

# Human Factors: The Journal of the Human Factors and Ergonomics Society

<http://hfs.sagepub.com/>

---

## Understanding Negative Impacts of Perceived Cognitive Load on Job Learning Effectiveness: A Social Capital Solution

Chieh-Peng Lin

*Human Factors: The Journal of the Human Factors and Ergonomics Society* 2010 52: 627 originally  
published online 8 November 2010

DOI: 10.1177/0018720810386606

The online version of this article can be found at:

<http://hfs.sagepub.com/content/52/6/627>

---

Published by:



<http://www.sagepublications.com>

On behalf of:



Human Factors and Ergonomics Society

Additional services and information for *Human Factors: The Journal of the Human Factors and Ergonomics Society* can be found at:

Email Alerts: <http://hfs.sagepub.com/cgi/alerts>

Subscriptions: <http://hfs.sagepub.com/subscriptions>

Reprints: <http://www.sagepub.com/journalsReprints.nav>

Permissions: <http://www.sagepub.com/journalsPermissions.nav>

Citations: <http://hfs.sagepub.com/content/52/6/627.refs.html>

>> [Version of Record](#) - Nov 29, 2010

[OnlineFirst Version of Record](#) - Nov 8, 2010

[What is This?](#)

# Understanding Negative Impacts of Perceived Cognitive Load on Job Learning Effectiveness: A Social Capital Solution

Chieh-Peng Lin, National Chiao Tung University, Taiwan

**Objective:** This study proposes a model explaining how social capital helps ease excessively required mental effort.

**Background:** Although organizational researchers have studied both social capital and cognitive load, no prior research has critically examined the role of social capital in improving individuals' mental load and effort and consequently enhancing job learning effectiveness.

**Method:** This study surveys participants made up of professionals in Taiwan's information technology industry. It measures the constructs with the use of 5-point Likert-type scale items modified from existing literature. The survey data were analyzed with the use of structural equation modeling.

**Results:** Job learning effectiveness is negatively influenced by role ambiguity and role conflict. Time pressure has a positive influence on role ambiguity and role conflict. Although the relationship between task complexity and role ambiguity is insignificant, task complexity has a positive influence on role conflict. Because the relationship between network ties and role conflict is insignificant, trust has a negative influence on role conflict. Last, shared vision has a negative influence on role ambiguity.

**Conclusion:** This study provides an example of how social capital can be applied as a useful remedy to ease the negative impact of perceived cognitive load on job learning effectiveness.

**Application:** The negative relationship between shared vision and role ambiguity suggests that a shared vision helps in disseminating organizationally common goals and directions among employees to alleviate individuals' mental efforts in dealing with the ambiguity of their job roles. A firm's management team should take actions to decrease role conflict by strengthening trust among employees.

**Keywords:** cognitive load, shared vision, trust, network ties, role conflict, role ambiguity

---

Address correspondence to Chieh-Peng Lin, Institute of Business and Management, National Chiao Tung University, Taiwan; jacques@mail.nctu.edu.tw.

## *HUMAN FACTORS*

Vol. 52, No. 6, December 2010, pp. 627–642.

DOI: 10.1177/0018720810386606.

Copyright © 2010, Human Factors and Ergonomics Society.

## INTRODUCTION

Learning has been heralded as a strategic asset and a source of competitive advantage for business organizations. A major challenge facing organizations is how to achieve future success through their members' job learning in an effective manner, because effective job learning involves complicated psychological and social conditions (e.g., Berings, Poell, & Simons, 2005). Job learning in complex cognitive domains, such as computer programming and industrial design, is typically constrained by the limited cognitive processing of human memory (Paas & van Merriënboer, 1994a). One important theory that explains job learning, based on cognitive processing, is the cognitive load theory (Paas, Renkl, & Sweller, 2003; Sweller, van Merriënboer, & Paas, 1998; van Merriënboer & Ayres, 2005), in which a cognitive load indicates individuals' information processing capacity during learning processes. Specifically, cognitive load is a multidimensional factor that represents the load of performing a particular task on the cognitive system of a learner (Paas & van Merriënboer, 1994a).

Cognitive load refers to the load on working memory during individuals' learning. Individuals' learning at their workplace may be aimed at problem-solving skills as well as thinking, reasoning, and practicing skills (Sweller, 1988; Sweller et al., 1998). Cognitive load theory indicates that the more employees have to learn in a short period of time or from various instructors, the more difficult it is to process the learning information in their working memory (Sweller, 1988; Paas, Renkl, et al., 2003; van Merriënboer & Sweller, 2005). Working memory is inevitably limited in capacity when dealing with novel and unorganized information, because when the number of elements that need to be organized increases, the number of possible combinations increases exponentially (van Merriënboer & Sweller, 2005).

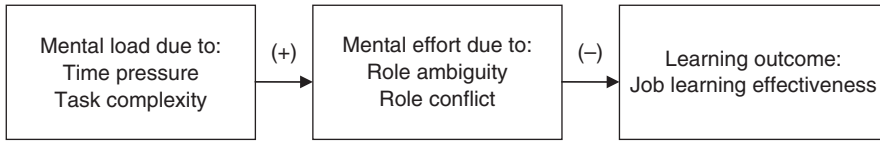


Figure 1. Pivotal assumptions of job learning effectiveness.

The dimensions of cognitive load theory include mental load, which originates from the interaction between task characteristics (e.g., task format, multimedia, task complexity) and learner characteristics (e.g., age, prior education, etc., that are included as control variables in this study), and thus yields an a priori estimate of mental effort, which refers to the mental capacity that is actually allocated to accommodate the demands imposed by the task in workplaces (Paas & van Merriënboer, 1994a; van Merriënboer & Sweller, 2005).

For employees, learning tasks within complex cognitive domains (e.g., software programming) typically represent situations that are close to the limits of their capabilities, imposing a high or excessive load on their cognitive system (Paas & van Merriënboer, 1994a). The more complex a job is, the higher the processing demands are, and the more likely it is to exceed the concurrent processing of the response capabilities of organizational members (Paas & van Merriënboer, 1994b). As a result, ineffective job learning may be attributed to a relatively excessive or high cognitive load (Sweller, 1988).

From an assessment aspect, perceived cognitive load can be conceptualized with respect to mental load, mental effort, and consequential performance (Paas & van Merriënboer, 1994b). Mental load is imposed by job or environmental demands, such as time pressure and job complexity (i.e., task-centered factors in cognitive load theory), which are regarded as independent of individuals' characteristics (Paas & van Merriënboer, 1994a). For example, previous research suggests that cognitive load may be caused by the inherent complexity of the problem in job settings, as is the case in split attention (Pillay, 1997). Mental effort refers to the amount of capacity or resources actually allocated to accommodate job-related demands in which the mental effort includes the effort in dealing with role ambiguity and the effort in dealing

with role conflict. These in turn reflect the amount of controlled processing in which the individuals are engaged (Paas & van Merriënboer, 1994b).

A role is defined as a pattern of behaviors (Tubre & Collins, 2000). An employee often encounters a dilemma in performing particular behaviors because of role ambiguity and role conflict. His or her mental effort is substantially required for dealing with role ambiguity when the set of behaviors expected for a role is unclear and ambiguous (Tubre & Collins, 2000). Similarly, the mental effort for dealing with role conflict is great when there is incompatibility between the expected set of behaviors perceived by the focal person and that perceived by role senders (D. Katz & Kahn, 1978). The general conclusion of meta-analytic reviews suggests that job performance is negatively influenced by role ambiguity (Abramis, 1994) and by role conflict (Jackson & Schuler, 1985).

