

# *More Options, More Use? Effects of a University's Change in Learning Management System on Learning Management System Use*

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**Abstract:** *This study investigated how university teaching faculty perceived the change from one learning management system (LMS) platform to another as well as changes in faculty LMS use following transition. Data were obtained through self-reports from a 2017 web survey of teaching faculty at a large, public university in Pennsylvania. Data from both open-ended and close-ended items were analyzed. Results of OLS regression models indicated that faculty perceptions and use of the new LMS were shaped but not fully determined by experiences with the previous LMS. Early adopters were distinct from later adopters in perceptions of the previous LMS, age, and number of classes taught. Respondents expressed transition concerns including time and effort involved, learning challenges, ability to import content, and feature equivalence.*

**Keywords:** transition, teaching, learning management system

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## Introduction

The term learning management system (LMS) refers to software applications whose purpose is to assist educational institutions, faculty, staff, and students in the administration, documentation, and delivery of courses. Though features vary considerably by product, many include a gradebook, the ability to post course materials, and the ability for students and faculty to interact electronically through email or other means. LMS use in higher education is nearly universal. A 2013 survey of more than 800 undergraduate institutions across the U.S. found that 99% employed some form of LMS (Dahlstrom, Brooks, & Bischel, 2014). More than 90% of undergraduate institutions were already using some form of LMS in the early 2000's (Hawkins, Rudy, & Madsen, 2002). However, the increasing number of LMS options available in higher education, combined with aging systems in place, has meant that colleges and universities are likely to consider changing their choice of LMS at some point. Of the institutions surveyed in 2013 by Educause, 15% had intentions to change to a different LMS within three years (Dahlstrom et al., 2014).

Currently, little is known about the impact of such a change on teaching faculty. Yet, a 2014 survey of faculty from 151 institutions found that 85% used their institution's LMS; more than half used it daily (Dahlstrom et al., 2014). Of those surveyed, 60% felt the LMS was critical to their teaching (Dahlstrom et al., 2014). A nationally representative study of 4,564 college and university teaching faculty found that 80% used an LMS for sharing syllabi and related information with students (Allen & Seaman, 2012). About two-thirds of faculty reported that they regularly used the LMS to record grades and communicate with students. More than 30% reported regularly using the LMS to track attendance, provide e-textbooks and readings, and identify students in need of extra help (Allen & Seaman, 2012). While there are arguably other ways to accomplish these tasks, the wide extent to which faculty are using LMS as part of course delivery suggests that significant changes to an institution's LMS are likely to be met with concern, and may possibly impact the way faculty administer their courses.

The purpose of the present study was to investigate how a change in LMS affected teaching faculty. Specifically, this study examined how teaching faculty perceived the change to a new LMS, how LMS use

changed from one system to the next, and the demographic and academic characteristics associated with these trends. To do so, the study utilized online survey data from a large, public university in Pennsylvania comprised of a central campus and more than a dozen commonwealth campuses located elsewhere in the state. This university gradually shifted to a new LMS between 2014 and 2016. Through this university cannot be viewed as representative of all institutions, the results yield valuable insight for institutions considering an LMS change. The pages to follow detail the existing research and theory that serve as a foundation for this study.

## **Review of the Literature**

### **Teaching with Technology**

In 1985, Davis introduced the Technology Acceptance Model (TAM) as a theoretical representation of how and why information systems like LMS are adopted by end users. Under the TAM, external characteristics of the technology itself (features) affect user perceptions of usefulness and perceptions of ease of use. These perceptions, in turn, impact whether users will adopt the technology and to what extent. Later work added a third intervening variable, subjective norms, which refer to perceived pressures to adopt or use the technology (Legris, Ingham, & Collette, 2003). Together, these three factors help to explain how teaching faculty perceive available technology in and out of the classroom.

A 2012 survey of teaching faculty across the U.S. found that more than 60% of respondents felt more excitement than fear over the growth of hybrid and blended education, the use of e-textbooks and e-resources over traditional textbooks, and increasing availability of online educational content (Allen & Seaman, 2012). Nearly two-thirds felt that their institution provided excellent resources for incorporating digital tools in the classroom (Allen & Seaman, 2012). In a 2011 study, most faculty studied believed that podcasts, wikis, and social media sites could serve as valuable tools in collaborative learning (Moran, Seaman, & Tinti-Kane, 2011). In another study, most faculty at a Midwestern university felt that use of information technology in the classroom improved teaching (Lonn & Teasley, 2009). Faculty indicated that the top two benefits of using information technology in teaching were

improved communication with students and improved efficiency (Lonn & Teasley, 2009). These ideas are consistent with perceptions of usefulness from TAM (Davis, 1985).

