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Towards a Contingency Theory of eLearning

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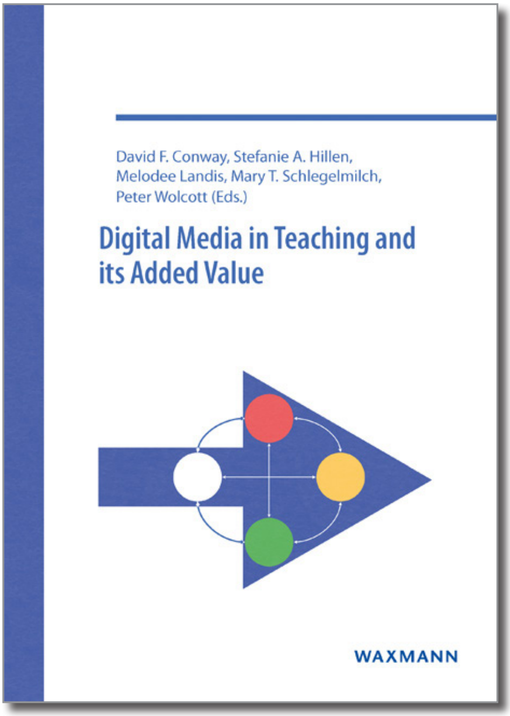

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Towards a Contingency Theory of eLearning

Abstract

This chapter proposes a contingency theory based model of eLearning. Using this theoretical lens the authors argue that given a virtual learning environment, there are ideal profiles of eLearning ("fit") that result from a combination of learner engagement, learner style, learning task, and the appropriate leveraging of IT capabilities. Using this theoretical lens, the authors discuss how eLearning technologies can be classified into an eLearning technologies capabilities grid. The chapter concludes with a discussion of the implications of the proposed theoretical model and one illustration of "ideal profile" is described wherein bundles of information technology capabilities were utilized to enhance and augment the learning experience of the students.

1. Background and Purpose

> *Someday, in the distant future, our grandchildren's grandchildren will develop a new equivalent of our classrooms. They will spend many hours in front of boxes with fires glowing within. May they have the wisdom to know the difference between light and knowledge.* (Plato c. 428–348 BC)

While various modes of eLearning are in widespread use in both academia and industry, there is still a need for a better understanding of how to balance the pedagogical elements (e.g., learning task, learner engagement, and learner style) and the capabilities of eLearning technologies that support the learning process and outcomes in different contexts of learning. As early as 2003, Nichols opined that "there has been much written about eLearning practice however little attention has been given to eLearning theory." In this vein, Siemens (2005) argues that traditional learning theories are not useful for understanding the eLearning phenomenon at the intersection of technology and learning. In particular, he argues that "[b]ehaviorism, cognitivism, and constructivism are the three broad learning theories most often utilized in the creation of instructional environments. These theories, however, were developed in a time when learning was not impacted through technology. Over the last twenty years, information technology has reorganized how we live, how we communicate, and how we learn. Learning needs and theories that describe learning principles and processes, should be reflective of underlying social environments. Vaill emphasizes that "learning must be a way of being – an ongoing set of attitudes and actions by individuals and groups that they employ to try to keep abreast of the surprising, novel, messy, obtrusive, recurring events…" (1996, p. 42). In a thesis exploring the adaptivity of learning management systems with a focus on student learning styles, Graf (2007) reports her findings of a study where she split subjects into three groups: one in which students were matched with learning tools and layouts that suited their learning styles, one in which students were mismatched, and one in which all students saw the same layout. Graf concluded that although each group achieved around the same average grade, students who were correctly matched mastered the material in far less time. Those in the mismatched group spent more time learning the information and were more likely to seek out alternate materials to enhance their understanding. Thus, Graf argued that matching students with tools that fit their learning styles reduces the time and energy needed to learn material. In this vein, it is the goal of our chapter to propose a **contingency theory of eLearning** wherein this notion of adaptivity takes the form of "ideal profiles" that incorporate factors such as the nature of technology capabilities available to learners within the eLearning platform, learning styles and leaning task type. We argue that in order to positively impact learner engagement and performance, the eLearning environment has to allow for the development of "ideal profiles" that allow personalization of the learning experience for each student.

2. Theory Development

In developing our proposed theoretical model, we draw upon relevant research in the areas of eLearning adoption and use, the nature of learning embedded in the learning task, learner style, learner engagement, and the IT capabilities that support accomplishing the learning task. Using the theoretical lens of contingency theory and its concept of "fit", we present a theoretical model of eLearning that aids in defining the ideal profile that combines learner engagement, learning style, learning task, and the appropriate bundle of IT capabilities. The proposed contingency theory of eLearning is displayed in Figure 1. In the following paragraphs we describe each component of our theoretical model.