Individuals' cognitive role orientation has been found to affect job performance in previous literature (e.g., S. Parker, 2007), which implies that the mental effort in dealing with job roles is critical for job learning effectiveness. This study examines two constructs representing two different kinds of mental effort: the mental effort in dealing with role ambiguity and the mental effort in dealing with role conflict. To briefly present the study's constructs, the study uses *role ambiguity* and *role conflict* for short. Nevertheless, its main focus about role ambiguity and role conflict is based on individuals' mental effort in dealing with such job roles. Figure 1 collectively presents the pivotal assumptions of job learning, suggesting the relationship between mental load, cognitive load, and learning effectiveness.

Although a majority of previous research has focused on understanding how individuals' mental load and mental effort consequently constrain their job learning, solutions beyond individuals and their tasks to ease such constraints are rarely

discussed. Given that previous research indicates that it may not be possible to reduce the load caused by a task's inherent difficulty (Pillay, 1997), a potential solution beyond individuals and their task to improve job learning effectiveness turns out to be necessary. According to the cognitive load theory, interactions between people and their social environment may affect cognitive load (e.g., Paas & van Merriënboer, 1994a) through social factors to ease their excessively required mental effort. For this reason, an important aspect that can properly provide critical social factors to ease excessively required mental effort is social capital, defined as those features of social organizations that facilitate social interactions among organizational members (Putnam, 1995).

The concept of social capital has captured the attention of sociologists (e.g., Coleman, 1988; Putnam, 1995) and organizational theorists (e.g., Nahapiet & Ghoshal, 1998) as a way of understanding why people in social communities, organizations, and industry clusters support each other so as to relieve their abnormal cognitive load and mental effort, even when there are no legal obligations or expectations of personal gains from doing these acts. Although organizational researchers have studied social capital and cognitive load separately, no prior research has critically examined the role of social capital in improving individuals' mental load and effort and consequently enhancing job learning effectiveness. Without a thorough examination of social capital and its positive influence on cognitive load, our understanding about cognitive load will remain limited, and organizational initiatives for improving job learning effectiveness will remain unjustifiable. Given the deficiency of the aforementioned literature in addressing job learning effectiveness from a social cognitive aspect, two research questions of this study are thus derived:

*Research Question 1:* What critical factors based on cognitive load theory influence job learning effectiveness?

*Research Question 2:* What role does social capital play in improving cognitive load and job learning effectiveness?

Exploring these research questions is important, because a thorough understanding of social

capital in improving cognitive load can help firm management reinforce critical social determinants to boost individuals' job learning effectiveness.

### Research Model and Hypotheses

This study proposes a research model, shown in Figure 2, based on the preceding rationale and pivotal assumptions for explaining the formation of job learning effectiveness. In the proposed model, job learning effectiveness is negatively affected by role ambiguity and role conflict (in terms of mental effort), and both role ambiguity and role conflict are positively influenced by time pressure and task complexity (in terms of mental load). Role ambiguity is negatively affected by shared vision (i.e., a dimension of social capital), whereas role conflict is negatively influenced by trust and network ties (i.e., two other dimensions of social capital).

The mental effort spent on job roles is influential in individuals' job learning effectiveness, because job roles are the key perspectives of employees' job-related functions (Knight, Kim, & Crutsinger, 2007). Previous research suggests that the heavy mental effort in dealing with role ambiguity and role conflict results in detrimental outcomes (Babin & Boles, 1998), such as decreased job learning effectiveness (e.g., Adobor, 2006).

Role ambiguity involves a situation in which employees do not have a clear direction about what is expected for their role in the job or organization (Yousef, 2000), which increases the demand for mental effort in the job learning process. Excessive mental effort attributable to a lack of role clarity is likely to erode job-related effectiveness or performance (e.g., Singh, Goolsby, & Rhoads, 1994). Role ambiguity may serve as a significant source of learning distress for workers (Moxley, 2002). Role ambiguity introduces uncertainty into the work setting and makes highly skilled and motivated employees appear inefficient and ineffective in the job contexts (Moxley, 2002), consequently weakening their job learning effectiveness.

Similar to the case of role ambiguity, employees' mental effort required for role conflict may hurt their job learning effectiveness. Role conflict is the simultaneous occurrence of two or more sets of job learning pressures in the workplace in which employees' compliance with

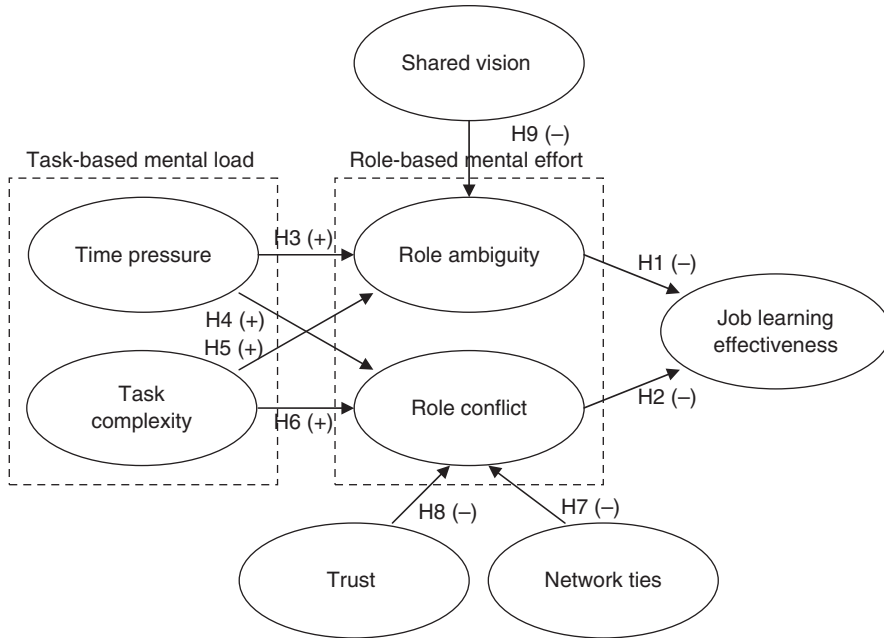


Figure 2. Research model.

one makes compliance more difficult with the other (Bacharach, Bamberger, & Conley, 1991), consequently restraining performance (Rabinowitz & Stumpf, 1987; Yousef, 2000). Given that individuals with a high degree of role conflict are likely to receive contradictory messages from different role senders or receive conflicting information from different subsystems in the organization (Adobor, 2006), their role conflict perpetuates unnecessary extra mental effort in the learning process and consequently leads to ineffective job learning. For example, employees' mental effort to meet the contradictory demands of two or more criteria (e.g., customer oriented vs. cost oriented) can be seen as adding to the mental effort in dealing with role conflict (Bacharach et al., 1991; Knight et al., 2007).

Previous research has indicated the potentially negative combined effects of role conflict and role ambiguity on job-related performance (Zahra, 1985), partially supporting the negative relationship between role conflict and job learning effectiveness. Employees encountering role conflict are likely to experience psychologically overloaded efforts, reducing job-related performance (Bettencourt & Brown, 2003). Thus, two

hypotheses related to role ambiguity and role conflict in terms of mental effort are derived as follows:

*Hypothesis 1:* Role ambiguity is negatively related to job learning effectiveness.

*Hypothesis 2:* Role conflict is negatively related to job learning effectiveness.

