5-18-2013

A REVIEW OF MODELS: VIRTUAL TEAMWORK TRAINING MODEL AND UTAUT

Joy Godin
Georgia College, joy.godin@gcsu.edu

Tanya Goette
Georgia College, tanya.goette@gcsu.edu

A REVIEW OF MODELS: VIRTUAL TEAMWORK TRAINING MODEL AND UTAUT

Joy Godin
Georgia College
joy.godin@gcsu.edu

Tanya Goette
Georgia College
tanya.goette@gcsu.edu

ABSTRACT

As the demand for virtual teams increases, faculty members should examine various strategies for teaching students to become successful working in virtual teams. By incorporating virtual team learning theory and technology acceptance research, faculty can develop such strategies. An examination of a virtual team learning theory and the unified theory of acceptance and use of technology (UTAUT) is provided. This paper combines virtual team learning literature with technology acceptance research identifying a need for future research to help faculty better understand how to prepare students to work virtually in a global environment.

INTRODUCTION

Today, students that graduate, no matter their major, need to be able to work in a global marketplace. Some of the skills required for this involve being able to work in teams, being able to work in a virtual environment, and being able to use whatever technology is needed to work virtually. The theoretical framework examined in this model review include: a virtual teamwork training model and the unified theory of acceptance and use of technology (UTAUT). The combination of the two models will contribute to an understanding of how students can acquire skills to work in the virtual workplace.

VIRTUAL TEAM LEARNING THEORIES

A number of researchers have identified theories that impact virtual team learning (Andres & Shipp, 2010; Kock, Lynn, Dow, &Akgun, 2006) as well as models for developing and implementing effective electronic collaboration learning environments (Bower, 2011; Chen, Sager, Corbitt, & Gardner, 2008; Kirschner, Stijbos, Kreihns, & Beers, 2004). Following educational philosopher John Dewey's (1922) belief that learning is an iterative process of designing, carrying out, reflecting upon and modifying actions, Edmonson (1999) characterized learning in groups as a continuous process of reflection and action. Andres and Shipps (2010) developed a model for measuring team learning in technology-mediated distributed teams. The researchers combined the theory of affordances (Gibson, 1977; Kirschner et al., 2004) and social impact theory (Latane, 1981) to develop a framework that can be used to explain the impact of the collaboration mode on team learning and the social factors that impact team learning and problem solving.

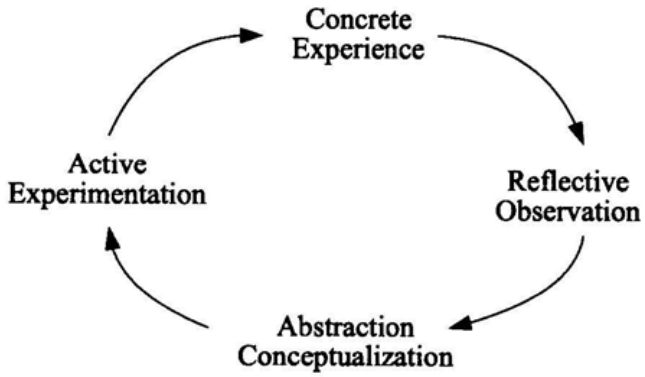
Virtual Teamwork Training Model

Chen, Sager, Corbitt, and Gardiner (2008) proposed a model for virtual teamwork training. The researchers used a mixed-methods approach examining survey data, student comments and final project submissions. The researchers found that employing the virtual teamwork training model resulted in "increasing students' awareness of and competence in performing virtual teamwork" (p. 38).