However, enthusiasm towards online or digitally-assisted learning does not extend to all areas, nor to all faculty. In the 2012 survey noted above, faculty were more fearful than excited about the growth in online learning more generally and the growth of for-profit education (Allen & Seaman, 2012). Respondents expressed concerns about privacy and student integrity in research by Moran et al, (2011). In another study, faculty felt very positively about their institution's LMS, but quite negatively about a synchronous communication tool that was also available to instructors (Salajan, Welch, Peterson, & Ray, 2011). Demographics may play a role. Georgina and Hosford (2009) found that those with less than five years of teaching experience were more comfortable with the newest technologies than other faculty. Those more comfortable with these digital tools, in turn, were those most likely to integrate technology into their teaching (Georgina & Olson, 2008). Gautreau (2011) found that age and sex did not affect faculty decisions to adopt an LMS, but that untenured faculty and those more comfortable and familiar with technology were those most likely to use an LMS in their teaching. Thus, while the majority of faculty may feel some level of excitement about digital teaching tools overall, these trends may mask significant variation by demographics and by the type of tool being considered. These variations may reflect the perceptions of ease of use indicated by TAM (Davis, 1985).

### **Faculty Perceptions of LMS**

Several past studies investigated faculty perceptions of LMS specifically. Lonn and Teasley (2009), for example, found that faculty perceptions varied by LMS feature. Most instructors reported that being able to post the syllabus, send announcements, and post readings were very helpful. Likewise, Quarless (2007) noted that students and less experienced LMS faculty users most valued asynchronous communication tools and the ability to view or post basic content easily. In contrast, 24% of faculty in the Lonn and Teasley study (2009) felt that the ability to give online quizzes and exams was not valuable. Faculty also felt less favorable towards features like student peer review (Lonn & Teasley, 2009). Variation may be related to level of use. Laverty and colleagues (2012)

found that only 21% of faculty at one university would classify themselves as advanced users; most faculty only used a few features.

Research has found that faculty are motivated to use LMS for a variety of reasons, which may also help to explain why faculty in the Lonn and Teasley (2009) study had such mixed attitudes towards various LMS features. Alturki et al, (2016) found that faculty were primarily motivated by convenience and ease of use. Likewise, another study found that motivation to use LMS was shaped by anxiety over the time required, support, and perceived usefulness (Bousbahi & Alrazgan, 2015). These findings match with those of Lonn and Teasley (2009) in that the most highly regarded features assisted faculty with class management and organization. Woods and colleagues (2004) found that LMS use was simply a function of past use of the LMS. However, perceptions varied by at least one demographic trait; women had more positive views about the role of LMS in teaching (Woods et al., 2004). Rucker and Frass (2017) found no such differences in perceptions based on sex or years of teaching experience.

Another study of a university in Australia provided a contrasting viewpoint (Zanjani, Edwards, Nykvist, & Geva, 2016). During in-depth interviews, nearly 29% of instructors and 20% of students indicated that an instructor's active participation with students within the LMS was important for student engagement. Neither group felt that simply posting assignments or materials through the LMS was sufficient. More than a third of instructors felt that their course LMS environment needed materials and activities designed specifically for that environment (Zanjani et al., 2016). In contrast to the studies previously mentioned, these respondents seemed to value interaction and engagement over convenience.

Perceptions of changing LMS. There is limited research on the impact of a change in LMS on faculty. One example, detailed by Barr and colleagues (2007), occurred when three institutions in New Zealand were offered the opportunity to transition to Moodle. At the time, two of the three institutions were already using a proprietary LMS. Using interviews and focus groups, the authors found that instructors did not believe that they needed to change their teaching style as a result of the LMS switch. The instructors reported that they were satisfied by the new LMS primarily because it was user-friendly and granted them a great

deal of control over their courses (Barr et al., 2007). These views are consistent with both the perceptions of usefulness and perceptions of ease of use elements of TAM (Davis, 1985).