The concept of "fit" in contingency theory is well documented in various areas of organizational behavior research (Van de Ven & Drazin, 1984). The key thread common to all scholarly research in this area is that an organizational outcome is the consequence of a "fit" or match between two or more factors (Drazin & Van de Ven, 1985). There are three ways to define and test the concept of fit: selection, interaction, and systems approach (Drazin & Van de Ven, 1985). Due to its relevance to this chapter, we will focus our attention briefly on the systems approach. Under the systems approach, "fit is a feasible set of equally effective, internally consistent patterns of organization and context and structure" (Drazin & Van de Ven, 1985, p. 335). This approach proposes that there are significant relationships among latent context, structure and performance constructs.

Clearly the concept of "fit" has broad utility to various areas of theory development wherein organizational performance requires a congruence or match of two or more factors (Khazanchi, 2005). Thus, consistent with the systems approach for defining and assessing "fit," we apply it to the eLearning context, proposing that "fit" in the eLearning context involves four interacting components: nature of learning embedded in the learning task, learner style, learner engagement, and the bundle of technology capabilities that support accomplishing the learning task. In this chapter, we use this notion of "fit" to propose a contingency theory of eLearning as a means of developing an understanding of the components that impact eLearning (Khazanchi, 2005). It should be noted that contingency theory has previously been used as a basis for empirical studies related to adoption of and satisfaction with eLearning solutions (Lin & Wang, 2012; Lu & Chiou, 2010). However, while these studies do focus on factors related to the eLearning system, they only cover a limited set of the possible information technology capabilities.

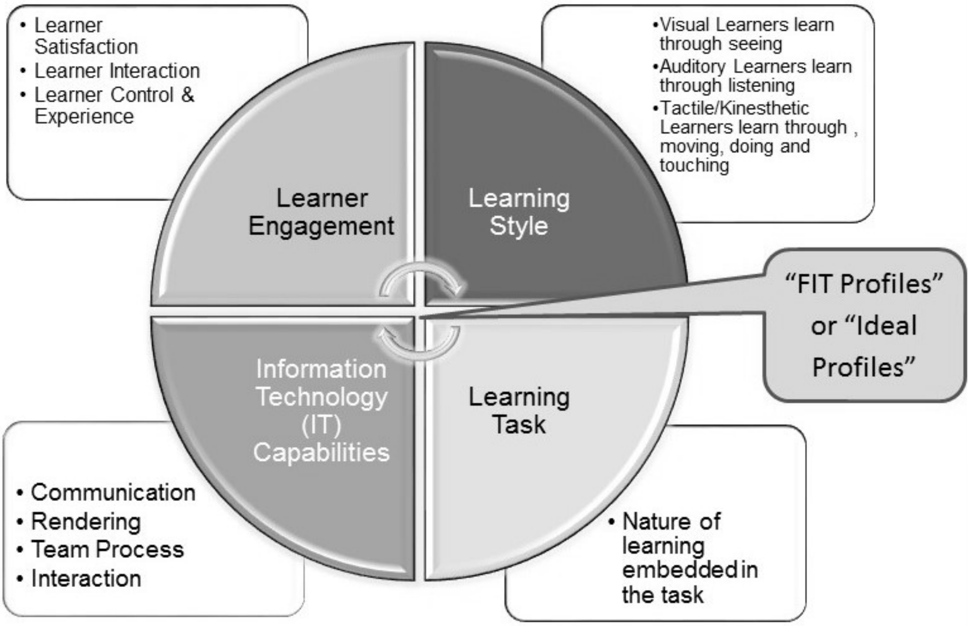

Figure 1: A Contingency Theory of eLearning

Learner Engagement: According to Schlechty (2001), learners (students) who are engaged exhibit three characteristics: (1) they are attracted to their work, (2) they persist in their work despite challenges and obstacles, and (3) they take visible delight in accomplishing their work. In an extensive review of educational research on student engagement, Fredricks, Blumenfeld & Paris (2004) describe three components of student engagement, which are behavioral, emotional and cognitive engagement. While behavioral engagement is mainly related to positive conduct such as following classroom norms and participating in classroom activities, emotional engagement refers to students' affective experiences at school, such as interest, boredom, or anxiety. Cognitive engagement, in its turn, stresses investment and commitment to learning, ability to self-regulate and be strategic in learning. Students who are cognitively engaged in learning prefer challenging work, are able to cope with failures and are persistent in mastering knowledge and skills. Each of the three components is important to be taken into account when evaluating student engagement; simply doing school tasks, following the rules and even receiving high grades does not necessarily indicate that the student is truly engaged. Student engagement requires psychological investment and active involvement in learning activities (Newmann, Welhage, & Lamborn, 1992). Researchers are increasingly finding support for the argument that "… when learners are engaged in shaping and leading their own learning and education this can result in benefits for all learners, educators, the institution and the education system as a whole" (Walker & Logan, 2008, p. 2). In particular, the benefits for learners who are involved are said to include: greater sense of ownership over their learning, increased motivation, improved self-esteem, greater achievement, improved relationships with peers and educators, and increased self-efficacy (Bandura, 1997). Keeping this in mind, we define *learner engagement in an eLearning context as behavior that is the sum total of learner control, learner interaction and learner satisfaction.* The greater the control, satisfaction and interaction capability in the eLearning context, the higher the chances of learner engagement. In the following paragraphs we further elaborate on learner control, interaction and satisfaction.