The teamwork training model developed by Chen and colleagues (2008) was derived from David Kolb's (1984) learning cycle. Figure 1 depicts Kolb's learning cycle. Knowles, Holton, and Swanson (2005) described how Kolb defined learning as the process of creating knowledge through experience. Knowles et al. identified Kolb's four-step cycle of experiential learning. The first step is for the learner to be involved in concrete new experience. Second, the learner should reflect and make observations on the experience from many perspectives. Third, generalizations and theories are created based on the reflections and observations. Lastly, the theories and concepts are tested in new situations. The educator's role is to serve as the facilitator of reflection and encourage learners to discuss and reflect on concrete experiences in a trusting, open environment.Chen et al. (2008) applied the ideas from

Kolb's learning cycle into their model for virtual teamwork. Table 1 summarizes the training model proposed by Chen and his colleagues.Unlike Kolb's learning cycle, the model proposed by Chen et al. does not require that learners start the learning process with concrete examples. Instead they learn through abstract conceptualization – reading or hearing about virtual teamwork practices from others.

Figure 1. David Kolb's (1984) learning cycle (Chen et al., 2008)



The researchers suggested that instructors can provide relevant reading materials and informative lectures, and encourage group discussions about the virtual teamwork. Once students have been introduced to virtual teamwork practices, they will then participate in a virtual teamwork project. The teacher should design a virtual teamwork project that will have enough complexity that it will force the students to actively engage in virtual collaboration to complete the project. Additionally, Chen et al. (2008) explained that students should be required to reflect on activities as they occur and identify the lessons that were learned through each activity.

Table 1: Model of Virtual Teamwork Training, (Chen et al., 2008).

Learning Process	Learning Techniques	Teaching approach
Abstraction Conceptualization – (Conceptual Learning at the Beginning of the Class	Students learn by reading, listening, and discussing the following knowledge areas • Face-to-face teamwork • Virtual teamwork • Computer mediated communication (CMC)	The instructor supplies relevant reading material, gives well-organized and informative lectures, and encourages teams to discuss relevant materials.
Active Experimentation and Concrete Experience – (Learning by doing the project)	Students learn by doing the following activities: • Engaging virtual teamwork by following the known effective practice • Engaging virtual teamwork by trial and error	The instructor designs the virtual teamwork with appropriate level of project complexity and task interdependence so that team members have to engage in serious virtual collaboration to complete the project.
Observational Reflection— (Learning by reflecting on project execution)	Students learn by reflecting and discussing effective/ineffective virtual team practices	The instructor encourages individual and group reflection via team discussion, team report writing, and online forum discussion.

TECHNOLOGY ACCEPTANCE THEORIES

A vast spectrum of technology acceptance research exists. The theory of reasoned action (TRA) was developed by Fishbein and Ajzen in 1975 and described in their book *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. The theory of reasoned action is a model for predicting behavior based on attitudes and beliefs (Fishbein&Ajzen, 1975; Sheppard, Hartwich, &Warshaw, 1988). The theory of reasoned action is used to predict a person's behavior taking into account attitudes and perceptions or the beliefs of those who are important to them.

Everett Rogers developed the innovation diffusion theory in the 1960s, and it has since become a broadly applied model for measuring rate of adoption in behavioral science fields (Rogers, 1995). Moore and Benbasat (1991) modified the theory to examine the factors that lead to technology acceptance. The researchers identified six independent variables impacting technology acceptance: (a) relative advantage, (b) ease of use, (c) image, (d) visibility, (e) compatibility, (f) results demonstrability, and (g) voluntariness of use (Moore &Benbasat, 1991).

Fred Davis (1989) applied the theory of reasoned action to information systems research by developing the technology acceptance model (TAM). TAM is the most widely implemented theoretical model for evaluating technology adoption (Venkatesh, Morris, Davis, & Davis, 2003; Ma & Liu, 2004). The technology acceptance model applied two variables, perceived usefulness and perceived ease of use, which were used to determine behavioral intention to use and actual system use (Davis, 1989).

Extended from the theory of reasoned action discussed above, the theory of planned behavior (TPB) (Ajzen, 1991) added the construct of perceived behavioral control. Perceived behavioral control is the perception of internal and external constraints on behavior (Taylor & Todd, 1995b). The theory of planned behavior is made up of three core constructs: attitude toward behavior, subjective norm, and perceived behavioral control (Ajzen, 1991). Taylor and Todd (1995a) proposed a model that combined constructs of the technology acceptance model (TAM) with those of the theory of planned behavior (TPB). The combined model (C-TAM-TPB) added usefulness and ease of use to the TPB.

