The Impact of Web-based Instruction on Faculty in Higher Education Institutions: New Directions for Research

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Abstract

Previous research conducted on web-based teaching technologies on faculty in higher educational institutions has focused on faculty attitudes, roles, skills and adoption issue for adding to the literature. This paper contributes to the analysis of web-based technologies by presenting a five-year literature review of 39 journal articles published between 2006 and 2010 in 25 journals. This paper focuses specifically on academic faculty at higher educational institutions and analyzes literature on the basis of data collection methods used, countries and Internet technologies studied, and the research objective of each article. This analysis revealed a number of limitations in the existing literature such as the tendency: to conduct one-time (vs. temporal) studies; to repeat adoption factor studies; to treat web-based technologies and faculty as homogenous in understanding adoption; and to focus on a small population of faculty without considering the interactions of faculty across universities and/or between countries. These limitations highlight the need for moving beyond identifying and evaluating adoption factors into new research directions. This paper concludes by identifying a number of broad research questions areas which might help overcome the limitations of the existing body of research.

Key words: college faculty; web-based learning; elearning; Internet; higher education.

1.0 The Impact of Web-based Instruction on Faculty in Higher Education Institutions: New Directions for Research

The adoption of web-based learning technologies in academic institutions has been the subject of previous research, especially over the past decade with the growth of the Internet and online learning technologies. A systematic search of the literature identified at least 39 articles published between 2006 and 2010 with a focus on the impact of web-based learning technologies on academic faculty in higher education settings. Many published articles looked at adoption factors (motivators/inhibitors) of web-based instruction on academic faculty. It is important to conduct an analysis of recent journal articles dealing with web-based teaching technologies and the impact this is having on academic faculty in order to identify future research directions. Previous analyses of the impact of web-based instruction technologies on faculty has taken the form of adoption literature which has focused on identifying and analyzing the factors which aimed to predict or explain why faculty adopt (or do not adopt) to different forms of web-based technologies [Kukes, Waring & Koorland (2006); Panda & Mishra (2007); Hiltz, Shea & Kim (2007); Kanuka, Heller & Jugdev (2008); Birch & Burnett (2009); Mitchell & Geva-May (2009); Sayadian, Mukundan & Baki (2009); Green, Alejandrao & Brown (2009); Crawley, Fewell & Sugar (2009); Huang & Hsia (2010); Yu, Brewer, Angel-Jannasch-Pennell & DiGangi (2010); and Alebaikan & Troudi (2010)].

While such adoption factor research is useful, the these studies do not offer insights into larger trends relating to the types of research being conducted or into the future research opportunities these trends represent. There have been a few articles that are focusing on teaching with new web-based technologies, such as Web 2.0 (Wood & Friedel (2009), Yu, Brewer, Angel-Jannasch-Pennell & DiGangi (2010) and Archambault, Wetzel, Foulger & Williams (2010)) or in blended learning environments (Ocak (2010) and Alebaikan & Troudi (2009)), as well as examining what is needed for faculty in various countries to teach international courses online (Sadykova & Dautermann (2009). Other contributions have been investigating faculty adoption using theoretical models ((Muhira (2009); Benson, Samarawickrema (2009); Popov (2009); Swann (2010); and Wang, Solan & Ghods (2010).).

The aim of this article is to look at this body of literature more broadly to identify opportunities for new directions of research beyond what has been published. While this analysis is not exhaustive, it can be viewed as indicative of what has been done in peer-reviewed, academic journals. The trend analysis of this research has identified limitations in existing research such as:

- Lack of focus on longitudinal studies.
- Repeat of adoption factor studies which are reaching a saturation point.
- Treat web-based technologies as homogenous in terms of how it is impacting full-time faculty.
- Focus on one or a small population of faculty without considering faculty across universities and/or between countries.