Another interview-based study by Ge and colleagues (2010) found that overall perceptions of a transition from one LMS to another were related to prior experience. Faculty who had more experience using the previous LMS adapted to the transition more quickly. This finding was replicated in a study of faculty at a university in Saudi Arabia (Alturki et al., 2016). Additionally, faculty in the Ge et al study (2010) were inclined to make comparisons between the new and old systems. Faculty with positive experiences in the past LMS were more open to the transition while those with more negative past experiences approached the new system with more caution or anxiety. Customization options were initially overwhelming for some faculty (Ge et al., 2010). However, later research found that the ability to customize LMS content not only made adhering to principles of effective teaching easier, but also increased faculty-perceived benefits of LMS use (Wang, Doll, Deng, Park, & Yang, 2013).

Some research has focused on the transition itself. Ryan and colleagues (2012), for example, found that most of their respondents were not frustrated about the change to a new LMS, but that only about 20% felt they were well-informed about the transition. West and colleagues (2007) observed several patterns in the process of faculty LMS adoption. First, faculty were more likely to use or experiment with one or two features before whole-scale inclusion into their courses. Second, challenges were common and faculty often needed encouragement from students, colleagues, and others. Third, more experienced users were more inclined to adapt or adjust existing features to their own particular teaching needs. Lastly, faculty were likely to reflect on their early experiences and use these as a basis for continuing or discontinuing their use of the LMS (West et al., 2007). While West et al (2007) focused on first-time adoption, similar patterns might occur for users changing from one LMS to another.

### **Hypotheses**

Drawing on the existing literature, this study tested the following hypotheses. Given limited and conflicting findings in past research, no a priori hypotheses are proposed regarding individual demographic or

academic characteristics. However, these traits are included as predictors in analyses.

- 1) Faculty with greater use of the former LMS will report more frequent and varied use of the new LMS.
- 2) Faculty with positive views of the former LMS will have more positive attitudes towards the transition and towards the new LMS.
- 3) Early adopters will report more frequent and varied use of the new LMS, more positive views of the transition, and more positive perceptions of the new LMS.

## **Method**

This study is based on analysis of an approximately 50-question, online survey with responses collected in Fall 2017. The survey addressed topics including use of the past and current learning management systems (LMS), perceptions of the features of these systems, feelings about the switch, as well as basic demographics. The survey was administered through the Qualtrics survey platform. All study procedures, including informed consent, were approved by the university's Institutional Review Board prior to implementation. Participation in the study was voluntary; no form of compensation was offered to participants. Respondents were required to be age 18 or older. The other requirement was that respondents had taught at least one course at the university. Respondents who failed to meet these requirements or did not agree to the terms of the informed consent document were screened out of the survey. Potential respondents included all teaching faculty at the university's central campus as well as the 19 campuses located elsewhere in the state. To distribute the survey, an email describing the study and a link to the study itself were sent to key representatives at each campus. These representatives forwarded the information through local listservs and similar lines of communication. In total, 289 individuals responded to the survey. One respondent did not agree to the informed consent terms, leaving a sample of 288. The sample is not representative of all teaching faculty at the university studied nor of college and university faculty more generally.

## Measures

**LMS use.** Respondents who reported using the past LMS were asked to indicate how often they used each of 16 key features available in the LMS. These included, among others, calendar, announcements, discussion boards, the LMS-integrated email system, quizzes, and teams. For each, respondents answered on a Likert scale ranging from 1 (very frequently) to 6 (never). These were reverse coded so that higher values indicated more frequent use. Items were averaged to create a mean frequency of use measure ( $\alpha = 0.86$ ). To address variety of features used, a count of the number of features used at least sometimes (i.e. excluding features indicated as “never” used) was calculated. This count was used to create a measure for the percentage of the 16 features used. Equivalent measures were calculated for current LMS use ( $\alpha = 0.94$ ). However, given the greater number of features available in the current LMS, there were 22 features included, such as data analytics, notifications, the phone app.