The motivational model (MM) theory resulted from a substantial body of research in the psychological domain explaining behavior (Venkatesh et al., 2003). Much research has been done applying the constructs of the MM theory in the information systems field, looking at how motivation impacts technology use (Davis et. al, 1992; Venkatesh et al., 2003). Two primary core constructs were presented as the central beliefs of the motivational model (Vallerand, Fortier, &Guay, 1997): intrinsic motivation and extrinsic motivation.

Social cognitive theory, derived from social learning theory, is one of the most prominent models in the human behavior field (Venkatesh et al., 2003). Social cognitive theory suggests that behavior change is affected by environmental influences, personal factors, and attributes of the behavior itself (Compeau& Higgins, 1995). In 1995, Compeau and Higgins extended the social cognitive theory to apply to computer utilization. The researchers found that computer self-efficacy, one believing that he or she can perform a behavior, and a predicted positive outcome from performing the behavior will impact usage of a technology. Thompson, Higgins, and Howell (1991) proposed the model of PC utilization (MPCU). Extending the theory of human behavior model developed by Triadis in 1977 (Venkatesh et al., 2003), the model differs from TPB and TRA in that it measures actual usage instead of intention to use (Thompson et al., 1991).

Unified Theory of Acceptance and Use of Technology

Venkatesh et al. (2003) proposed a model known as the unified theory of acceptance and use of technology (UTAUT). The researchers designed UTAUT by incorporating eight prominent theories in user behavior. The models that were synthesized in the development of the UTAUT model are: (a) theory of reasoned action (TRA), (b) technology acceptance model (TAM), (c) motivational model (MM), (d) theory of planned behavior (TPB), (e) combined TAM and TPB (C-TAM-TPB), (f) model of PC utilization (MPCU), (g) innovation diffusion theory (IDT), and (h) social cognitive theory (SCT). Each of the eight models has been briefly introduced above.

Overview of UTAUT Study

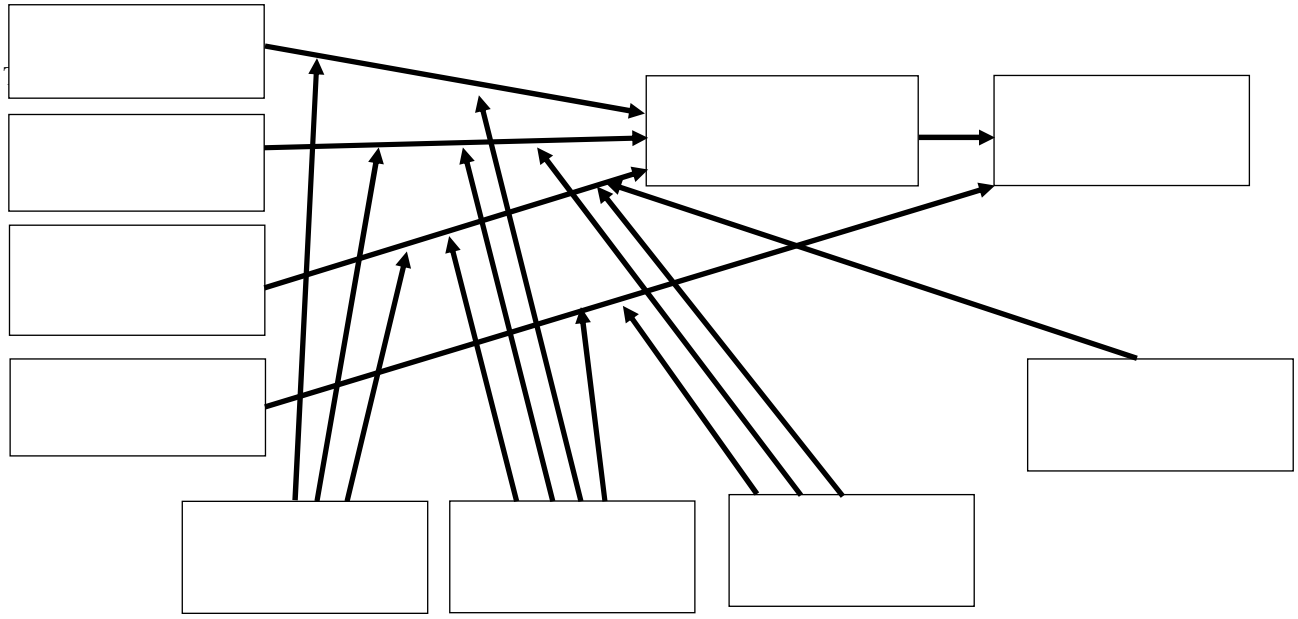
The UTAUT study began with four major objectives: (a) to review user acceptance literature, (b) to compare the eight models, (c) to develop the UTAUT model, and (4) to empirically test the UTAUT model (Venkatesh et al., 2003). After reviewing the eight models of user behavior, Venkatesh et al. (2003) identified 32 constructs. The UTAUT study design was a longitudinal field study across four organizations and among employees being introduced to a new technology. In an effort to increase the robustness of the new model, the researchers included different technologies, industries, organizations, and business functions, as well as varying levels of voluntariness (Venkatesh et al, 2003).