This paper makes a unique contribution to previous research by addressing these limitations by including 25 journal articles published from 2006-2010 that identifies trends in data collection methods used, countries studied, web-instruction technologies adopted and research objectives employed. This paper is the only literature analyses of 2006-2010 journal articles in the topic area. It will also present several areas of new research directions that will help overcome some of the limitations uncovered. This paper is structured as follows. The search strategy used to identify selected journal articles is explained followed by a description of how analysis was conducted. Next, the major trends are presented in four areas: (1) data collection approaches; (2) learning technologies; (3) countries examined; and (4) research objectives of the articles.

2.0 Selecting Web-Based Instruction Journal Articles

Articles used in this literature analysis were selected on the basis that they involved conceptual or empirical work focusing on the impact of web-based learning technologies on faculty in higher education institutions, and were in peer-reviewed academic journals. The search for articles included such terms as *faculty*, *web-based instruction* and *higher education* to find relevant articles. Web-based technologies included general or specific web-based instructional technologies (such as web 2.0), online learning or blended learning methods. Distance learning technologies were not included unless: (1) there was an aspect of online learning; and (2) a research objective of studying the faculty interface was included. Articles focusing on use of a specific web-based technology were also not included if they did not involve some kind of interface with academic faculty and involve learning. The majority of articles studying web-based learning are focused on the student, and these were not included unless they had a faculty variable included.

Only peer-reviewed academic journals were included to ensure the articles analyzed were of higher quality when compared to journals without a peer-review process. A wide range of publication venues were analyzed to include electronic journals. The list of publication venues used in the literature analysis is shown in Table 1. Included in the analysis were articles published between 2006 and 2010 to ensure that this analysis focused on recent research. The articles were identified by searching online databases such as EBSCOHost, and were restricted to those which were available in full-text via the University library. In using this screening criteria, some journal articles may have been missed; but with 39 articles included, it allows some degree of confidence that this paper reports an extension collection of recent journal articles published in peer-reviewed academic journals.

Table 1 summarizes the 25 journals from which the articles were identified and analyzed, and many of the articles came from journals dedicated to educational technologies and education research. This table demonstrates that there is a wide range of journals looking at the impact of web-based instruction in academia and that the number of articles have been increasing throughout the 2006-2010 period.

3.0 Research Trends and Opportunities

In this section, major trends will be discussed as a result of the analysis of articles by exploring the instructional technologies used, countries studied, data collection methods and primary research goal of each article. This analysis allowed for broad similarities and differences in the literature as well as limitations necessary to determine new trends for future research. While the results are broken down by year, it should be noted that the articles analyzed do not cover a sufficiently long period for reliable historical analysis.

3.1 Predominate Focus on One-Time Data Collection

The data collection approaches emerging from the analysis is shown in Table 2. Upon observation, there does not appear to be a bias in qualitative vs. quantitative approaches, with 13 of 39 articles reporting only quantitative data while 18 of 39 articles reporting only qualitative data, and 5 of 39 articles reporting both qualitative and quantitative data. There were, however, no longitudinal studies comparing survey results over time or studying the adoption rate of web-based technologies over time. This represents a gap in the research because web-based learning technologies, faculty skills and aspects of the university environment can change quite quickly. It is therefore concluded that there is an opportunity for longitudinal studies, both qualitative and quantitative, which examine temporal issues affecting web-based instructional use. This type of research is important because it can track the changes in adoption and experience by full-time faculty over a longer time horizon.

3.2 Web-based Technologies Studied

Further insights into research trends were gained by examining identifying the web-based technologies and applications reported in the journal articles that are summarized in Table 3. The articles were organized based on the examples used and if unclear, based on the description of the technology used. This proved to be a challenge, where authors referred to technologies such as online, Internet, Web, or distance learning, rather than specific technologies used in web-based instruction. Therefore, Table 3 is intended to be used in broad, generic terms vs. specifically referring to any web-based instruction technology.

The first observation from Table 3 is a strong tendency by researchers to treat web-based learning generically vs. listing a specific technology or application employed. This can be a problem because different technologies can have different benefits in facilitating online learning. For example, if one effect observed by faculty is that student problems are not mitigated, what technology is affecting this outcome (the learning management system, a communication technology, and/or a specific application (e.g., use of wikis))? It is very difficult to identify the differences between various technologies without understanding the specific technology and application being studied.

