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Multi-dimensional alignment between online instruction and course technology: A learner-centered perspective



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ABSTRACT

Compared with face-to-face instruction, online instruction in distance and hybrid education relies on the extensive use of course technology. Course technology supports multiple aspects of online instruction including objective specification, material organization, engagement facilitation, and outcome assessment. This study looks into different dimensions underlying the alignment between online instruction and course technology, and investigates the direct and indirect effects of involved constructs on student satisfaction as the outcome variable. The empirical evidence from a survey supports most research hypotheses, and suggests that instruction-technology fit is a partial mediator for online instruction and a full mediator for course technology in terms of their relationships with student satisfaction. Whereas all alignment dimensions but assessment fit are significant, engagement fit calls for closer attention than objective fit and material fit. That is, course technology has great potentials as well as a big space for improvement to facilitate the student engagement aspect of online instruction. From a learner-centered perspective, the findings offer researchers and practitioners helpful insights on how to utilize all kinds of e-learning tools for student success.

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1. Introduction

Advances in electronic learning transform higher education by giving students more flexibility and control while maintaining high standards of instructional quality (Garrison, 2011). In 2012, around one third of American college students took one or more online courses and such distance learning enrollment had been increasing at a much faster pace than overall higher education enrollment during the past 10 years (Allen & Seaman, 2013). In terms of development stages, online education has surpassed the first two levels of “personal productivity aids” (e.g. automatic office tools) and “enrichment add-ins” (e.g. multi-media content, computer-mediated communication), and is in the final process of “paradigm shift” that requires the redesign and reconfiguration of course content and delivery to facilitate active learning for students (Rogers, 2000; Schneckenberg, Ehlers, & Adelsberger, 2011).

Compared with face-to-face teaching that can be divided into individual classes, online instruction needs to take a more holistic approach in the design and delivery of course modules, each comprising multiple learning components (Barajas & Owen, 2000; Van Merriënboer & Kirschner, 2013). In distance and hybrid education, online instruction components need to be clearly defined and implemented with the support of appropriate e-learning tools (Marty, 2003; Sun & Wang, 2014). In a virtual environment, for instance, a group project is conducive to collaborative learning only if teamwork activities are well

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facilitated by groupware tools like discussion board and web conferencing. In this sense, online course development can be viewed as the process of integrating instructional content and course technology to enhance distance learning experiences for students (Fink, 2013; Henry, 2001).

One critical success factor of distance learning, therefore, is the alignment between online instruction and course technology (Angeli & Valanides, 2005; Bennett, Bishop, Dalgarno, Waycott, & Kennedy, 2012; Chen, Wu, & Yang, 2006; Singh, Mangalaraj, & Taneja, 2010). Due to the complex nature of online instruction, its relationship with course technology is unlikely to be simple. However, most researchers regard their alignment unidimensional in conceptualization and operationalization. Perceived fit, or the overall perception of how course technology fits the need of online instruction, is typically used (e.g. Gu, Zhu, & Guo, 2013; McGill & Klobas, 2009). The unidimensional approach simplifies analyses but also limits the insights of findings. For instance, some aspects of alignment may be more critical to the success of online courses than others. Treating them as the same makes it hard to prioritize efforts.

This study examines the multi-dimensional alignment between online instruction and course technology, and develops a research model to investigate its relationships with other variables. Then the article describes measurement development and data collection to test the hypothesized relationships. Finally, it presents the results of statistical analyses and discusses the implications of findings, followed by the conclusion.

2. Research background

The concept of alignment originated in management literature, such as the fit between business strategy and organizational structure (Kathuria, Joshi, & Porth, 2007). There are six general approaches to conceptualize fit as: 1) moderation, 2) mediation, 3) matching, 4) covariation, 5) profile deviation, and 6) gestalt (i.e., an organized whole) (Venkatraman, 1989). In the field of information systems, researchers mainly examine the alignment between technology use with either strategies at the organizational level or tasks at the individual level (Chan & Reich, 2007).

The critical alignment issue in online course design and delivery concerns the use of specific e-learning tools to support various online instruction activities. For such task-related alignment, the most well-known theory is the task-technology fit (TTF) model. Based on the fit-as-matching conceptualization, the model suggests that both task performance and technology utilization are enhanced if technology characteristics match task characteristics (Goodhue & Thompson, 1995).

The original TTF scale includes 16 factors including the right data, the right level of detail, accuracy, compatibility, locatability, accessibility, flexibility, meaning, assistance, ease-of-use of hardware and software, systems reliability, currency, training, authorization, presentation and confusion (Goodhue, 1998). Factors like ease-of-use of hardware and software and compatibility overlap with constructs in other theories, such as ease-of-use in Technology Acceptance Model (Davis, 1989) and compatibility in Innovation Diffusion Theory (Rogers, 2010). Among the other TTF factors, accuracy, accessibility and reliability are more pertinent to general information quality than specific tasks (Lee, Strong, Kahn, & Wang, 2002).

Most studies that adopted the concept of task-technology fit only used a few questionnaire items to directly measure the perceived fit between task and technology. In the context of online education, such items often use descriptions like: “course technology fits well with the way I like to study” and “course technology is compatible with all aspects of my study” (Gu et al., 2013; McGill & Hobbs, 2008). They are used as the reflective indicators of the latent variable of perceived task-technology fit in the modeling of its relationships with other variables.

Reflective modeling follows the basic premise of psychometrics: a human subject’s response to a scale reflects the individual’s underlying “true score” of psychological state (DeVellis, 2012). When task-technology fit is conceptualized as a reflective construct, therefore, it is supposed to be unidimensional in nature. That is, the perceptual indicators of such a reflective construct are “caused” by the same source of psychological influence, and should exhibit a relatively high level of internal consistency (Spector, 1992).

Yet the alignment between online instruction and course technology, or instruction-technology fit, may involve more than a single dimension. Online instruction is an endeavor comprising multiple aspects of efforts, and course technology needs to support all of them to make a course successful. Nevertheless, it is possible that course technology is better aligned with some aspects of online instruction than it is with other aspects.

A formative construct comprises various dimensions that contribute to its formation in various ways and are not necessarily consistent with each other (Petter, Straub, & Rai, 2007). Instead of using the unidimensional perceived fit construct, this study conceptualizes instruction-technology fit as a formative construct following the fit-as-gestalt approach to capture different aspects of the alignment between online instruction and course technology. The indicators of a formative construct are heterogeneous in nature as they constitute its different dimensions, in contrast to the homogenous indicators of a reflective construct (Bollen & Lennox, 1991). Thus, the measurement validity of a formative construct should be examined based on the theoretical relevance and conceptual completeness of its indicators rather than their internal consistency (Hair, Black, Babin, & Anderson, 2009).

One of the most authoritative and comprehensive guidelines to evaluate the design of online courses is the Quality Matters Higher Education Rubric (simply, QM Rubric) (Shattuck, 2010). The examination of its structure may provide useful clues for identifying the dimensions of instruction-technology fit and related constructs. The latest edition of QM Rubric comprises eight general standards as listed in Table 1 (Quality Matters, 2014). For each standard, there are specific rubric items to evaluate the relevant aspect of online course design. There are 21 three-point items, 15 two-point items, and 8 one-point

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