The survey results indicated that each of the eight models had one or more significant constructs (Venkatesh et al., 2003). The researchers found seven of the constructs appeared to be consistent determinants of intention to use or actual usage. Venkatesh et al. eliminated the following three constructs: (a) attitude toward technology, (b) self-efficacy, and (d) anxiety. The researchers theorized that the three contstructs are not direct determinants of intention. The remaining four constructs were used in the UTAUT model. The constructs measured in the UTAUT model are: (a) performance expectancy, (b) effort expectancy, (c) social influence, and (d) facilitating conditions. Each of the constructs is defined below. Four moderating factors will influence these independent variables in different ways according to Venkatesh et al. (2003). The factors are: (a) gender, (b) age, (c) experience, and (d) voluntariness of use.

Independent Variables

Figure 2 reveals the UTAUT model graphically. The following provides a detailed examination of the UTAUT model's four independent variables and the moderating factors.

Figure 2: UTAUT Model (Venkatesh et al., 2003)



Performance expectancy was defined by Venkatesh et al. (2003) as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p. 447). The study results found that performance expectancy was moderated by gender and age and that the effect was strongest for young men.*Effort expectancy* was defined by Venkatesh et al. (2003) as "the degree of ease associated with the use of the system" (p. 450). The study proved that effort expectancy would be moderated by gender, age, and experience finding the effect strongest for young women with minimal experience. *Social influence* is "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p.451). Gender, age, experience, and voluntariness were proven to moderate social influence, with older women under mandatory conditions with little experience having the strongest effect (Venkatesh et al., 2003). *Facilitating conditions* are "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 452). The UTAUT study found that age and experience moderated facilitating conditions with a greater effect with older more experienced workers.

Moderating Factors

Gender, age, experience, and voluntariness ofusewere moderating factors in UTAUT. *Gender* served as a moderator in the UTAUT study because past research on gender differences found men tend to be highly task-oriented (Minton & Schneider, 1980). *Age* also served as a moderator to the independent variables. Previous research showed that age plays a role in technology adoption (Venkatesh& Morris, 2000; Morris &Venkatesh, 2000). *Experience* refers to

the amount of experience an individual has in a specific domain. *Voluntariness of use* refers to whether or not an individual is mandated to use a particular technology. Venkatesh et al. (2003) explained that the majority of past technology acceptance research has focused on technology where participants primarily volunteer to use it.

Dependent Variables.

