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# THEORY AND PRACTICE: REVIEWING TECHNOLOGY— MEDIATED LEARNING RESEARCH

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## ABSTRACT

*Prior researchers of technology-mediated learning (TML) have expressed concerns about the lack of theoretical foundation and the lack of the investigation of the role of information technology (IT) in enabling individualized learning methods. In this paper, I review the literature published during the period of 2002–2006. Based on 28 articles reviewed, it is noted that a majority of the papers are firmly grounded on theories or theoretical frameworks; empirical research has been dominant in TML literature; and most of the investigations focus on relationships between contextual factors and learning outcomes and learning experience.*

## KEYWORDS

Technology-mediated Learning (TML), Theoretical Frameworks, Literature Review

## INTRODUCTION

This paper aims to provide a review of recent literature about technology-mediated learning (TML) research. TML is defined as an “environment in which the learner’s interactions with learning materials (readings, assignments, exercises, etc.), peers, and/or instructors are mediated through advanced information technologies” (Alavi & Leidner 2001). Distance learning, open and distance learning, computer-mediated learning, computer-based learning, web-based learning, e-learning, online learning, networked management learning, and organizational learning, among others are different types/terms used in TML environments. The term “information technology” (IT) broadly refers to computing, communication, and data management technologies, and their convergence (Alavi & Leidner 2001). A number of researchers pointed out that TML research lacked studies of a few issues, such as how the role of IT enables individualized learning methods; the consideration of the interactions of technology, instructional method, and the psychological processes of student learners. They raised some fundamental issues about how research on TML should be conducted. They contended that there is also a need for research that takes a broader perspective on the impact of TML (Alavi & Leidner 2001; Arbaugh & Benbunan-Finch 2004; Hodgson & Watland 2004).

It has been noted that the comparative traditional classroom/networked learning research design has been conducted extensively and this body of research needs to move to other directions (Arbaugh & Benbunan-Finch 2004). The authors argued that simply examining the relation between the inputs (e.g., students, technology, instructors, and courses) and the outputs (e.g., learning outcomes) is no longer enough. It is more important to study the specific process characteristics that moderate and account for those outcomes. They recommended that researchers focus more on rigorous research designs and theory-driven research questions rather than studying single courses and comparatives.

This paper reviews the findings of TML research to date. It updates earlier summaries of TML research. This paper intends to answer the following key questions:

- What types of studies have been conducted in TML research? What were the theories, the methods, and findings?
- What is the current overall picture of TML research?

I employed an electronic search to identify TML research to select papers for review. A search for the term “technology mediated learning” on ABI/INFORM and EBSCO databases resulted in a list of 65 publications for the period 2002–2006. To select the paper for review, I narrowed the field of 65 publications to a sample of 28 by focusing on papers that studied the role of information technology and the learning perception. Of the total of 28 papers, 4 were review papers, 3 were theory papers, 13 were empirical papers, and remaining 8 were case studies and observation papers. An overview of these papers is provided in next section followed by discussion and conclusions.

## **A META-REVIEW OF TML LITERATURE REVIEW**

Learning is an activity that students engage in to acquire particular skills and knowledge (Brookefield 1984). Technology-mediated learning inevitably inherited from traditional learning with incorporation with the characteristics of technology. Among the papers reviewed, it is noted that most of the papers (80%) are grounded in learning theories or theoretical frameworks adapted from theories.

### **Learning Theories and Educational Models Influencing TML**

At the core of any course, regardless of its delivery form, online or face-to-face, is the process of learning and the pedagogy that supports effective learning (Benbunan-Fich, Hiltz, & Harasim 2004). To achieve effective learning outcomes, two contrasted learning processes have been identified—objectivism and constructivism. Objectivism views knowledge as a product that can be transmitted one way from the teacher or the textbook to the learners whereas constructivism means that “as people experience something new they compare this experience to internalized knowledge constructs based on past experiences, and then modif[y] their constructs accordingly.” (Benbunan-Fich, Hiltz, & Harasim 2004 p. 21). By contrast, the constructivist model assumes that knowledge has to be discovered, constructed, practiced, and validated by each learner; it is student-centered. The pedagogical methods using this model include collaborative learning, such as simulations and case studies with group discussion.

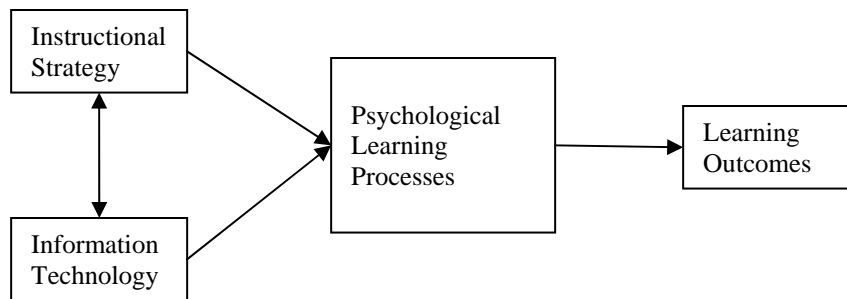
Aligned with the constructivism view of learning, experiential learning theory (ELT) defines learning as “the process whereby knowledge is created through the transformation of experience. Knowledge results from the combination of grasping and transforming experience’ (Kolb 1984 p. 41). ELT suggests that adaptive flexibility is related to the degree that one can integrate conceptualizing/experiencing and acting/reflecting (Mainemelis et al. 2002).