Learner Control: Learner control refers to "*instructional strategies through which learners can exercise some level of control over the events of instruction. It means that learners make their own decisions regarding the sequence, pace, flow, amount, and review of instruction*" (Simsek, 1993 & 2012; Williams, 1996; Merrill, 1994; Chou & Liu, 2005; Byers, 2010). According to Chou & Liu (2005), the notion of learner control is founded on motivation theory (Keller, 1983), attribution theory (Martin & Briggs, 1986), and information processing theory (Gagne, 1997). Bandura (1997) states that students achieve better performance because of higher degrees of learner control and greater self-efficacy (Chou & Liu, 2005). It has also been argued that learner control can lead to positive results because it is a way of allowing individual influences to exert a positive influence without trainer control (Chou & Liu, 2005). Learner control can be supported through the provision of choice, the opportunity for initiative and the assurance that the activity is related to individual values. Lack of autonomy in learning is likely to make students feel controlled and forced towards particular goals (Connell, 1990). In a field experiment comparing traditional and technology mediated virtual learning environments (TVLE), Chou & Liu (2005) found that "because TVLEs provide a high level of learner control" the TVLE student subjects outperformed their counterparts in the traditional environment and had greater learning satisfaction.

Learner control can be measured using well established validated scales – e.g., the learner-content interaction strategy preference survey by Byers (2010) is a 5 item (for each content strategy), 7-point Likert scale with verbal labels at end points – "1" = "Strongly Disagree" and "7" = "Strongly Agree."

Learner Interaction: In conducting a meta-analysis study of "interaction" in distance education research, Bernard et al. (2009) cite a number of sources and conclude that the literature is largely univocal about the importance of interaction because of the integral role that interaction between students, teachers, and content is presumed to play in all of formal education. Moore (1989) distinguished among three forms of interaction in distance education: (a) student-student interaction, (b) student-instructor interaction, and (c) student–content interaction. Anderson's (2003) "interaction equivalency theorem" posits that if any one of student-student, student-teacher or student-content interaction is of a high quality, the other two can be reduced or even eliminated without impairing the learning experience – thus creating means of developing and delivering education that is cost affordable for all of us. According to Zhang (2005), one reason for emphasizing learner-content interaction in eLearning is to increase learner engagement and enhance learner control over the content and process. In fact, in two experiments conducted by Zhang (2005) using student subjects, it was found that "students using a fully interactive multimedia-based e-learning environment achieved better performance and higher levels of satisfaction than those in a traditional classroom and those in a less interactive e-learning environment." Similarly, Zimmerman (2012) conducted a study to examine the relationship between learner-content interaction and course grade in online courses and concluded that learners who spent more time interacting with course content achieve higher grades than those who spent less time with the content.

Therefore, for the purpose of our model, we use learner interaction to mean "student-content" interaction. We adapt Byers (2010, p. 5) description of "*learner interaction*" *as including strategies facilitated within self-directed online content in the form of (a) simulations, (b) interactive reference (e.g., text, images, animations, and check-your-thinking questions), (c) personal feedback (e.g., embedded and end-of-topic multiple-choice quiz questions), (d) hands-on learning opportunities (e.g., embedded tangible activities to facilitate learning), and (e) pedagogical implications (e.g., specific instructional strategies).*

Learner Satisfaction: Social interactions have a significant impact on shaping individual student motivation (Pintrich, 2003). The importance of social environment for students' self-regulated learning skills was reflected in Zimmerman's (1989) social cognitive view of self-regulation. Although interaction with peers can be challenging due to various factors such as social skills and individual differences, in general students who have a chance to interact with peers demonstrate more positive attitudes, higher levels of motivation as well as greater overall satisfaction with the learning experience than students who do not have this opportunity (Resta & Laferrière, 2007). Arbaugh (2000) argues that the more learners perceive interaction with others, the higher the eLearning satisfaction. Perceived eLearner satisfaction has been used in evaluating effects of learning environments and activities in various settings (Alavi, 1994; Alavi, Wheeler, & Valacich, 1995; Wang, 2003; Wolfram, 1994). In fact, in an empirical study in Korea on this topic, Jung, Choi, Lim & Leem (2002, p. 160) concluded that: "Even for adult learners, social interaction with their instructors and collaborative interaction with peers are important to enhance their learning and increase their participation in online discussion."