Given the nature of today's organizational environments, an important work demand that is extremely substantial is time pressure (Kickul & Posig, 2001). Specifically, time pressure is work environment stress and a characteristic of work that may adversely affect individuals (or cause human strains; Kickul & Posig, 2001), directly boosting their role ambiguity and role conflict. Indeed, previous literature indicates that what may be said about the relationship between individuals' job roles and resources may also be said about the relationship between their roles and time pressure (Roxburgh, 2002). Cordes, Dougherty, and Blum (1997) found a significantly positive relationship between many employees' quantitative overload items (such as those measuring time pressure) and emotional exhaustion in their job roles.

Previous research indicates that an increase in work hours and greater time pressure to complete a job place additional job constraints and role demands on employees' psychology (Kickul & Posig, 2001). For example, the major sources of role stress (e.g., role ambiguity and role conflict) that contribute to job outcomes (e.g., job satisfaction, lack of external or internal locus of control) include time pressure, low salaries, lack of self-esteem, and so on in which time pressure is perceived as the most stressful aspect of work (Sari, 2005). Additionally, ample research has demonstrated that time pressure is a major source of job-related stress.

Given that time pressure reflects "too much to do with too little time" (D. Parker & DeCotiis, 1983), individuals who perceive time pressure as a mental load can sense the cognitive dissonance of their role by being forced to take on two different and incompatible roles at the same time and by having trouble determining which role he or she should play. For instance, employees in a matrix organizational structure may find a role conflict attributable to the contradictory requirements from project and functional managers, who are seen as exerting equal influence on the promotions and rewards of the employees (R. Katz & Allen, 1985). Previous research indicates that employees' powerlessness regarding the deployment of limited resources (e.g., time) to implement their tasks adds them to inherent role conflict (McConville & Holden, 1999). Based on this rationale, the hypotheses regarding time pressure are stated as follows:

*Hypothesis 3:* Time pressure is positively related to role ambiguity.

*Hypothesis 4:* Time pressure is positively related to role conflict.

In addition to time pressure, task complexity is another factor positively related to role ambiguity and role conflict. A complex task is one that is considered to be ill structured, ambiguous, and information overloaded (Adobor, 2006), causing heavy mental load. Given that a task is complex when it contributes to increasing a heavy information load on employees, task complexity entails high cognitive demands on employees (Adobor, 2006). Previous studies suggest that

task complexity increases when there are more information cues to process, more acts (e.g., from different supervisors) to execute, or increased interdependence between the cues and acts (Speier & Morris, 2003), positively affecting the employees' mental effort in job roles. For example, employees in "middle-line management" are often assigned an imprecise set of job roles that are complex and contradictory, inevitably enhancing the individuals' role conflict and role ambiguity (McConville & Holden, 1999).

Kahn, Wolfe, Quinn, Snoek, and Rosenthal (1964) asserted that role ambiguity results from organizational task complexity exceeding the individual's span of comprehension. Frequent changes in technology that require associated complex changes in social structure, common complex exchanges in personnel that disturb interdependencies, multifaceted changes in an organization's environment that impose new demands on its members, and complicated managerial philosophies that foster restriction on information flow throughout the organization are all probable factors to cause role ambiguity and conflict (Rizzo, House, & Lirtzman, 1970). In reality, these various complex changes can easily confuse individuals about their future direction and responsibility toward their job roles, suggesting a positive influence of task complex (in terms of mental load) on both role ambiguity and role conflict.

Van Merriënboer and Sweller (2005) summarized how Pollock, Chandler, and Sweller (2002) tested techniques for reducing cognitive load based on cognitive load theory. Pollock et al. presented learners with a sequence of instructions with two stages. In the first stage, cognitive load was constrained by not providing learners with all information (i.e., by including information that was not too complex in the first place). Instead, isolated elements that may be processed step by step were provided. In the second stage, all information was provided at this stage, including the interactions among the elements. The elements can be simultaneously processed in working memory in the second stage.

Even though understanding (e.g., about job roles) was lower in the first stage, this deficiency in the first stage was effectively compensated in the second stage, when the full set of interacting elements was provided. In contrast, presenting

the full set of interacting elements in both stages led only to a more ambiguous understanding (i.e., worse than the preceding method). Collectively, the learning techniques that were tested indicate that task complexity is a key issue during a job learning process based on cognitive load theory. Consequently, the hypotheses regarding task complexity are derived as follows:

*Hypothesis 5:* Task complexity is positively related to role ambiguity.

*Hypothesis 6:* Task complexity is positively related to role conflict.

Social capital comprises important resources embedded in a social structure and can be defined as “the features of social organizations such as networks, norms, and social trust that facilitate social interaction for mutual benefit” (e.g., Putnam, 1995, p. 67). Social capital is important because people count on social networks for support during times of crisis, for sharing their joys and stresses, for relieving their cognitive load, and for assistance in successfully playing their job roles.

Based on relationships between organizational members in a social network, social capital is the invisible glue that holds social networks together and motivates people to work toward a common goal and direction (Coleman, 1988), relieving their mental effort in dealing with role ambiguity or conflict. In previous literature, researchers proposed slightly different conceptualizations of the social capital construct. For instance, Nahapiet and Ghoshal (1998) defined social capital as “the sum of actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit” (p. 243), and they conceptualized this construct in terms of three types of resources or “capital”: structural capital, cognitive capital, and relational capital. Structural capital is similar to Putnam’s description of social networks. Relational capital includes Putnam’s descriptions of trust and norms of reciprocity. Cognitive capital refers to shared resources, such as language, interpretations, goals, direction, and mindset, that facilitate effective communication between individuals in the network.

This definition collectively underscores three dimensions of social capital in this study:

(a) network ties, referring to structural links or connections between individuals in a social network (i.e., structural social capital); (b) trust, referring to the strength of social relationships developed among individuals in the network that are developed through a history of prior interactions among these members which influence their subsequent behaviors in the network (i.e., relational social capital); and (c) shared vision, referring to a set of beliefs and assumptions about organizational work and processes used to perform work that are broadly agreed on by the organizational community (i.e., cognitive social capital). The influence of social capital on the mental effort in dealing with role ambiguity and conflict is discussed next.

First, the structural dimension of social capital is represented by the construct of network ties (Tsai & Ghoshal, 1998). The closeness of individuals to others in the organization, via their network ties, provides the opportunity for interaction that lowers the threat of job role conflict (Fussell, Harrison-Rexrode, Kennan, & Hazleton, 2006). Social network ties that facilitate interpersonal communication help create semantic links between role sets and decrease role conflict (Shumate & Fulk, 2004), suggesting a negative relationship between network ties and role conflict.

Second, the relational dimension of social capital is represented by the trust construct (Tsai & Ghoshal, 1998). Trust represents a willingness of organizational members to be vulnerable to the actions of others because of beliefs in their benevolence, competence, and integrity (Kankanhalli, Tan, & Wei, 2005), increasing the compatibility in social expectations that impinge on perceived role performance. Previous literature suggests that because compliance with role expectations by different participants in an organization is problematic, trust is necessary (Haas & Deseran, 1981) because of its antithesis of uncertainty (Luhmann, 1979). If trust is possessed by organizational members, then their uncertainty about job roles will be lowered, resulting in decreased mental effort in dealing with role conflict. It has been empirically confirmed that employees with high trust in both coworkers and management have higher job satisfaction and lower role conflict (Tidd, McIntyre, & Friedman, 2004), implying a negative



relationship between employees' trust and their mental effort for dealing with role conflict.