Among different educational models, the socio-cultural model offers a new perspective which assumes that learning is social, involves assisted performance and is regulated by the group and involves the formation and evaluation of shared values (Rumble 2001). The collaborative learning is also based on this model.

In summary, the objectivism view is more instructor-controlled with predefined objectives, whereas the constructivism view or experiential method is flexible. It provides students more autonomy in learning. Prior researchers (e.g., Brookefield 1984) have indicated that the better the fit between the learners' characteristics (e.g., learning styles) and the instructional style, the more favorable the learning outcomes resulting from the learning. In TML environments, quite a few other contextual factors and levels of analysis need to be taken into consideration. As a result, several different research frameworks have been proposed based on above learning theories.

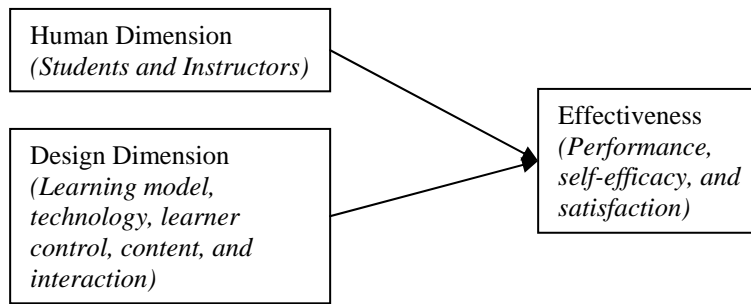
### Development of Theoretical Frameworks:

Several research frameworks (e.g., Piccoli et al. 2001; Alavi & Leidner 2001; Benbunan-Fich, Hiltz, & Harasim 2004) have been proposed to guide TML research. Most frameworks organize research variables in terms of input-process-output model. Alavi and Leidner (2001) proposed a general framework for TML research (Figure 1). In the model, the "inputs" include instructional strategy referring to "methods and models presenting, sequencing, and synthesizing subject-matter content" (Alavi & Leidner 2001 p. 6), and "information technology" refers to technology-mediated form of content presentations or the delivery of instructional events. The psychological processes in this context refer to states within the learner that are involved in learning. The "output" learning outcomes refer to the observed and measured action and performance that result from learning as well as learners' affective reaction to TML and efficiency of TML environments.



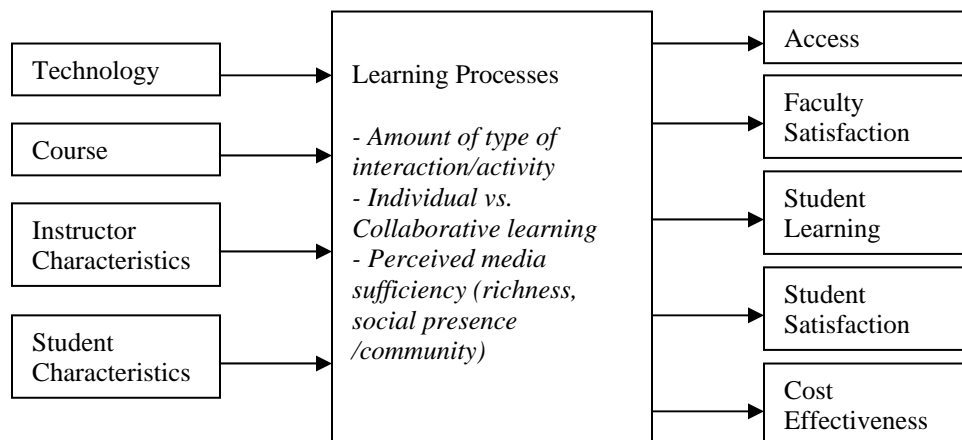
**Figure 1. A Framework for TML Research (Alavi & Leidner 2001)**

Piccoli, Ahmad, and Ives (2001) proposed a broad framework identifying the theoretical constructs and relationships in web-based virtual learning environments (VLE). They identified two classes of determinants: human dimension and design dimension (Figure 2).