Behavior intension and actual use were the two dependent variables of the UTAUT model (Venkatesh et al., 2003). *Behavioral intention*, adapted from the TAM model (Davis, 1989) is defined as the plan to perform a task. Sheppard, Hartwick, and Warshaw (1988) showed how behavioral intention had a positive relationship with actual use. The majority of past technology acceptance research focused on behavioral intention instead of actual use (Trice &Treacy, 1988). *Actual use*, also known as use behavior, is defined as the objective measure of use of a specific technology. Trice and Treacy (1988) reported that use is more difficult to report and therefore most researchers choose to focus on behavioral intention instead.

Research Employing UTAUT Model

A number of recent studies in a wide variety of research domains have applied the UTAUT model, including mobile banking implementations (Zhou, 2012; Sangle&Awasthi, 2011), wireless communications (Anderson &Schwager, 2004), organizational learning systems (Wong & Huang, 2011), and training in health care systems (Marshall, Mills, & Olson, 2008).

CONCLUSION

This model review included a brief overview of the frameworks of virtual team learning and technology acceptance theories. Descriptions of the virtual teamwork training model (Chen et al., 2008) and the unified theory of acceptance and use of technology (Venkatesh et al., 2003) were provided. Areview of literature indicated that while virtual team learning and technology acceptance models are widely used, no studies were found that link both virtual team learning and collaboration technology acceptance research. It is important that workers of the future are able to use the latest technological tools to communicate and work virtually in our new flat world (Friedman, 2005). These authors suggest that future research should examine these areas together in order to better understand how to prepare students, and thus future workers, for collaborating virtually in a global environment.

REFERENCES

1. Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179-211.
2. Anderson, J. E., &Schwager, P. H. (2004). SME adoption of wireless LAN technology: Applying the UTAUT model. *Proceeding of the 7th Annual Conference of the Southern Association of Information Systems*, 7, 39-43.
3. Andres, H. P. &Shipps, B. P. (2010). Team Learning in Technology-Mediated Distributed Teams. *Journal of Information Systems Education, 21*(2), 213-221.
4. Bower, M. (2011). Synchronous collaboration competencies in web-conferencing environments – their impact on the learning process. *Distance Education, 32*(1), 63-83.
5. Bozionelos, N. (1996). Psychology of computer use: Prevalence of computer anxiety in British managers and professionals. *Psychological Reports, 78*(3), 995-1002..
6. Chen, F., Sager, J., Corbitt, G., & Gardiner, S. C. (2008). Incorporating virtual teamwork training into MIS curricula. Journal of Information Systems Education, 19(1), 29-29-41.
7. Compeau, D. R. ,& Higgins, C. A. (1995). Application of social cognitive theory to training for computer skills. *Information Systems Research, 6*(2), 118-143.
8. Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319-340.
9. Davis, F. D., Bagozzi, R. P., &Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982-1003.
10. Davis, F. D., Bagozzi, R. P., &Warshaw, P. R. (1992). Extrinsic and Intrinsic Motivation to Use Computers in the Workplace. *Journal of Applied Social Psychology, 22*(14), 1111-1132.
11. Dewey, J. (1922). *Human Nature and Conduct,* New York, New York: Holt.
12. Edmonson, A. (1999). Psychological safety and learning behavior in work teams. A*dministrative Science Quarterly, 44*(2), 350-383.
13. Fishbein, M., &Ajzen, I. (1975). Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research. Boston: Addison-Wesley.

