also found that the residuals for all constructs satisfied distribution assumptions for regression. The normal probability plot of the standardized residuals suggested that the residuals were normally distributed. The plot of standardized residuals against the standardized predicted values indicated linearity and equality of variance.

<table>
<thead>
<tr>
<th>Mean</th>
<th>SD</th>
<th>TVR*</th>
<th>JBRT</th>
<th>SCPL</th>
<th>REP</th>
<th>EXPB</th>
<th>ORT</th>
<th>MTR</th>
<th>PJOC</th>
<th>NOV</th>
<th>COMP</th>
<th>SIZE*</th>
</tr>
</thead>
<tbody>
<tr>
<td>JBRT (α=.84)</td>
<td>3.58</td>
<td>1.86</td>
<td>.15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>SCPL (α=.89)</td>
<td>3.89</td>
<td>1.7</td>
<td>.16</td>
<td>.46</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>REP (α=.92)</td>
<td>4.52</td>
<td>1.58</td>
<td>.08</td>
<td>.24</td>
<td>.35</td>
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<tr>
<td>EXPB (α=.84)</td>
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<td>.32</td>
<td>.51</td>
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<td>ORT (α=.93)</td>
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<td>.07</td>
<td>.30</td>
<td>.36</td>
<td>.41</td>
<td>.29</td>
<td></td>
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<tr>
<td>MTR (α=.85)</td>
<td>4.02</td>
<td>1.79</td>
<td>.07</td>
<td>.20</td>
<td>.52</td>
<td>.29</td>
<td>.47</td>
<td>.42</td>
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<tr>
<td>PJOC (α=.89)</td>
<td>4.77</td>
<td>1.37</td>
<td>-.09</td>
<td>.19</td>
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<tr>
<td>NOV (α=.71)</td>
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<td>.04</td>
<td>-.10</td>
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<td>-.02</td>
<td>.02</td>
<td>-.19</td>
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<td>COMP (α=.81)</td>
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<td>.08</td>
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<td>.33</td>
<td>.11</td>
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<td>-.02</td>
<td>.05</td>
<td>.02</td>
<td>.07</td>
<td></td>
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<tr>
<td>SIZE*</td>
<td>17.74</td>
<td>48.45</td>
<td>-.20</td>
<td>-.12</td>
<td>.13</td>
<td>.07</td>
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<td>.09</td>
<td>.05</td>
<td>.09</td>
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<td>-.14</td>
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<tr>
<td>DUR* (months)</td>
<td>17.78</td>
<td>15.80</td>
<td>-.07</td>
<td>-.08</td>
<td>-.08</td>
<td>-.12</td>
<td>-.09</td>
<td>-.13</td>
<td>-.13</td>
<td>-.27</td>
<td>-.03</td>
<td>.11</td>
</tr>
</tbody>
</table>

Table 4. Cronbach’s Alpha and Correlation among Constructs

(SD=Standard Deviation; α=Cronbach’s Alpha; *This construct was measured with single item and Cronbach’s Alpha was not calculated)

4.2 Tests for Hypotheses

Modulated multiple regression involves testing two models. In the first model, all variables (independent variable, dependent variable, moderators, and controls) were entered to test for their main effects. The second model was ran with all variables including the interaction terms, which were computed by multiplying the turnover construct with each of the constructs representing mechanisms for managing forgetting. All interaction terms were assessed simultaneously so that their effects could be seen in the context of the overall model.
The R² value of 0.40 and adjusted R² value of 0.32 indicated that the overall model was satisfactory in explaining the variance in ISD project performance (see Table 5). The change in R² value between the two steps of regression was 0.13 (F=4.80, p<0.001), which was significant and indicated that the outcome of the second model with the interaction terms could be interpreted. Results of hypothesis tests showed that as hypothesized, turnover negatively affected ISD project performance (H1 was supported). However, the practices of succession planning, use of knowledge repository, and orientation were found to be effective in mitigating its negative effect (H2b, H3a, and H4a were supported). On the other hand, the practices of job rotation, exit processing, and mentoring were found to have no significant effect (H2a, H3b, and H4b were not supported). Only one of the control variables (project duration) was found to have significant relationship with ISD project performance.

The main objective of this study is to empirically examine the effectiveness of mechanisms for managing forgetting of knowledge caused by member turnover in ISD project teams. A research model was proposed based on de Holan and Phillip’s (2004) framework of organizational forgetting and assessed with data collected from ISD project teams. Consistent with hypothesis H1 and past research, the level of member turnover was found to be negatively related to ISD project performance. Such effect, however, was found to be effectively buffered by managing organizational forgetting. These findings are discussed below.

5 DISCUSSION

The main objective of this study is to empirically examine the effectiveness of mechanisms for managing forgetting of knowledge caused by member turnover in ISD project teams. A research model was proposed based on de Holan and Phillip’s (2004) framework of organizational forgetting and assessed with data collected from ISD project teams. Consistent with hypothesis H1 and past research, the level of member turnover was found to be negatively related to ISD project performance. Such effect, however, was found to be effectively buffered by managing organizational forgetting. These findings are discussed below.