Adapting Giese and Cote's (2000) description and findings on the notion of "customer satisfaction," Wang (2003, p. 77) defines perceived e-learner satisfaction as "*a summary affective response of varying intensity that follows asynchronous eLearning* *activities, and is stimulated by several focal aspects, such as content, user interface, learning community, customization, and learning performance.*" This construct of perceived eLearning "learner satisfaction" is measured by Wang using a 26-item scale. However, for our purposes, we describe learner satisfaction as a summative measure of overall satisfaction with the course.

Learning Style: According to Litzinger, Lee, Wise, & Felder (2007) "learning styles are characteristic preferences for alternative ways of taking in and processing information. The concept arose with the work of Kolb, whose learning styles instrument is credited by some as the first to be created in the U.S." (p. 309). For learning styles, the most used measurement is the Felder-Soloman Index of Learning Styles© (ILS). It is an on-line instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style (Fielder, 2015). According to Litzinger, Lee, Wise & Felder (2007) the ILS instrument has been shown to have appropriate internal consistency reliability and construct validity from both factor analysis and student feedback. The ILS measurement provides guidance on how students prefer to learn and can be useful in designing online experiences by using a variety of IT capabilities that cater to a diverse set of learners and styles (Litzinger, Lee, Wise, & Felder, 2007).

Learning Task: In addition to the learner's style, the nature of learning embedded in the task is an important factor to consider in thinking about eLearning pedagogy and strategy. This implies that one would analyze the learning outcomes and performance objectives of a task by identifying the domains and levels of learning and determining prerequisite skills and task/content structure. There are four well known taxonomies for identifying learning domains/levels in tasks based on a focus on the psychomotor, intellectual, and affective domains. These are: Bloom's taxonomy of cognitive domain (Bloom, Engelhart, Furst, Hill, & Krathwohl, 1956); Krathwohl's taxonomy of affective domain (Krathwohl, Bloom, & Masia, 1964); Gagne's five learned capabilities (Gagné & Briggs, 1974); and Harrow's taxonomy of psychomotor domain (Harrow, 1972).

Information Technology Capabilities (ITC): The notion of ITC discussed here draws upon various theories that are discussed in detail in our previous work reported in Davis, Owens, Murphy, Khazanchi, & Zigurs (2009). The general definition of a capability is the inherent potentiality of being developed, i.e., a "feature or faculty capable of being developed." Information technology (IT) is viewed as a set of capabilities for communication, rendering, interaction, and team process. ITC are dynamic and represent a starting point that can change with time through the process of users' adaptation and appropriation. These capabilities can be classified according to their function which allows for a systematic approach to their conceptualization and implementation. ITC are distinctive features of a specific technology that include various technological functionalities. ITC can change dynamically through interaction in the environment as people use the capabilities to complete a task. ITC can be broadly classified into four categories – communication, team process, interaction, and rendering.

First, ITC for *communication* can be defined as “any aspect of the technology that supports, enhances, or defines the capability of group members to communicate with each other” (Zigurs & Buckland, 1998). Such communication capabilities should be able to: a) provide communication channels (Carte & Chidambaram, 2004; Zigurs & Munkvold, 2006); b) support high quality of communications by increasing the speed of message delivering (Dennis, Fuller, & Valacich, 2008) and supporting multiple cues transmission (Davis, Owens, Murphy, Khazanchi, & Zigurs, 2009); and c) provide channel expansion capability which allows users to expand their understanding of the characteristics of the technology as they interact with the technologies (Carlson & Zmud, 1999).

Next, ITC for *team process* provide support for process structuring, enable information processing, provide appropriation support, enable socialization, and build community. Process structuring is defined as “any aspect of the technology that supports, enhances, or defines the process by which groups interact”. Information processing is defined as the capability to gather, share, aggregate, structure, or evaluate information (Zigurs & Buckland, 1998), such as brainstorming tools. Appropriation support refers to the support for appropriation provided by restrictiveness of the technology and outside factors (Dennis, Fuller, & Valacich, 2008).

We define ITC for *interaction* as any aspect of technology that can support direct interactions between people or between people and artifacts. For example, parallel editing capability that supports the direct interactions between people (Dennis, Fuller, & Valacich, 2008); modifying content of files, creating visual artifacts in the form of text, images, pictures, 3-D models, or some combinations that support direct interactions between people and artifacts (Dennis et al., 2008).

Finally, ITC for *rendering* are defined as capabilities that support “the process of creating or executing life-like images on the screen” (Davis, Owens, Murphy, Khazanchi, & Zigurs, 2009). Personalization and vividness are two capabilities that constitute IT capabilities for rendering. Personalization allows people to create personal focus among people (Daft & Lengel, 1984), and vividness allows a mediated environment containing rich information in terms of formal features (Steuer, 1992). Rendering capabilities support the process of creating life-like images such as avatars and objects in a virtual space. Specific capabilities include personalization and vividness of representation that utilizes 2D and immersive three-dimensional imagery.