A second observation is that there is an emergence of new web-based instructional technologies, like Web 2.0 and blending learning, starting in 2009 and continuing in 2010. This suggests that new research is targeting the impact of these new technologies on academic faculty, continuing to look at adoption factors as well as other areas previously published for previously employed technologies.

3.3 Web-based Focus on Single Country Studies

Additional trends were identified when the countries in which the authors conducted their research is summarized in Table 4. Table 4 shows 38% of the articles were studied in the US. This could be the result of the longer period of time in using online instruction and the larger number of researchers working in the US. In addition, more than 69% the articles are from the UK, USA, Australia, and Canada. This suggests that there are research opportunities in developing and/or non-native English speaking countries. This disparity could also be explained by the limited accessibility of non-English language journal articles in the university research databases.

Another observation from Table 4 is that only one article included a cross-country comparison between Africa and Canada (Note: the one global article shown in Table 4 was conceptual and did not employ a research method). This suggests a further research opportunity for cross-cultural studies to determine the extent to which the impact of web-based instruction on faculty varies given national and cultural contexts.

3.4 Emphasis on Faculty Adoption

Additional areas for further research were identified when the articles were organized by primary research objective. The primary research objective was determined from the statements the authors made in the article. If the objective was not clear, it was identified by reviewing the findings and then deducing the primary objective. The categories shown in Table 5 were identified after reading each article and grouping the objectives inductively using a condensation approach. Over 31% of the articles addressed adoption factors, or aspects of web-based instruction that motivated or inhibited academic faculty in its use. A future study that either organizes this research into a single framework or conducts a meta-analysis with existing quantitative data may reduce the need for additional adoption research. The exception will be those studies that look at emerging technologies.

Once agreement is reached over common adoption factors, efforts can be targeted toward best practices that can leverage the motivating factors and overcome the inhibiting factors.

A third observation is that most studies treated academic faculty as a homogeneous group, with few studies looking at the impact of tenure or other types of faculty (adjunct, part-time). In the online learning environment, courses are more likely to be taught be adjunct faculty than full-time or tenure-track faculty (Knapp, Kelly-Reid & Ginder, 2010), and yet few studies included adjunct faculty. A few studies did show differences in how faculty employment status affects adoption; for example, Yu, Brewer, Angel-Jannasch-Pennel & DiGangi showed that part-time and adjunct faculty were more willing to use Web 2.0 applications (2010) than tenured faculty. Without detailing out specific faculty characteristics, results are inconsistent. Without exploring the various faculty groups and how these can affect adoption, such important correlations may go undetected between a full set of adoption factors. In addition, sample sizes were small in most studies, particularly the qualitative studies. This suggests conducting a meta-analysis that will increase the sample size using a full set of adoption factors and various faculty employment statuses to be a beneficial research area.

4.0 Proposed Directions for Research

A familiar finding in what inhibits faculty adoption of web-based learning technologies is lack of policies, technical/administrative support, skills and incentives. When new technology is introduced that affects the learning process without alignment of policy, procedures and a plan to address faculty needs, faculty can perceive a loss of control with the expectation of an increased workload. Nandahkumar (1999) showed that when technology is laid directly over a face-to-face organizational structure without changes to policies or structure that predictable results include erosion of trust. There may be a wealth of information that explains how technology and innovation can affect the adoption rates of internal stakeholders. Schneckenberg (2009) argues that the underlying problems for e-learning adoption of faculty are "structural peculiarities of universities and cultural barriers that are deeply rooted in the academic community." (p.414). This suggests that organizational change will be difficult at best and much can be learned from universities whose faculty have been successful in adapting to online learning. Therefore, sharing best practices is a future research area.

Articles examining faculty roles have shown that these have become more complex and less autonomous with online learning because faculty must not only design learning that responds to the changing needs of tech-savvy students but integrate the technologies into their courses to extend the flexibility of educational services in universities. Several articles have also investigated the skill set needed to effectively serve in the new role, which highlights research in the professional development area. And although there has been some theoretical work that looks at specific interactions between faculty and elements of the online learning environment, there are no theories that adequately explain the adoption of technology by academic faculty. Innovation theories suggest that unless faculty already have a positive attitude toward web-based instruction technology, university leadership and advocates will need to convince them of the benefits before adoption will occur. A framework or theory that explains the linkages of faculty role, pedagogy, skills, and incentives to adoption is an area of future research.