**Perceptions of LMS features.** Respondents were asked to indicate their perceptions of each of the features noted above, both for the former and current LMS. Respondents were presented with a Likert scale ranging from 1 (extremely positive) to 7 (extremely negative). An additional “don’t know” option was also provided; these responses were treated as missing in the creation of averages. Responses were reverse coded such that higher values indicate more positive feelings. These items were averaged to create a mean score ( $\alpha = 0.92$  for past LMS;  $\alpha = 0.94$  for current LMS).

**Feelings about switch.** Respondents were asked to indicate how they felt about the university’s switch to the new LMS. Respondents were presented with a Likert scale ranging from 1 (extremely positive) to 7 (extremely negative). Responses were reverse coded such that higher values indicate more positive feelings.

**Individual demographics.** Demographic controls include sex (male, female, other), race (White, Black, Asian, Other), ethnicity (Hispanic, not Hispanic), marital status (married, single, other), age (18-24, 25- 34, ..., 55-64, 65+), and whether the respondent holds a terminal degree in their field (ph.D. or professional degree).

**Academic characteristics.** Respondents were asked when they taught their first class using the new LMS, with response options ranging from Fall 2015 to Summer 2017. Higher values on the scale indicate earlier adoption. Respondents were asked to indicate their current academic title from a list of 19 possibilities, such as assistant professor, instructor, and so on. These categories were collapsed into tenured or tenure-line and other. As an open-ended question, respondents were asked to indicate the field in which they primarily teach. These were categorized as follows: Arts & Humanities; Engineering; Business & Information Sciences Technology; Education; Health, Human Development, Social Sciences; Mathematics & Natural Sciences; Other Field. Other academic-specific controls include number of classes taught in the current semester, years of teaching experience (< 1 year, 1- 5 years, 6- 10 years, ..., 21-25 years, 25+), and whether the respondent teaches at a commonwealth campus or some other campus.

## **Analysis**

Ordinary Least Squares (OLS) regression is used for all models. Unstandardized coefficients are displayed in tables. Predictors are added sequentially in groups. First, variables related to previous LMS use are added. Next, individual demographics are included. Finally, each table includes a model with all predictors included. Results of the open-ended question asking respondents about their concerns with changing to a new LMS were coded manually in a two-step process, following the recommendations of Strauss and Corbin (1998) in their interpretation of Grounded Theory. The authors first used an open coding process of reading each response and developing preliminary categories to match apparent themes. Each response could have multiple themes, as needed, to address all aspects of a respondent's answer. Responses were typically very brief, so most responses only included one or two key ideas. Many of the preliminary categories were also quite similar, so a second step in the coding process, also referred to as axial coding, involved combining or separating categories to create a parsimonious, yet still representative, coding of respondent answers (Strauss & Corbin, 1998); each response was still allowed to have multiple themes/ categories.

## Results

### Demographic Characteristics

Selected demographic, academic, and LMS-related characteristics of the sample are displayed in Table I for context. As shown, most respondents were female, married, and identified as White. Mean age fell between 35 and 54. Additionally, 60% of the sample reported an academic title that reflected a tenured or tenure-line position. Respondents reported more than 11 years of teaching experience, on average. Respondents were currently teaching about three classes; roughly 86% were teaching full-time. The overwhelming majority were teaching at commonwealth campuses. Most held terminal degrees in their respective fields. In terms of LMS use, respondents reported using a much greater percentage of current LMS features, on average, than past LMS features. This equated to a jump of more than 20%. However, mean perceptions of the features of the two systems were quite similar. Respondents felt, on average, more positively than negatively about the switch. Approximately 47% felt moderately or extremely positive about the change, while roughly 16% felt moderately or extremely negative about the change.

*Table I: Selected characteristics of sample (n = 288)*

Variable	N	Mean (SD)	Range
Age categorical	242	3.95 (1.05)	(2, 6)
Number of classes taught	249	2.96 (1.37)	(0, 8)
Years of teaching categorical	250	4.24 (1.67)	(1, 7)
Angel mean use frequency	228	3.45 (0.99)	(1, 6)
Current LMS mean use frequency	250	4.13 (1.13)	(0, 6)
Past LMS mean perceptions	224	5.27 (1.02)	(1, 7)
Current LMS mean perceptions	250	5.13 (1.13)	(1, 7)
Past LMS percent use	288	70.66 (26.20)	(0, 100)
Current LMS percent use	288	96.12 (8.91)	(0, 100)
Feelings about switching	253	4.92 (1.77)	(1, 7)
When switched	212	3.62 (1.27)	(1, 6)
Variable	N	Proportion	95% CI

Table I: Selected characteristics of sample (n=288), cont.