The following table summarizes the four IT capabilities and their characteristics and provides examples of technologies with regard to each capability.

Table 1: IT capabilities
(Adapted from Davis, Owens, Murphy, Khazanchi, & Zigurs, 2009)

IT Capabilities	Characteristics
Communication	Communication channels (e.g. email, audio/video conferencing)
	High quality of communications (e.g. instant feedback, multiple cues transmission)
	Channel expansion (e.g. expanding channel characteristics based on experience with use of IT)
Team Process	Process structuring (e.g. agenda setting)
	Information processing (e.g. brainstorming tools)
	Appropriation support
Interaction	Between-people interaction (e.g. parallel editing)
	People-artifacts interaction (e.g. modifying contents, creating 3-D models)
Rendering	Personalization (e.g. create avatars in virtual worlds)

3. Discussion and an Illustration

The authors propose a contingency theory of eLearning to explain their contention that learning and learner engagement can be supported and/or enhanced with the appropriate combination ("ideal profiles") of factors such as IT capabilities adapted, learning styles, and the nature of learning embedded in the task. To illustrate the proposed theoretical model, we need to first understand the extant milieu of information technology capabilities (ITC) available for designing eLearning experiences. Figure 2 provides one such view in the form of a 2 x 2 grid showing the nature of learner engagement (low to high) on the vertical dimension and the mode of interaction with learners (synchronous to asynchronous) on the horizontal dimension, while the identified eLearning technologies are shown in the grid as an outcome reflecting these two dimensions. Thus, directed instruction in synchronous mode is rich in interaction but potentially is not as engaging as using the capabilities inherently available in a platform like Second Life where one can use avatars, mobility and immediacy of artifacts for engaging interactions relating to some types of learning tasks (Davis, Murphy, Owens, Khazanchi, & Zigurs, 2009). On the other hand, current platforms such as MOOCs may have an outstanding reach to thousands of students (Allen & Seaman, 2013), but are unfortunately very "average" in its learner engagement as evidenced by the low completion of MOOC courses and poor satisfaction by learners (Koller, Ng, Do, & Chen, 2013). This grid also illustrates the point that there is work to be done in designing next generation eLearning platforms that combine the features from a variety of platforms that incorporate different technology capabilities that have the potential to impact learner engagement.

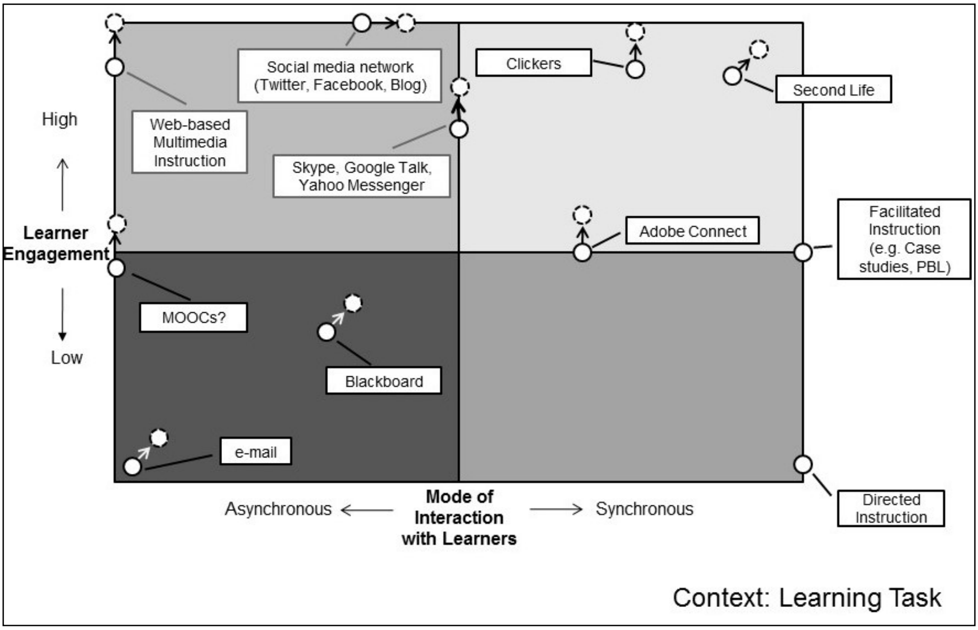

Figure 2: eLearning Capabilities Grid

Contingent "Fit" through Ideal Profiles: An Example

We use our own work with eLearning classes, one in particular reported in Munkvold, Khazanchi, & Zigurs (2011), to illustrate our conceptualization of "contingent fit" or "ideal profiles". Please note that much of this illustration of our proposed theoretical model is based on the work previously reported in our paper where we described a graduate seminar titled "Working in Virtual Environments" that was conducted over fifteen weeks as a joint course between University of Agder (UiA) in Norway and University of Nebraska at Omaha (UNO) in the U.S. Seventeen graduate students were enrolled in the course, of which fifteen students were registered in a Master's program in Information Systems at UiA and two students were registered in the Master's in Information Systems program at UNO. Three of the students in the UiA program were one-semester, international exchange students from Austria, Czech Republic and Germany. The course was an elective in both programs. All scheduled course activities were run as virtual sessions, thus interaction in the course was independent of geographical location. The course deliverables were a combination of individual and team-based tasks:

- One team case analysis.
- Four individual case commentaries.
- One team project, focusing on developing a virtual work trainee program for a global company.
- An individual reflection journal, including weekly journal entries reflecting on learning outcome, teamwork and personal experiences.

Four teams of students were established with 4–5 members, with all teams comprising students from at least two countries. While both the US students were working part-time, most of the students in the Norwegian course were full-time students.

As illustrated in Table 2, the class was taught using both synchronous and asynchronous technology capabilities. This allowed students with differing learning styles to stay consistently engaged in the class over its full period. This approach is consistent with prior research findings where researchers have concluded that this blended approach is highly suitable for students with differing learning styles in the same class (refer Er & Arifoglu, 2009). Er & Anrifoglu conclude that some students prefer a synchronous online mode because they need the equivalency of face-to-face instruction, whereas others are comfortable with an asynchronous online mode because it affords more time to consider all facets of an issue at their own pace. Thus, in our illustrative course, we provided opportunities for communication, team process and interaction by and among students with differing learning styles, bundling together a variety of ITC. For example, students could work on the structured and unstructured learning tasks that were required in the course both individually and in groups by using Huddle to communicate asynchronously and/or Adobe Connect and Skype to interact synchronously. The use of this array of information technology capabilities resulted in greater engagement of all students on an ongoing basis. The core IT capabilities and their functional use in the class along with suitability for various learning styles are detailed in Table 2.

Table 2: Working in Virtual Environments – ITC Adopted

Technology Platform	**IT capabilities**	**Functional utilization**	**Overall assessment of «FIT»**
Adobe Connect™ (Figure 3)	Communication Interaction Rendering	Weekly synchronous class sessions and instructor meetings. ● Interactive text, audio and video chat was commonly utilized. ● Sharing of documents such as discussion notes, slides and more.	ITC features in this technology are a good fit for visual, aural and read/write type of learners.
Huddle™ (Figure 4)	Communication Team Process Interaction Rendering	Predominantly utilized as a shared workspace, our "home base" for the course; included a course workspace for everyone to access and separate workspaces for each team as their collaboration and project repository. Used by instructors to share syllabus, readings, guidelines, personal profiles of students and faculty, and customized user manuals and demos for the various technologies associated with the class.	ITC features in this technology are a good fit for visual, read/write and kinesthetic type of learners.
Wordpress™ Blog (Figure 5)	Communication Interaction	Knowledge networking tool; used by students to share student critiques on readings and for posting and commenting on case analyses	ITC features in this technology are a good fit for visual, read/write and kinesthetic type of learners.

Technology Platform	IT capabilities	Functional utilization	Overall assessment of «FIT»
Skype™	Communication	Used by students for occasional synchronous interaction in teams and weekly (optional) office hours with faculty.	ITC features in this technology are a good fit for aural and visual type of learners.