Third, similar to Tsai and Ghoshal's (1998) construct, the cognitive dimension of social capital is represented in this article as a shared vision. Shared vision is seen as a set of beliefs and assumptions about organizational orientation used as a guideline to play one's job role, which is broadly agreed on by the organizational community. Business organizations often consist of members with different educational backgrounds, prior job experiences, and job expectations, and they often differ in the ways they interpret the same organizational assignments, causing high mental effort in dealing with role ambiguity. When organizations are successful in creating a shared vision that reduces role ambiguity for employees, they increase information sharing necessary for effective learning, compatibility, and creative development (Pearce & Ensley, 2004). Given that shared vision, by definition, entails the absence of ambiguity (Pearce & Ensley, 2004), shared vision provides a frame of shared values for diverse organizational members to do their job in a uniform manner, lessening their mental effort in dealing with role ambiguity (e.g., Tismaneanu, 2007).

It is important to note that shared vision is more important to role ambiguity than the other two dimensions of social capital, because such vision is the most critical aspect in clarifying the ambiguous direction (or goals) for organizational members. On the other hand, role conflict is more likely eased if stable network ties and interpersonal trust can be strengthened. In summary, the last three hypotheses are derived and summarized as follows:

*Hypothesis 7:* Network ties are negatively related to role conflict.

*Hypothesis 8:* Trust is negatively related to role conflict.

*Hypothesis 9:* Shared vision is negatively related to role ambiguity.

**METHOD**

**Participants and Procedures**

The participants surveyed in this study are professionals from a total of 30 large information technology firms in a well-known industrial zone in northern Taiwan. The study's survey excludes

**TABLE 1:** Sample Characteristics (N = 329)

Characteristic	n	%
Gender		
Male	170	51.67
Female	159	48.33
Age		
Younger than 20	2	0.61
20–29	137	41.64
30–39	124	37.69
40–49	52	15.81
50 or older	14	4.26
Education		
High school or less	46	13.98
University	235	71.43
Graduate school	48	14.59
Position level		
Management	85	25.84
Nonmanagement	244	74.16
Department		
Research and development	32	9.73
Human resource/Training	26	7.90
Finance/Accounting	36	10.94
Production	73	22.19
Sales/Service	104	31.61
Other	58	17.63
Job career in years		
1–5	121	36.78
6–10	110	33.43
11–15	46	13.98
16–20	29	8.81
21–25	13	3.95
26 or more	10	3.05
Tenure in years (in the current organization)		
1–5	212	64.44
6–10	72	21.88
11–15	13	3.95
16–20	17	5.17
21–25	9	2.74
26 or more	6	1.82

employees working less than a year in their current organization, because they were unable to evaluate their learning effectiveness in comparison with their experience 1 year ago. Of the 600 questionnaires distributed to the participants, 329 usable questionnaires were collected for a response rate of 54.83%. Table 1 presents the characteristics of the sample.

This study measures the constructs with a 5-point Likert-type scale items modified from existing literature. The items from existing literature were

translated, repeatedly reworded, and modified into Chinese by a focus group of five people, including three graduate students and two professors familiar with organizational behavior and learning. The measurements were tried via two pilot tests before the actual survey, and the pilot test respondents were excluded from the subsequent survey. The pilot test data were subjected to exploratory factor analysis and reliability analysis to identify items that loaded poorly on their hypothesized scales, which were then further refined. This prudent process of instrument refinement led to considerable improvement in content validity and scale reliability.

The study's scale items were either directly drawn or slightly modified from previous literature to fit the research topic. For example, whereas an item for measuring task complexity in previous literature was "How much mental and perceptual activity was required (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)?" this study just slightly modified the item to "My job takes lots of mental activity (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.)." As another example, whereas an item for measuring job learning effectiveness was "Compared to a year ago, I now know much more about proven methods and procedures," this study slightly modified it to "Compared to a year ago, I now know much more about efficient methods to do my work." Whereas an item for measuring time pressure was "On this project, team members believed they were under a lot of time pressure," this study slightly modified it to "I perceive to be under a lot of time pressure in my job." Collectively, this study has conducted a thorough procedure for developing and designing scale items appropriately (e.g., items from previous literature, my focus group, exploratory factor analysis) in this study.

Regarding perceived cognitive load, according to Paas, Tuovinen, Tabbers, and van Gerven (2003), a useful method for determining the level of perceived cognitive load is measuring the participant's mental effort with scale items (May, 2005; Paas, Tuovinen, et al., 2003). Even though self-ratings may appear questionable, it has been demonstrated that employees are quite capable of giving a numerical indication of their perceived mental load or burden (Paas, Renkl, et al., 2003; Gopher & Braune, 1984). Such a finding

was first demonstrated in the context of cognitive load theory by Paas (1992). Subjective techniques involve a questionnaire comprising semantic differential scales on which the participants indicate the experienced level of cognitive load (Paas, Renkl, et al., 2003). Previous research has shown that reliable measures can be effectively obtained with unidimensional survey scales (e.g., Paas, Renkl, et al., 2003; Paas & van Merriënboer, 1994b). Furthermore, it has been presented that such scales are sensitive to relatively small differences in cognitive load and are reliable, valid, and unintrusive (e.g., Paas, Renkl, et al., 2003; Paas & van Merriënboer, 1994a, 1994b).

The appendix lists the measurement items. Job learning effectiveness was measured with four items directly drawn from Gray and Meister (2004). This study uses a 5-point Likert-type scale in which the participants rated their mental effort spent dealing with their role ambiguity and role conflict. From the perspective of mental effort, three items for role ambiguity and another three items for role conflict were directly drawn from Babin and Boles (1998). From the perspective of mental load, task complexity was measured with three items modified from Speier and Morris (2003), whereas time pressure was measured with another three items modified from Sethi (2000). Network ties were measured with three items drawn from Chiu, Hsu, and Wang (2006). Trust was measured with three items modified from Yilmaz and Hunt (2001). Shared vision was measured with three items, including the first two items modified from Croteau and Raymond (2004) and the third item modified from Tsai and Ghoshal (1998).

## DATA ANALYSIS AND TEST RESULTS

The survey data were analyzed with the use of a two-step structural equation modeling approach (Anderson & Gerbing, 1988). The test results from each stage of analysis are presented in the following. The overall goodness-of-fit indices in the confirmatory factor analysis (CFA; see Table 2) indicate that most fits of the measurement model are satisfactory. More specifically, the normalized chi-square (chi-square/degrees of freedom) of the CFA model was smaller than the recommended value of 2.0. Even though the goodness-of-fit index was slightly lower than the recommended value of 0.9, comparative fit index,

**TABLE 2:** Standardized Loadings and Reliabilities

Construct and Item	Standardized Loading	AVE	Cronbach's $\alpha$
Job learning effectiveness			
JL1	0.77 ( $t = 15.61$ )	.64	.88
JL2	0.78 ( $t = 15.97$ )		
JL3	0.84 ( $t = 17.76$ )		
JL4	0.81 ( $t = 16.90$ )		
Role ambiguity			
RA1	0.85 ( $t = 18.26$ )	.72	.91
RA2	0.93 ( $t = 20.94$ )		
RA3	0.76 ( $t = 15.63$ )		
Role conflict			
RC1	0.83 ( $t = 17.76$ )	.72	.88
RC2	0.89 ( $t = 19.53$ )		
RC3	0.82 ( $t = 17.39$ )		
Time pressure			
TP1	0.70 ( $t = 13.98$ )	.69	.87
TP2	0.89 ( $t = 19.43$ )		
TP3	0.90 ( $t = 19.57$ )		
Task complexity			
CO1	0.66 ( $t = 12.74$ )	.67	.85
CO2	0.88 ( $t = 18.86$ )		
CO3	0.90 ( $t = 19.40$ )		
Network ties			
NT1	0.79 ( $t = 16.33$ )	.68	.86
NT2	0.90 ( $t = 19.84$ )		
NT3	0.78 ( $t = 15.98$ )		
Trust			
TR1	0.91 ( $t = 21.10$ )	.84	.93
TR2	0.93 ( $t = 22.12$ )		
TR3	0.91 ( $t = 21.02$ )		
Shared vision			
SV1	0.84 ( $t = 18.17$ )	.77	.91
SV2	0.94 ( $t = 21.89$ )		
SV3	0.86 ( $t = 19.03$ )		