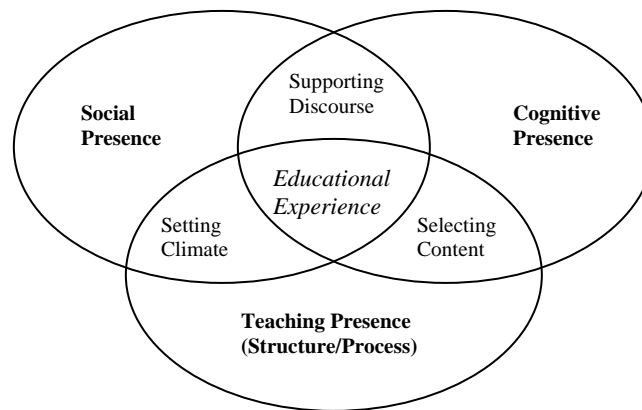
**Figure 2. A Framework Identifying Dimensions and Antecedents of VLE Effectiveness (Piccoli et al. 2001)**

By following input-process-output model, Benbunan-Fich, Hiltz, and Harasim (2004) proposed a model for online interaction learning. The “inputs” are the contextual or moderating factors including technology, course, and instructor and student characteristics, the learning process is the mediator or intervening variables, and outcomes or effectiveness of online learning is the dependent variable (Figure 3). The authors also proposed that this model is a dynamic framework with the contextual factors interacting with each other to define particular technology-mediated contexts in which education processes take place. The learning and satisfaction outcomes provide feedback loops back to “inputs” that result in changes to the contextual factors. These changes may occur immediately or over time.



**Figure 3. Input-Process-Output Model for Online Interaction Learning Theory (Benbunan-Fich et al. 2004)**

Above three frameworks focus on the entire process of TML, from the contextual factors to the TML outcomes. Garrison, Anderson, and Archer (2003) proposed the concept of community of inquiry taking place in the learning process part. They stated that the ability to create critical communities of inquiry distinguishes from online learning from previous paradigms of distance education. To define the functioning of this community of inquiry, they proposed three overlapping elements: social presence, cognitive presence, and teaching presence. These three essential elements form the core of their framework (Figure 4).



**Figure 4. Elements of Educational Experience (Garrison et al. 2003)**

These learning theories and frameworks are found to have been applied in TML environments in terms of course design, socio-cultural aspects, interaction between learners, as well as interaction between participants with the learning content, technology and tasks to be performed. The following section reviews the applications applying above discussed theories, frameworks and theoretical foundations related to them.

### **Application of Theoretical Frameworks to the TML studies**

The majority of the research was found to investigate the relationship between contextual factors and learning experience and learning outcomes from a technology perspective or from a pedagogical perspective.

Arbaugh and Benbunan-Finch (2003) conducted a study of MBA-level courses to examine the interaction between learning theories and web-based virtual learning environments in terms of learning perception and delivery medium satisfaction. They identified three main pedagogical models and learning theories that they see as most associated with online learning: objectivism, cognitive constructivist, and collaborative. The findings provide empirical support for the idea that, while each of the learning theories may be incorporated into web-based courses, the collaborative learning model should be the foundation upon which they are designed and delivered.

Jones, Connolly, Gear, and Read (2006) investigated collaborative learning with group process support system (GPSS). The focus of their study is on socio-cultural aspects of learning. The framework in this article builds on the interrelationships between three themes: individual and collective learning in groups, conversational learning, and the role of technology as an aid to learning.

A number of researchers have investigated the impact of contextual factors illustrated in the theoretical frameworks discussed above. Chou (2005) applied Piccoli, Ahmad, and Ives's framework with focus on the instructor's positive attitude towards technology, the instructor's interactive teaching style, and the instructor's control over the technology with learning effectiveness to study how to innovate IT effectively in a TML environment. The study found that in order to deploy IT effectively and appropriately, it is crucial that learners make connections between new IT capabilities and current instruction problems on which knowledge-sharing and coordination and support of TML environment both have a positive impact.

Arbaugh (2005) investigated the effects of technological characteristics, the pedagogical structure of courses, and their relationship to learning experience with the technology (e.g., the Internet, the course

delivery medium). The author found that the increased use of a variety of media on course Web sites enhances course experience.

A few studies investigated the interaction between participants (Arbaugh, 2002; Benbunan-Finch et al. 2003), the interaction between participants with the learning content, technology and tasks to be performed (Anderson, 2003; Carabajal et al., 2003), the Institutional effects (Alavi & Gallupe 2003), and cultural impact on TML (Hornik & Tupchiy 2006).

## SUMMARY

Based on the 28 papers reviewed, I note the following about the current state of TML research. First, empirical research has been dominated in TML literature mainly because it is still the exploratory stage as more emerging technology being incorporated in learning. Second, most of the investigations focus on relationships between contextual factors and learning outcomes and learning experience. Third, the majority of the papers are firmly grounded in theories or theoretical frameworks which positively respond to the calls of the need of theory foundation in TML research. Fourth, most of the papers focus on single institution or single semester samples.

## CONCLUSIONS

This paper reviews recent TML literature in terms of the development and application of theoretical frameworks of the TML study. It provides the current picture of TML research. For future research, the review shows that the collaborative management research can be incorporated into the theoretical frameworks at a learner's level to investigate how to facilitate the transition from individuals to a learning community and how telepresence and sense of awareness in a TML environment help facilitate during the transition. The level of analysis can be expanded using multi-school samples and focus more on the learning process.

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