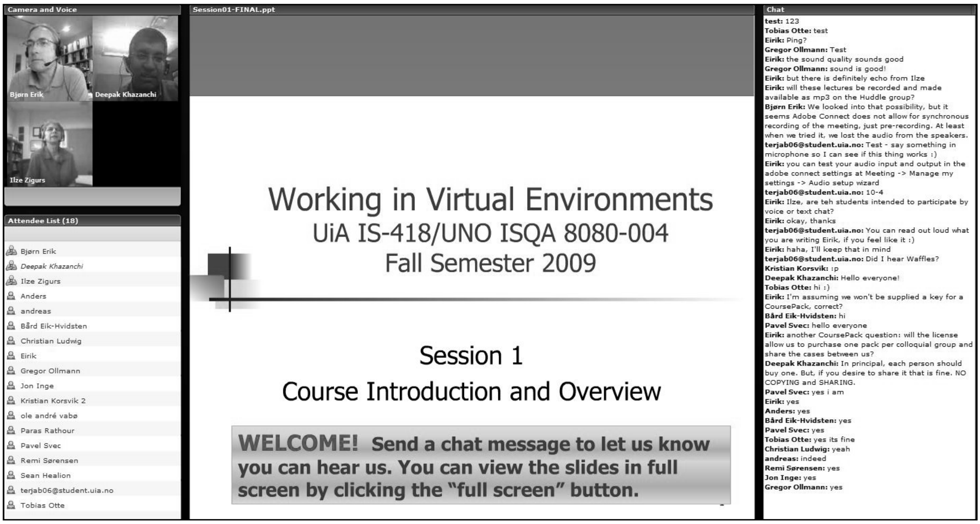

Figure 3: Working in Virtual Environments – Adobe Connect

The course included 13 synchronous class sessions, most of these were run as 75 minute sessions in the afternoon Norway local time (CET) and morning US time (CDT). Figure 3 shows a screenshot of the setup for the synchronous course sessions using Adobe Connect. The real-time conferencing sessions on Adobe Connect afforded "face to face" interaction and discussion both among the students and with the instructors, which would not have been possible if this was a purely asynchronous class. While we did not directly compare student satisfaction and learning outcomes with an asynchronous version of a similar course, we discovered that students at their own discretion based a major part of their project work on the use of synchronous communication tools indicative of the fact that inclusion of synchronous media in their communication repertoire was preferred when available. Further, attendance at the weekly class sessions was nearly 100%, despite the fact that attendance was voluntary. Although all capabilities of Adobe Connect were available to students, only half of the students perceived video of the presenters as useful, and all but one preferred not to display video of all participants. Further, most of the students preferred text chat over audio for class discussion and several students expressed a dislike of parallel communication with simultaneous use of audio, presentation slides, and chat during the sessions. In fact, a large majority (88%) confirmed peferring text chat over audio interaction for a variety of reasons including the convenience of relaying a thought in a short burst and its ease of use compared with audio/video interaction. This speaks to the differ-

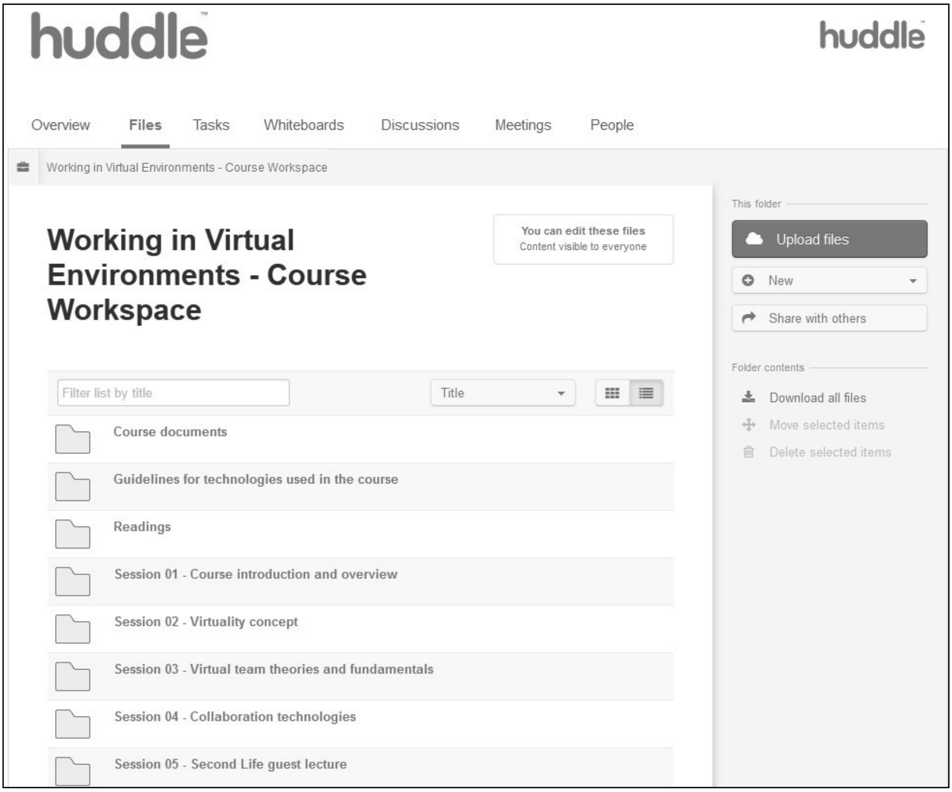

Figure 4: Working in Virtual Environments – Shared workspace

ent learning styles that were likely present in the class and the flexibility of communication modes available in synchronous conferencing tools. On the other hand, there was also anecdotal evidence that a small number of students with potentially different learning styles (such as those who did not like multiple modes of communication) felt a lack of control on their learning environment resulting in a reduced impact on their ability to engage in the class. However, a majority of the students (76%) agreed that an online only format was very effective for this course.

For the team project, the students were responsible for selecting their own portfolio of collaboration technologies and were encouraged to try out different options. A project room in Huddle was created for each team, but some teams preferred other tools as their project repository, such as Dropbox and ProjectPlace. A snapshot of how Huddle was used is shown in Figure 4. The instructors also used Huddle to provide access to shared class materials including readings and training documents for each of the collaboration tools used in the class and for any ongoing updates to the course syllabus. In addition, students uploaded and shared their final team reports via Huddle. For all project teams in the class, Skype was the preferred tool for synchronous group meetings and chat between team members.