Note. See the appendix for measurement items. AVE = average variance extracted. Goodness-of-fit indices ( $N = 329$ ):  $\chi^2(247) = 482.18$  ( $p < .001$ ); non-normed fit index = 0.95; normed fit index = 0.92; comparative fit index = 0.96; goodness-of-fit index = 0.89; root mean residual = 0.03; root mean square error of approximation = 0.05.

nonnormed fit index, and normed fit index all exceeded 0.90. Furthermore, the root mean residual was smaller than 0.05, and the root mean square error of approximation was smaller than 0.08. These figures strongly support that the hypothesized CFA model in this study fits well with the empirical data.

Convergent validity was obtained by meeting the three conditions below. First, all factor loadings were statistically significant at  $p < .001$ , as shown in Table 2. Second, the average variance extracted (AVE) for all constructs exceeded 0.50, suggesting that the overall hypothesized

items capture sufficient variance in the underlying construct as opposed to those attributable to the measurement error. Third, the reliabilities for each construct exceeded 0.70, as presented in Table 2, satisfying the general requirement of reliability for research instruments. Discriminant validity was assessed herein by chi-square difference tests based on the Bonferroni method. Since chi-square difference statistics for all pairs of constructs in this study exceeded the critical value of 17.09 (see Table 3), the discriminant validity the study's data sample is thus confirmed.

**TABLE 3:** Chi-Square Difference Tests for Examining Discriminate Validity

Construct Pair	$\chi^2(247) = 482.18$ (unconstrained model)	
	$\chi^2(248)$ (Constrained Model)	$\chi^2$ Difference
(F1, F2)	1024.16***	541.98
(F1, F3)	940.28***	458.10
(F1, F4)	1130.70***	648.52
(F1, F5)	945.11***	462.93
(F1, F6)	877.91***	395.73
(F1, F7)	1056.23***	574.05
(F1, F8)	1100.60***	618.42
(F2, F3)	772.20***	290.02
(F2, F4)	929.88***	447.70
(F2, F5)	960.43***	478.25
(F2, F6)	911.96***	429.78
(F2, F7)	1381.28***	899.10
(F2, F8)	946.65***	464.47
(F3, F4)	907.51***	425.33
(F3, F5)	877.40***	395.22
(F3, F6)	931.83***	449.65
(F3, F7)	1382.44***	900.26
(F3, F8)	1165.88***	683.70
(F4, F5)	800.93***	318.75
(F4, F6)	941.28***	459.10
(F4, F7)	992.14***	509.96
(F4, F8)	989.30***	507.12
(F5, F6)	923.43***	441.25
(F5, F7)	944.37***	462.19
(F5, F8)	943.43***	461.25
(F6, F7)	704.61***	222.43
(F6, F8)	858.71***	376.53
(F7, F8)	1021.25***	539.07

Note. F1 = job learning effectiveness; F2 = role ambiguity; F3 = role conflict; F4 = time pressure; F5 = task complexity; F6 = network ties; F7 = trust; F8 = shared vision.

\*\*\*Significant at the .001 overall significance level with the Bonferroni method.

The CFA model was transformed to a structural model that reflects the model paths proposed in the study's research model for the purpose of testing the hypotheses. It is important to note that gender, age, education, management position, a firm's welfare, job career, and tenure are used as control variables by my including dummy variables in the model. Previous studies indicate that demographic variables, such as age, gender, environment, prior education, and job tenure, are influential in determining the effectiveness of a

learning course (Donavant, 2009; Omoregie, 1997). Specifically, the willingness to engage in professional development learning is often influenced by job tenure or prior educational level of the employees (Chan & Auster, 2003). Similarly, previous literature suggests that senior employees with work experience are likely to become adept at understanding what is expected of them and are more able to effectively deal with role conflict (Kohli, Shervani, & Challagalla, 1998). Collectively, the inclusion of the control variables helps to precisely assess the relationship between research constructs proposed in this study.

Table 4 presents the test results of this analysis. Seven out of the nine hypothesized associations were validated at the  $p < .05$  significance level or better. Job learning effectiveness is negatively influenced by role ambiguity and role conflict with standardized path coefficients of  $-0.25$  ( $p < .05$ ) and  $-0.22$  ( $p < .05$ ), respectively, supporting Hypothesis 1 and Hypothesis 2. Time pressure has a positive influence on role ambiguity with a standardized path coefficient of  $0.40$  ( $p < .01$ ) and on role conflict with a standardized path coefficient of  $0.33$  ( $p < .01$ ), supporting Hypothesis 3 and Hypothesis 4. Although the relationship between task complexity and role ambiguity is not significant (thus, Hypothesis 5 is not supported), task complexity has a positive influence on role conflict with a standardized path coefficient of  $0.26$  ( $p < .05$ ), supporting Hypothesis 6. Although the relationship between network ties and role conflict is not significant (thus, Hypothesis 7 is not supported), trust has a negative influence on role conflict with a standardized path coefficient of  $-0.25$  ( $p < .05$ ), supporting Hypothesis 8. Last, shared vision has a negative effect on role ambiguity with a standardized path coefficient of  $-0.42$  ( $p < .01$ ), thus supporting Hypothesis 9.

Unsupported Hypothesis 5 suggests that task complexity does not necessarily cause heavy mental effort in dealing with role ambiguity, suggesting existing employees' tolerance for role ambiguity in doing their complex tasks. Such phenomenon may be possible, because previous literature argues that some individuals are better at managing ambiguity than others (Adobor, 2006). At the same time, unsupported Hypothesis 7 suggests that trust rather than network ties in social capital can effectively improve individuals'

TABLE 4: Path Coefficients and t Value

Hypothesis	Standardized Coefficient
1. Role ambiguity → Job learning effectiveness	-.25**
2. Role conflict → Job learning effectiveness	-.31**
3. Time pressure → Role ambiguity	.40**
4. Time pressure → Role conflict	.27**
5. Task complexity → Role ambiguity	.12
6. Task complexity → Role conflict	.31**
7. Network ties → Role conflict	-.12
8. Trust → Role conflict	-.22**
9. Shared vision → Role ambiguity	-.42**

Note. Gender, age, education, management position, a firm's welfare, job career, and tenure are included as control variables in the model.

\*\* $p < .01$ .

mental effort in dealing with role conflict. This phenomenon occurs perhaps because network ties are more superficial than trust in concurrently meeting the demands of two or more groups (e.g., managers and colleagues), leading to an insignificant relationship between network ties and role conflict (given trust herein). Nevertheless, the unexpected results for the unsupported hypotheses may warrant further study so that the precise cause behind the unsupported hypothesis will not be misinterpreted.

To further confirm the appropriateness of my research model in terms of its parsimony and significance, this study conducted a post hoc analysis by adding direct paths from all the independent variables to the outcome (i.e., job learning effectiveness). The empirical results in Figure 3 reveal that all the direct paths added are insignificant (the significance for the other paths remains unchanged), supporting the parsimony and significance of the research model.