Along with these future research areas, a review of the literature has identified new directions for future research, many of which will require a greater organizational view of faculty adoption of web-based technologies.

1. Explore the dimensions on which faculty are homogenous and heterogeneous to adopting web-based instruction technologies. As stated earlier in the paper, this can be furthered by developing an organizing framework and/or meta-analysis using existing survey data.
2. Identify the full range of online instruction technologies and applications which are applicable to academic faculty. There is a tendency in published articles to treat all web-based instruction homogenously. Research on newer technologies, like Web 2.0 and mobile technologies, can be conducted to learn which applications are most suitable to faculty adoption.
3. Investigate a complex model that explores the changing faculty role, knowledge gap, pedagogy and incentives of faculty in using web-based learning technology over time.
4. Explore types of interventions that can be used organizationally to support faculty in online teaching environments to include possible solutions which address the difficulties faculty face using online technologies.

5. Conduct longitudinal research using both qualitative and quantitative data collection approaches to address limitations of current research that provides one look view of faculty adoption.
6. Examine cross-cultural variances which can occur when faculty in various countries teach international courses online. The similarities and differences in adoption profiles can be compared and the extent to which faculty adoption heterogeneity varies between countries (if at all). Developing and non-English speaking countries can learn from what has been done in other countries (if applicable) or conduct their own studies.

These proposed research directions provide some initial suggestions for conducting future research on promoting faculty use of web-based learning technologies. It is hoped that the ideas shared will encourage new research which moves beyond adoption studies and into the proposed areas to contribute to greater levels of adoption of web-based technologies by faculty.

5.0 Conclusions

This paper presented an analysis of recent web-based technologies impacting academic faculty at higher education institutions. The analysis addresses limitations on previous studies by reviewing journal articles from 2006-2010 from a range of 25 journals. Most importantly, this paper identified trends emerging relative to technologies, countries studied, data collection methods and primary research objectives. The paper highlighted potential future research directions based on these major trends include the need for research to:

- Studies the temporal effects related to faculty use of web-based instruction technologies (longitudinal studies).
- Studies the organizational factors that affect faculty adoption to include best practices, tools and theories.
- Considers the differences in web-based technologies as well as in employment status of faculty at higher education institutions.
- Increase the sample population of faculty and include faculty at different universities and/or between countries.

It is believed that these suggestions will have important implications in encouraging the researcher to become a practitioner as observing change in universities, especially for those faculty who are in universities being asked to participate online learning. Future research should identify and investigate approaches, tools and technologies that can help faculty more easily transition to various online learning technologies that are appropriate for them, their students and the universities they serve.

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Table 1: Summary of Journal Articles Identified

Journal Name	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**
Australasian Journal of Education Technology				2	1	3
Behavior and Information Technology					1	1
Career and Technical Education Research	1					1
Community College Review				1		1
Distance Education				3		3
Education Research					1	1
Educational Media International		1				1
Electronic Journal of eLearning		1				1
International Journal on E-Learning			1			1
International Journal of Academic Development			1			1
International Journal of Emerging Technologies in Learning				1		1
International Review in Open and Distance Learning				4	1	5
Journal of Asynchronous Learning Networks		1		2		3
Journal of College Teaching and Learning				1		1
Journal of Computing in Teacher Education	1					1
Journal of Digital Learning in Teacher Education					1	1
Journal of Distance Education				1	2	3
Journal of Education Research				1		1
Journal of Educators Online				1		1
Journal of Technology Integration in the Classroom				1	1	2
Quarterly Review of Distance Education		1		1		2
Research in Learning Technology					1	1
Teaching in Higher Education				1		1
Turkish Online Journal of Education Technology				1		1
World Journal on Educational Technology					1	1
Total	**2**	**4**	**2**	**21**	**10**	**39**