Students in the class were also assigned case studies that they analyzed in small teams. The students were required to provide individual responses and reactions to the case analysis via a Wordpress blog setup for the course (refer Figure 5).

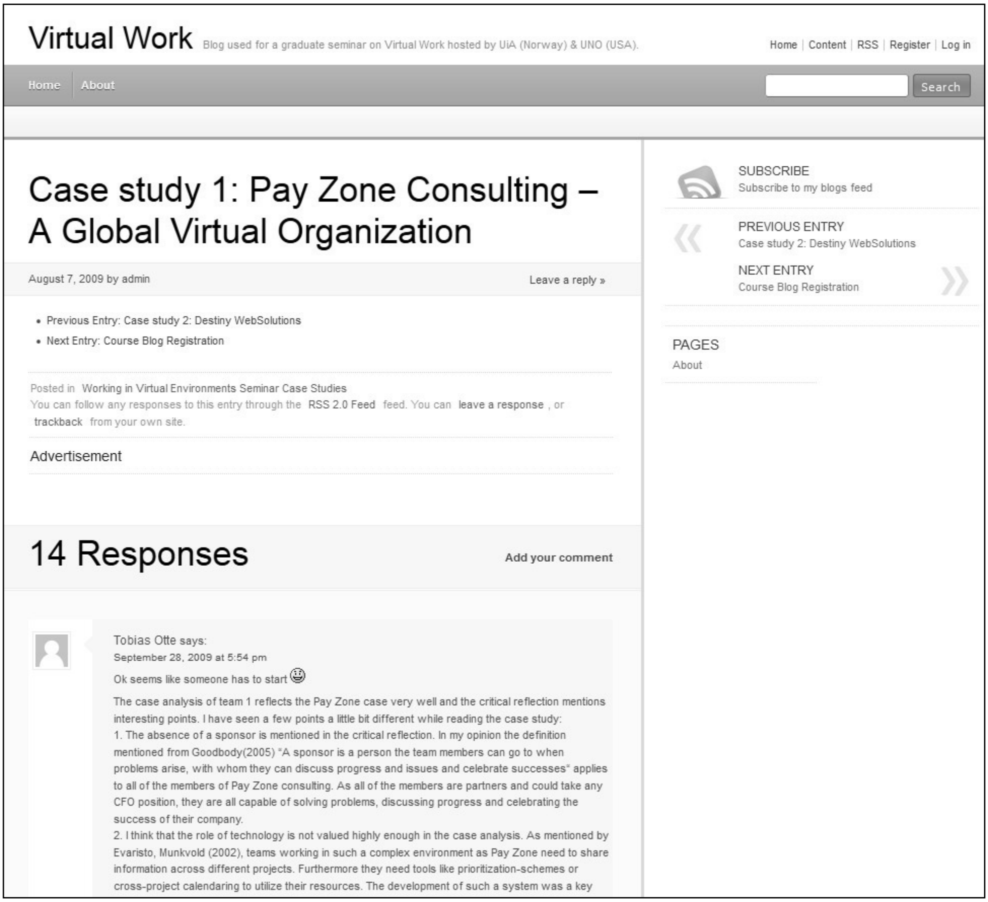

Figure 5: Virtual Work Course WordPress Blog

4. Implications and Concluding Remarks

We have argued for a contingency theory based model for eLearning, and have illustrated how this can be applied for analyzing the fit between IT capabilities and characteristics of the learning environment in an eLearning course. Many questions still remain unanswered. Is there really a fit profile that can mix the factors in the proposed model in an optimal way? What empirical tools can we employ to assess such a theoretical model? Which of the contingent factors in the model are more important than the others? We believe that the "fit," whether it is described as a contingency fit or ideal profile suggests that the factors impacting fit are combined in ways that create an eLearning setting that is effective and engaging for the learner. However, this contingency theory should not be interpreted in a deterministic fashion, where particular combinations result in given outcomes. Rather, it represents an initial basis for designing eLearning environments that can be adapted to the particular characteristics of the learners and the course setting.

Finally, a possible further extension of the theory could be to incorporate research findings from the area of collaboration scripting to inform about ways to effectively scaffold online learners and help them benefit from the ideal profile. Dillenbourg (2002, p. 61) defines collaboration scripts as a "set of instructions prescribing how students should form groups, how they should interact and collaborate and how they should solve the problem". While it may be difficult to take into account all the factors influencing the effectiveness of learner interactions, collaboration scripts can be regarded as an attempt to directly support interactions in the learning group. In the context of our eLearning course illustration, rather than letting the students themselves develop their preferred blend of ITC support and related collaboration practice, collaboration scripts could be derived from the contingency theory and presented as the suggested ideal profile for collaborative learning.

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