## DISCUSSION

This study provides an illustrative example of how social capital can be applied as a useful cure to ease the negative impact of perceived cognitive load on job learning effectiveness. This study finds that role ambiguity is amplified by time pressure and role conflict is magnified by both time pressure and task complexity, suggesting that these two factors indirectly impair job learning effectiveness. Management could monitor time pressure and task complexity to prevent role ambiguity and role conflict from being excessively enhanced.

Although this study proposes nine individual hypotheses to effectively explain the research model, the empirical tests herein are conducted by structural equation modeling that allows for simultaneous analysis of all the research constructs in the model rather than separate analyses (e.g., regressions). According to the empirical findings for the nine hypotheses, this study can be further summarized from an overall viewpoint that job learning effectiveness is positively influenced by shared vision and negatively influenced by time pressure via the mediation of role ambiguity. At the same time, job learning effectiveness is positively influenced by trust and negatively affected by time pressure and task complexity via the mediation of role conflict.

Although time pressure and task complexity are common in business organizations and are likely to drive role ambiguity and conflict, management can still alleviate role ambiguity and role conflict through initiatives to strengthen social capital (e.g., Pridmore, Thomas, Havemann, Sapag, & Wood, 2007). Specifically, given that time pressure and task complexity are often inevitable in modern industries, social capital can be one of the important solutions to ease their negative impact on role ambiguity and role conflict, improving employees' job learning effectiveness. The merits of social capital in this study are discussed from the two perspectives that follow.

First, the negative relationship between shared vision and role ambiguity indicates that shared vision significantly helps in disseminating organizationally common goals and directions among

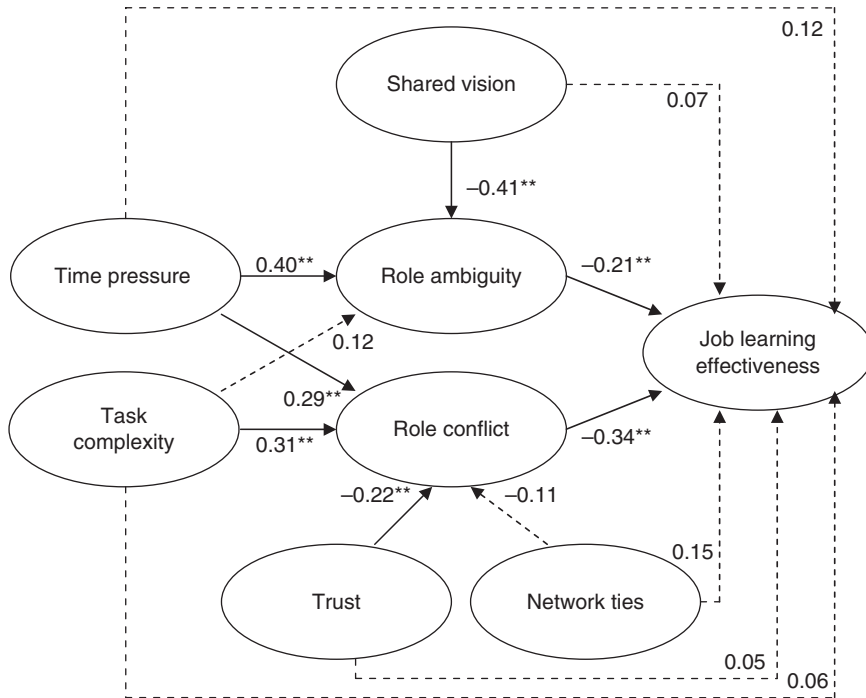


Figure 3. A post hoc analysis for the research model.

employees to alleviate the individuals' mental effort in dealing with their job role ambiguity. More specifically, shared vision can be seen as a special type of information sharing to strengthen employees' knowledge of their task responsibilities based on organizational goals and directions (e.g., Adobor, 2006), ultimately boosting their job learning effectiveness via decreased role ambiguity. In other words, increasing formal organizational communication (e.g., information and knowledge sharing) with employees in terms of future directions and goals reduces their mental effort for dealing with role ambiguity by decreasing uncertainty (e.g., Burney & Widener, 2007). It is important for management to recognize that time pressure is a driver and shared vision is a suppressor for role ambiguity. Management should periodically reengineer or restate the organization's vision sharing when excessive time pressure is detected.

Second, the negative relationship between trust and role conflict reveals that trust significantly reduces inadequate articulation of the role expectations imposed by others, because trust

with others (e.g., coworkers or opponents) allows one to ask for favors and make better predictions about job behaviors and roles (Friedman & Podolny, 1992). This ultimately enhances job learning effectiveness because there is less role conflict.

Management should take actions to decrease role conflict by strengthening trust among employees. For example, training or workshops can be provided to employees to guide them to take on different perspectives of various job functions in the organization and help them to clearly understand the structural causes of role ambiguity and role conflict. Management should learn that time pressure and task complexity are two drivers of role conflict, and trust is the only suppressor to lower such role conflict. This phenomenon may imply that trust building in the organization should be conducted on a regular basis to avoid serious role conflict. Given that trust building or degradation is a continuous process, management should measure, monitor, and manage trust within the organization more assertively. Collectively, employees with a strong shared vision and trust are likely to be well aware of each other's feelings

and organizational directions, thus causing less mental effort in playing their job roles.

In summary, the findings of this study lend potential solutions to the literature that attempts to improve perceived cognitive load in job learning contexts. Because no single management practice alone is superior to another in fostering social capital (e.g., shared vision and trust), management should try all possible methods to create harmonious working environments to inspire trust and shared vision in the long run.

### Limitations

The results of this study should be interpreted in light of several limitations. The first limitation relates to the cross-sectional survey used in this study, which limits the ability to achieve strong causal inferences from the data. Even though the study has surveyed the sample participants working in their organization for more than a year to properly measure their job learning effectiveness, future longitudinal studies to track learning effectiveness for certain periods can be important complements to this study.

The second limitation of this study is the possibility of a common method bias, given that the constructs of this study were measured perceptually with the use of Likert-type scales. Nevertheless, this study applies four important measures to reduce the potential threat of a common method bias. First, survey subjects are assured of complete anonymity in the cover letter confirming that neither their personal names nor the names of their organizations will be disclosed. Second, Harman's single factor test is performed in study (Podsakoff & Organ, 1986), revealing that the variances are not unevenly distributed among the proposed factors and thus a common method bias is unlikely a threat in my data sample. Third, the study used a marker variable to adjust partial correlation to control for this bias (Malhotra, Kim, & Patil, 2006). Finally, the study employed a confirmatory factor analytic approach to test for a common method bias (e.g., Sanchez, Korbin, & Viscarra, 1995), empirically confirming no serious common method bias.

The third limitation relates to the level of analysis. The survey and instruments of this study address the issue of job learning effectiveness from a general individual level rather than from a specific task level, team level, or organizational

level. Future studies that examine a similar issue beyond the scope of the individual level can be important complements to this study.

The fourth limitation relates to measurement validity. For example, the wording of the scale items for mental effort indicates that the mental effort required for the job is excessive, with no room for the respondents to indicate otherwise. Even though I have conducted a thorough and careful procedure to develop the study's survey instrument, it is possible that the measure for some factors (e.g., cognitive load, mental effort) may be slightly biased. A general problem of cognitive load (or mental effort) measures has been described by Reed, Burton, and Kelly (1985), who found a potential reversal effect in cognitive engagement with increasing difficulty of the learning materials. For example, low cognitive load scores can be obtained for very easy materials, and they do increase with increasingly difficult tasks (Brunken, Plass, & Leutner, 2003; Reed et al., 1985). Nevertheless, when the primary tasks became excessively difficult, the load scores obtained turned low again, implying a cognitive disengagement of the learner (Brunken et al., 2003). For that reason, criterion-related validity or experiments (e.g., Kalyuga, Chandler, & Sweller, 2004) may be applied in future research for surveying cognitive load.