5.1 Managing Memory Decay

Contrary to our hypothesis, job rotation did not significantly mitigate the negative effects of member turnover (H2a). This finding may be related to the difficulty of implementing job rotation in most of the teams in our sample whose team size is small (less than 10) and project duration is short (1-2 years). In these projects, resources are limited, and members often cannot afford to spend too much
time learning about other members’ tasks. Even when job rotation is implemented, the costs incurred (e.g., time delay, training) may have cancelled out any positive impact on project performance.

The moderating effect of succession planning was found to be significant as hypothesized (H2b). Succession planning is most likely to be applicable when member in important position is leaving the team and a new member has been identified to take over his/her position. Such planning may involve top management periodically reviewing key members in the ISD project team to determine possible backups for critical positions. A detailed succession plan may also outline the factors to be considered and the processes to be followed when selecting candidates for replacement.

5.2 Managing Failure to Capture

The use of knowledge repositories as a tool to capture newly invented knowledge was found to be effective, supporting hypothesis H3a. To motivate both the exiting and new members to contribute their knowledge, intrinsic rewards such as recognition and recommendation may be offered. The knowledge repository should also be well organized and easy to search to encourage continuous usage (Chao et al. 2007).

We found that the practice of exit processing, despite its widespread adoption, was not an effective practice (H3b). In our sample, 91.4% of teams had implemented exit processing (see Table 2). These were mostly in the form of interviews with the project manager (66.2%) and questionnaires (47.0%) to gather undocumented knowledge from exiting team members. Our results suggest that capturing such knowledge is not sufficient to buffer the negative impacts of turnover and it may need to be coupled with other mechanisms such as knowledge repository to disseminate the knowledge captured.

5.3 Facilitating Intentional Forgetting

As hypothesized, the practice of new member orientation was found to mitigate the negative effect of turnover (H4a). Orientation can facilitate intentional forgetting by helping new members fit into the team. By properly orientating new members about the team’s norms and expectations, new members are encouraged to discard their incompatible knowledge and practices developed in previous work environment. However, although it is important to make sure that new members are involved in orientation, they should also begin work as soon as possible to avoid causing delay to the project.

Contrary to our hypothesis, the practice of mentoring was not significantly effective (H4b). The duration and frequency of mentoring programs in our sample offer some explanation: 53 teams (35.1%) had implemented formal mentoring, with 54.7% having formal mentoring relationship lasting less than a month and the other 35.9% indicating no fixed duration. Of these, 60.4% had meetings once a week or less. Another 31 teams (20.5%) had informal mentoring relationships and there was one meeting per week or less. Such infrequent meetings are likely to be insufficient in facilitating unlearning in new members. Responses to the qualitative questions in our questionnaire also revealed that this may also be a result of the lack of clear focus in the mentoring programs as they often had objectives that were either too narrow or too vague in scope. This was especially true in the case of informal mentoring.

6 IMPLICATIONS AND CONCLUSION

6.1 Limitations and Implications for Research

The proposed model suggests that human resource and project management practices can be applied to manage organizational forgetting as a result of turnover. It also highlights that other than employee retention strategies, knowledge retention and unlearning strategies are burgeoning topics for future research considering that turnover is inevitable.

The interpretation and application of results of this study are restricted by a few limitations. First, the
data was collected in a cross-sectional survey and hence did not allow us to draw conclusive evidence of causality, despite strong theoretical arguments and empirical support from past studies. Future research can consider assessing the independent and dependent variables separately from different data sources. Second, it was noted that about 60% of the total variance in project performance was unexplained, suggesting that there may be other extraneous variables to be accounted. Third, the participating ISD teams were generally small in size (less than ten members). Results may not be generalizable to other project contexts. Future studies can replicate this study in different project settings and geographical contexts to substantiate current findings.

6.2 Implications for Practice

Our study has identified several practical mechanisms for managing knowledge during team member turnover in ISD projects. Instead of relying solely on staff retention, this study suggests alternative approaches for dealing with the loss of useful knowledge and the inflow of incompatible knowledge during turnover. Together with employee retention strategies, this can increase ISD project team’s ability in delivering high-quality information systems.

Although a vast variety of human resource and project management strategies have been proposed and applied to prevent or deal with employee turnover, our study provides evidence that some are more effective than others in helping ISD project teams retain valuable knowledge and unlearn obsolete knowledge. In our study, it was found that succession planning, knowledge repository, and orientation programs were more successful than job rotation, exit processing, and mentoring in mitigating the detrimental effects of ISD project team member turnover. Our findings also highlighted the importance of having formal plans for managing the aftermath of turnover. These plans should have unambiguous objectives and clearly specify the actions to be taken in the event of turnover. Overall, this study suggests that project managers should manage turnover proactively on a continual basis rather than adopting a passive “wait-and-see” approach.

References