14. Fjermestad, J., &Hiltz, S. R. (1999). An assessment of group support systems experimental research: Methodology and results. *Journal of Management Information Systems, 15*(3), 7-149.
15. Fjermestad, J., &Hiltz, S. R. (2001). Group support systems: A descriptive evaluation of case and field studies. *Journal of Management Information Systems, 17*(3), 115-159.
16. Friedman, T. L. (2005). *The World is Flat: A Brief History of the Twenty-First Century*, Release 3.0, 2007, New York, New York: Picador.
17. Gibson, J. J. (1977). "The Theory of Affordances." In R. Shaw & J. Branford (Eds.), Perceiving, Acting and Knowing (pp. 67-82). Erlbaum, Hillsdale, NJ.
18. Hartwick, J., and Barki, H. (1994). "Explaining the Role of User Participation in Information System Use," *Management Science* , 40(4), 40-465.
19. Heath, C., Svensson, M. S., Hindmarsh, J., Luff, P., &vom Lehn, D. (2002). Configuring awareness. *Computer Supported Cooperative Work: Journal of Collaborative Computing, 11*(3-4), 317-347.
20. Kirschner, P. ,Strijbos, J. W. , Kreijns, K. & Beers, P. J. (2004). Designing electronic collaborative learning environments. *Educational Technology, Research and Development, 52*(3), 47-66.
21. Kock, N., Lynn, G. S., Dow, K. E., &Akgun, A. E. (2006). Team adaptation to electronic communication media: evidence of compensory adaptation in new product development teams. *European Journal of Information Systems, 15*, 331-341.
22. Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development.* New Jersey: Prentice-Hall.
23. Knowles, M. S., Holton, E. F., & Swanson, R. A. (2005). *The Adult Learner – The definitive classic in Adult Education and Human Resource Development*. Burlington, Massachusetts: Elsevier.
24. Latane, B. (1981). The psychology of social impact. *American Psychology, 36*(4), 343-356.
25. Ma, Q., & Liu, L. (2004). The technology acceptance model: A meta-analysis of empiral findings. *Journal of Organizational and End User Computing, 16*(1), 59-72.
26. Marshall, B., Mills, R., and Olsen, D. (2008). The Role of End-User Training in Technology Acceptance. *Review of Business Information Systems, 12*(2), 1-8.
27. Mathieson, K. (1991). Predicting user intentions: Comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research, 2*(3), 173-191.
28. Miller, J. B. (1976). *Toward a new psychology of women*. Boston: Beacon Press.
29. Minton, H. L., &Shneider, F. W. (1980). Differential psychology. Prospect Heights, IL: Waveland Press.
30. Moore, G. C., &Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.
31. Morris, M. G., &Venkatesh, V. (2000). Age differences in technology adoption decisions: Implications for a changing workforce. *Personnel Psychology, 53*(2), 375-403.
32. Morris, M. G., Venkatesh, V., & Ackerman, P. L. (2005). Gender and age differences in employee decisions about new technology: An extension to the theory of planned behavior. *IEEE Transactions on Engineering Management*, 52(1), 69-84.
33. Rogers, E. M. (1995). *Diffusion of innovation* (4thed.). New York: Free Press.
34. Sangle, P. S., &Awasthi, P. (2011). Consumers expectations from mobile CRM services: A banking context. *Business Process Management Journal, 17*(6), 898-918. doi:10.1108/14637151111182684
35. Sheppard, B. H., Hartwick, J., &Warshaw, P. R. (1988). The theory of reasoned action: A meta-analysis of past research with recommendations for modifications and future research. *Journal of Consumer Research, 15*(3), 325-343.
36. Taylor, S. ,& Todd, P. A. (1995a). Assessing IT usage: The role of prior experience. *MIS Quarterly, 19*(4), 561-570.
37. Taylor, S. ,& Todd, P. A. (1995b). Understanding information technology usage: A test of competing models. *Information Systems Research, 6*(4), 144-176.
38. Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly, 15*(1), 124-143.
39. Trice, A. W., &Treacy, M. E. (1988). Utilization as a dependent variable in MIS research. *Data Base, 19*(3), 33-41.
40. Vallerand, R. J., Fortier, M. S., &Guay, F. (1997). Self-determination and persistence in a real-life setting: Toward a motivational model of high school dropout. *Journal of Personality and Social Psychology*, 72(*5*), 1161-1176.
41. Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly, 27*(3), 425-478.
42. Wong, W., & Huang, N. N. (2011). The effects of E-learning system service quality and users acceptance on organizational learning. *International Journal of Business and Information, 6*(2), 205-225. http://search.proquest.com/docview+-/910986292?accountid=11078
43. Zhou, T. (2012). Examining mobile banking user adoption from the perspectives of trust and flow experience. *Information Technology and Management, 13*(1), 27-37.