Given my theoretical focus on social capital as one potential solution to the negative impact of cognitive load on job learning effectiveness, the study has limited consideration of predictors to those suggested by other theories beyond the social cognitive theory. Future researchers are also advised to consider other additional predictors beyond social capital and compare their explanatory ability to those examined in this study.

## APPENDIX

### MEASUREMENT ITEMS

#### Job learning effectiveness

- JL1. I now have a much better understanding of the right procedure to do my work than I did a year ago.
- JL2. Compared to a year ago, I now know much more about efficient methods to do my work.

(continued)

## APPENDIX (continued)

JL3. I have been revising and adapting my knowledge to keep up with changes in my organization this past year.

JL4. Over the past year, new innovations (or developments) at work have caused me to revisit and update my work-related knowledge.

### Role Ambiguity

In my firm, my mental efforts are excessively required, because . . .

RA1. There are unclear, planned goals and objectives for my job.

RA2. I am sometimes confused about my responsibilities.

RA3. The explanations are sometimes unclear as to what I have to do.

### Role Conflict

In my firm, my mental efforts are excessively required, because . . .

RC1. I sometimes have to bend a rule or policy in order to carry out my job.

RC2. I receive incompatible requests from two or more people.

RC3. I do things that are apt to be accepted by one person and not accepted by others.

### Task Complexity

CO1. My job takes lots of mental activity (e.g., thinking, deciding, calculating, remembering, looking, searching, etc.).

CO2. My job is a very complex one.

CO3. My job is a very exacting one.

### Time Pressure

TP1. I have no sufficient time to think carefully about my job.

TP2. I perceive to be under a lot of time pressure in my job.

TP3. I often feel pressured due to time limits of my job.

### Network Ties

NT1. I have close social relationships with my coworkers.

NT2. I spend a lot of time interacting with my coworkers.

NT3. I have frequent contact with my coworkers.

### Trust

TR1. I consider my coworkers as people who can be counted on to do what is right.

TR2. I consider my coworkers as people who can be counted on to get the job done right.

TR3. I consider my coworkers as people who are always faithful.

### Shared Vision

SV1. The strategy of my firm is explicit.

SV2. There is a strong feeling that common values exist in my firm.

SV3. People share the same vision in my firm.

## ACKNOWLEDGMENTS

The author would like to thank the National Science Council of the Republic of China, Taiwan, for its financial support.

## KEY POINTS

- This research finds that role ambiguity is amplified by time pressure, whereas role conflict is magnified by both time pressure and task complexity.
- Although time pressure and task complexity often inevitably drive up role ambiguity and conflict, management can still alleviate role ambiguity and role conflict with initiatives to strengthen social capital.
- Overall, this study shows how social capital in workplaces can lead to improved cognitive load process and consequently improve job learning effectiveness.

## REFERENCES

- Abramis, D. J. (1994). Work role ambiguity, job satisfaction, and job performance: Meta-analyses and review. *Psychological Reports, 75*, 1411–1433.
- Adobor, H. (2006). Exploring the role performance of corporate ethics officers. *Journal of Business Ethics, 69*, 57–75.
- Anderson, J. C., & Gerbing, D. W. (1998). Structural equation modeling in practice: A review and recommended two-step approach. *Psychological Bulletin, 103*, 411–423.
- Babin, B. J., & Boles, J. S. (1998). Employee behavior in a service environment: A model and test of potential differences between men and women. *Journal of Marketing, 62*, 77–91.
- Bacharach, S., Bamberger, P., & Conley, S. (1991). Work-home conflict among home nurses and engineers: Mediating the impact of role stress on burnout and satisfaction of work. *Journal of Organizational Behavior, 12*, 39–53.
- Berings, M. G. M. C., Poell, R. F., & Simons, P. R. (2005). Conceptualizing on-the-job learning styles. *Human Resource Development Review, 4*, 373–400.