Table 2: Summary of Data Collection Approaches Employed

Data Collection Approaches	2006	2007	2008	2009	2010	Total
Conceptual/Literature Review				3		3
Qualitative only:						
• Interviews			1	1	1	3
• Case studies				5		10
• Case studies with interviews				3	5	3
• Focus groups	1	1				2
Quantitative only:						
• Survey	1	2	1	6	3	13
Combined qualitative and quantitative:						
• Interviews and survey				3		3
• Case study, interviews and survey				1		1
• Video observation and interviews				1		1
Total	**2**	**3**	**2**	**23**	**9**	**39**

Table 3: Internet Learning Technology/Application

Internet Learning Technology/Application	2006	2007	2008	2009	2010	Total
Distance learning	1			2		3
Web-based (specific technology)		1	1	3	1	6
Web-based (general)	1	2	2	17	3	24
Web 2.0				1	1	2
Blended web-based					3	3
Total	**2**	**3**	**3**	**23**	**8**	**39**

Table 4: Summary of Countries Studied

Country/ies Studied	2006	2007	2008	2009	2010	Total
Africa				1		1
Africa-Canada				1		1
Australia				3	3	6
Belgium				1		1
Canada			1	1	1	3
India		1				1
Italy			1			1
Malaysia				1		1
Saudi Arabia				1		1
Sweden				1		1
Taiwan				1		1
Turkey					1	1
United Kingdom				3	1	3
United States	2	2		8	3	15
Global				1		1
Total	**2**	**3**	**2**	**23**	**9**	**39**

Table 5: Summary of Research Objectives

Category	Description	Total
Faculty Attitudes	Explores faculty attitudes and perceptions toward e-learning, distance learning and mobile learning [Zirkle, Norris, Winegardner & Frustaci (2006); Ulmer, Watson & Derby (2007); Craft (2009); Fish & Gill (2009); and Ocak (2010)].	5
Faculty Role/Identity	Examines how online learning affects faculty role and identity [Hanson (2009); Greener (2009); Arend (2009); Mitchell (2009); Mayadas, Frank & Bacsich (2009); Savin-Baden, Gourlay, Tombs, Steils, Tombs & Mawer (2010); and Archambault, Wetzel, Foulger & Williams (2010)].	7
Faculty Satisfaction	Investigates faculty satisfaction with online learning and higher education environment factors (see Bolinger & Wasilik (2009).	1
Adoption Factors	Explores varied adoption factors on adoption of online learning and various technologies [Kukes, Waring & Koorland (2006); Panda & Mishra (2007); Hiltz, Shea & Kim (2007); Kanuka, Heller & Jugdev (2008); Birch & Burnett (2009); Mitchell & Geva-May (2009); Sayadian, Mukundan & Baki (2009); Green, Alejandrao & Brown (2009); Crawley, Fewell & Sugar (2009); Huang & Hsia (2010); Yu, Brewer, Angel-Jannasch-Pennell & DiGangi (2010); and Alebaikan & Troudi (2010)].	12
Faculty Skills/Professional Development	Examines the different skill sets needed for online faculty and various professional development curricula: Trentin (2008); Awouters & Jan (2009); Jelfs, Richardson & Price (2009); Tynan, Adlington, Stewart, Value, Sims & Shanahan (2010).	4
Course Development	Reviews various course development issues (technical, pedagogical): Sadykova & Dautermann (2009); Ward, West, Peat & Adkinson (2010); Chao, Saj & Hamilton (2010); Wood & Friedel (2009).	4
Organizational Change	Explores the impact of organizational change on faculty (general); Richardson (2009).	1
Theory Development	Argues faculty-learner interaction framework: Muhira (2009); transactional distance theory for elearning design: Benson, Samarawickrema (2009); activity theory to explain extra effort needed by faculty: Popov (2009); dialogue theory to describe facilitating online: Swann (2010); and socio-technical systems theory to evaluate the elearning environment: Wang, Solan & Ghods (2010).	5
Total		**39**