- Bettencourt, L. A., & Brown, S. W. (2003). Role stressors and customer-oriented boundary-spanning behaviors in service organizations. *Journal of the Academy of Marketing Science, 31*, 394–408.
- Brunken, R., Plass, J. L., & Leutner, D. (2003). Direct measurement of cognitive load in multimedia learning. *Educational Psychologist, 38*, 53–61.
- Burney, L., & Widener, S. K. (2007). Strategic performance measurement systems, job-relevant information, and managerial behavioral responses: Role stress and performance. *Behavioral Research in Accounting, 19*, 43–69.
- Chan, D. C., & Auster, E. (2003). Factors contributing to the professional development of reference librarians. *Library & Information Science Research, 25*, 265–286.
- Chiu, C. M., Hsu, M. H., & Wang, E. T. G. (2006). Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems, 42*, 1872–1888.
- Coleman, J. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*, 95–120.
- Cordes, C. L., Dougherty, T. M., & Blum, M. (1997). Patterns of burnout among managers and professionals: A comparison of models. *Journal of Organizational Behavior, 18*, 685–701.
- Croteau, A. M., & Raymond, L. (2004). Performance outcomes of strategic and IT competencies alignment. *Journal of Information Technology, 19*, 178–190.
- Donavant, B. W. (2009). The new, modern practice of adult education: Online instruction in a continuing professional education setting. *Adult Education Quarterly, 59*, 227–245.
- Friedman, R. A., & Podolny, J. (1992). Differentiation of boundary spanning roles: Labor negotiations and implications for role conflict. *Administrative Science Quarterly, 37*, 28–47.
- Fussell, H., Harrison-Rexrode, J., Kennan, W. R., & Hazleton, V. (2006). The relationship between social capital, transaction costs, and organizational outcomes: A case study. *Corporate Communications, 11*, 148–161.
- Gopher, D., & Braune, R. (1984). On the psychophysics of workload: Why bother with subjective measures? *Human Factors, 26*, 519–532.
- Gray, P. H., & Meister, D. B. (2004). Knowledge sourcing effectiveness. *Management Science, 50*, 821–834.
- Hass, D. F., & Deseran, F. A. (1981). Trust and symbolic exchange. *Social Psychology Quarterly, 44*, 3–13.
- Jackson, S., & Schuler, R. (1985). A meta-analysis and conceptual critique of research on role ambiguity and role conflict in work settings. *Organizational Behavior and Human Decision Processes, 36*, 16–78.
- Kahn, R. L., Wolfe, D. M., Quinn, R. P., Snoek, J. D., & Rosenthal, R. A. (1964). *Organizational stress: Studies in role conflict and ambiguity*. New York, NY: Wiley.
- Kalyuga, S., Chandler, P., & Sweller, J. (2004). When redundant on-screen text in multimedia technical instruction can interfere with learning. *Human Factors, 46*, 567–581.
- Kankanhalli, A., Tan, B. C. Y., & Wei, K. K. (2005). Contributing knowledge to electronic knowledge repositories: An empirical investigation. *MIS Quarterly, 29*, 113–143.
- Katz, D., & Kahn, R. (1978). *The social psychology of organizations*. New York, NY: Wiley.
- Katz, R., & Allen, T. J. (1985). Project performance and the locus of influence in the R&D matrix. *Academy of Management Journal, 28*, 67–87.
- Kickul, J., & Posig, M. (2001). Supervisory emotional support and burnout: An explanation of reverse buffering effects. *Journal of Managerial Issues, 13*, 328–346.
- Knight, D. K., Kim, H. J., & Crutsinger, C. (2007). Examining the effects of role stress on customer orientation and job performance of retail salespeople. *International Journal of Retail & Distribution Management, 35*, 381–392.
- Kohli, A. K., Shervani, T. A., & Challagalla, G. N. (1998). Learning and performance orientation of salespeople: The role of supervisors. *Journal of Marketing Research, 35*, 263–274.
- Luhmann, N. (1979). *Trust and power*. New York, NY: Wiley.
- Malhotra, N., Kim, S., & Patil, A. (2006). Common method variance in IS research: A comparison of alternative approaches and a reanalysis of past research. *Management Science, 52*, 1865–1883.
- May, P. (2005). Analysis of computer algebra system tutorials using cognitive load theory. *International Journal for Technology in Mathematics Education, 11*, 117–138.
- McConville, T., & Holden, L. (1999). The filling in the sandwich: HRM and middle managers in the health sector. *Personnel Review, 28*, 406–424.
- Moxley, D. P. (2002). Social work strategies and tactics in the workplace: Socialization of people with disabilities. *Journal of Social Work in Disability & Rehabilitation, 1*, 43–60.
- Nahapiet, J., & Ghoshal, S. (1998). Social capital, intellectual capital, and the organizational advantage. *Academy of Management Review, 23*, 242–266.
- Omoregie, M. (1997). *Distance learning: An effective educational delivery system* (Information Analysis 1070). (ERIC Document Reproduction Service No. ED 418 683)
- Parker, D. F., & DeCotiis, T. A. (1983). Organizational determinants of job stress. *Organizational Behavior and Human Performance, 32*, 160–177.
- Parker, S. K. (2007). “That is my job”: How employees’ role orientation affects their job performance. *Human Relations, 60*, 403–434.
- Paas, F. (1992). Training strategies for attaining transfer of problem-solving skill in statistics: A cognitive-load approach. *Journal of Educational Psychology, 84*, 429–434.
- Paas, F. G. W. C., Renkl, A., & Sweller, J. (2003). Cognitive load theory and instructional design: Recent developments. *Educational Psychologist, 38*, 1–4.
- Paas, F. G. W. C., & van Merriënboer, J. J. G. (1994a). Instructional control of cognitive load in the training of complex cognitive tasks. *Educational Psychology Review, 6*, 351–371.
- Paas, F. G. W. C., & van Merriënboer, J. J. G. (1994b). Variability of worked examples and transfer of geometrical problem-solving skills: A cognitive-load approach. *Journal of Educational Psychology, 86*, 122–133.
- Paas, F. G. W. C., Tuovinen, J., Tabbers, H., & van Gerven, P. W. (2003). Cognitive load measurement as a means to advance cognitive load theory. *Educational Psychologist, 38*, 36–71.
- Pearce, C. L., & Ensley, M. D. (2004). A reciprocal and longitudinal investigation of the innovation process: The central role of shared vision in product and process innovation teams (PPIs). *Journal of Organizational Behavior, 25*, 259–278.
- Pillay, H. K. (1997). Cognitive load and assembly tasks: Effects of instructional formats on learning assembly procedures. *Educational Psychology, 17*, 285–299.
- Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: Problems and prospects. *Journal of Management, 12*, 531–544.
- Pollock, E., Chandler, P., & Sweller, J. (2002). Assimilating complex information. *Learning and Instruction, 12*, 61–86.
- Pridmore P., Thomas, L., Havemann, K., Sapag, J., & Wood, L. (2007). Social capital and healthy urbanization in a globalized world. *Journal of Urban Health, 84*, 130–143.

- Putnam, R. D. (1995). Bowling alone: America's declining social capital. *Journal of Democracy*, 6, 65–78.
- Rabinowitz, S., & Stumpf, S. A. (1987). Facets of role conflict, role-specific performance, and organizational level within the academic career. *Journal of Vocational Behavior*, 30, 72–83.
- Reed, W. M., Burton, J. K., & Kelly, P. P. (1985). The effects of writing ability and mode of discourse on cognitive capacity engagement. *Research in Teaching of English*, 19, 283–297.
- Rizzo, J. R., House, R. J., & Lirtzman, S. I. (1970). Role conflict and ambiguity in complex organizations. *Administrative Science Quarterly*, 15, 150–163.
- Roxburgh, S. (2002). Racing through life: The distribution of time pressures by roles and role resources among full-time workers. *Journal of Family and Economic Issues*, 23, 121–145.
- Sanchez, J. I., Korbin, W. P., & Viscarra, D. M. (1995). Corporate support in the aftermath of a natural disaster: Effects on employee strains. *Academy of Management Journal*, 38, 504–521.
- Sari, H. (2005). How do principals and teachers in special schools in Turkey rate themselves on levels of burnout, job satisfaction, and locus of control? *Alberta Journal of Educational Research*, 51, 172–192.
- Sethi, R. (2000). New product quality and product development teams. *Journal of Marketing*, 64, 1–14.
- Shumate, M., & Fulk, J. (2004). Boundaries and role conflict when work and family are colocated: A communication network and symbolic interaction approach. *Human Relations*, 57, 55–74.
- Singh, J., Goolsby, J. R., & Rhoads, G. K. (1994). Behavioral and psychological consequences of boundary spanning for customer service representatives. *Journal of Marketing Research*, 32, 558–569.
- Speier, C., & Morris, M. G. (2003). The influence of query interface design on decision-making performance. *MIS Quarterly*, 27, 397–423.
- Sweller, J. (1988). Cognitive load during problem solving: Effects on learning. *Cognitive Science*, 12, 257–285.
- Sweller, J., van Merriënboer, J. J. G., & Paas, F. (1998). Cognitive architecture and instructional design. *Educational Psychology Review*, 10, 251–296.
- Tidd, S. T., McIntyre, H. H., & Friedman, R. A. (2004). The importance of role ambiguity and trust in conflict perception: Unpacking the task conflict to relationship conflict linkage. *International Journal of Conflict Management*, 15, 364–380.
- Tismaneanu, V. (2007). Leninist legacies, pluralist dilemmas. *Journal of Democracy*, 18, 34–39.
- Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: The role of intrafirm networks. *Academy of Management Journal*, 41, 464–476.
- Tubre, T. C., & Collins, J. M. (2000). Jackson and Schuler (1985) revisited: A meta-analysis of the relationships between role ambiguity, role conflict, and job performance. *Journal of Management*, 26, 155–169.
- van Merriënboer, J. J. G., & Ayres, P. (2005). Research on cognitive load theory and its design implications for e-learning. *Educational Technology, Research and Development*, 53, 5–13.
- van Merriënboer, J. J. G., & Sweller, J. (2005). Cognitive load theory and complex learning: Recent developments and future directions. *Educational Psychology Review*, 17, 147–177.
- Yilmaz, C., & Hunt, S. D. (2001). Salesperson cooperation: The influence of relational, task, organizational, and personal factors. *Journal of the Academy of Marketing Science*, 29, 335–357.
- Yousef, D. A. (2000). The interactive effects of role conflict and role ambiguity on job satisfaction and attitudes toward organizational change: A moderated multiple regression approach. *International Journal of Stress Management*, 7, 289–303.
- Zahra, S. A. (1985). A comparative study of the effect of role ambiguity and conflict on employee attitudes and performance. *Akron Business and Economic Review*, 6, 37–42.

Chieh-Peng Lin is an associate professor in the Institute of Business and Management at National Chiao Tung University in Taiwan.

Date received: May 17, 2010

Date accepted: September 14, 2010