Sex		231		
	Male	90	0.39	(0.33, 0.45)
	Female	138	0.60	(0.53, 0.66)
	Other	3	0.01	(0.00, 0.04)
Marital Status		211		
	Single	37	0.18	(0.13, 0.23)
	Married	161	0.76	(0.70, 0.82)
	Other marital status	13	0.06	(0.04, 0.10)
Race and ethnicity		223		
	White	199	0.89	(0.84, 0.93)
	Black	3	0.01	(0.00, 0.04)
	Asian	10	0.45	(0.02, 0.08)
	Other race	7	0.03	(0.01, 0.06)
	Hispanic	7	0.03	(0.01, 0.06)
Rank		248		
	Tenured or tenure-line	149	0.60	(0.53, 0.66)
	Other	99	0.40	(0.34, 0.46)
Where teaches		251		
	Commonwealth campus	211	0.84	(0.79, 0.88)
	Other campus or online	40	0.16	(0.12, 0.21)
Full time		250		
	Yes	216	0.86	(0.82, 0.90)
	No	34	0.14	(0.10, 0.18)
Terminal degree		248		
	Yes	158	0.64	(0.57, 0.69)
	No	90	0.36	(0.31, 0.43)

Notes: SD refers to standard deviation. CI refers to confidence interval.

## Regression Models

Table II displays results of OLS regression models predicting current LMS use. The first panel uses percent of features used as the outcome, while the second panel uses mean frequency of use as outcome. For both, positive coefficients indicate that an increase in the given predictor is associated with an increase in use. In regards to percent of features used, results show that early adopters reported a greater number of features used. Adopting the LMS one semester earlier was associated with using about one additional feature (0.98), on average. Those teaching at commonwealth campuses were also using a greater number of features. Teaching at a commonwealth campus was associated with using nearly five (4.75) additional features compared to those teaching at the central campus. A marginal effect among the dummy variables for field also suggests that there may be some variation by discipline; social science faculty reported greater LMS use than engineering faculty (the reference

group). Overall, results show no significant associations with individual demographics or with most academic characteristics. Similar results surface in the second panel of models predicting mean frequency of use. Early adopters and those who used the previous LMS more frequently in the past were more likely to report a higher frequency of current LMS use than other respondents. In these models, no individual or academic characteristics were associated with use.

Table II: OLS regression predicting current LMS use

Predictor	Percent of current LMS features used			Mean frequency current LMS use		
	n = 198	n = 159	n = 154	n = 198	n = 159	n = 172
% past LMS features used	0.08 (0.07)	-0.00 (0.06)	0.00 (0.06)	-0.01 (0.01)	-0.02 (0.01)	-0.02 (0.01)
Mean frequency past LMS use	-1.71 (1.58)	0.03 (1.60)	0.38 (1.66)	0.28 (0.21)	0.54* (0.25)	0.59* (0.27)
Timing of LMS switch	0.80+ (0.48)	0.74+ (0.44)	0.98* (0.46)	0.10+ (0.06)	0.12+ (0.07)	0.13+ (0.07)
Age		-0.20 (0.57)	-0.57 (0.73)		-0.06 (0.09)	-0.04 (0.12)
Male		-0.31 (1.21)	0.25 (1.29)		-0.19 (0.19)	-0.12 (0.21)
Single		-0.87 (1.54)	-1.72 (1.59)		-0.12 (0.24)	-0.27 (0.26)
Other marital status		-0.97 (2.58)	-1.04 (2.66)		0.14 (0.40)	0.01 (0.43)
White		-2.07 (3.26)	-2.17 (3.32)		0.24 (0.51)	0.08 (0.53)
Asian		-0.13 (4.13)	-0.35 (4.15)		0.30 (0.65)	0.24 (0.67)
Hispanic		1.40 (4.43)	-0.85 (4.71)		0.75 (0.69)	0.24 (0.76)
Terminal degree		0.45 (1.18)	2.15 (1.55)		-0.00 (0.18)	0.15 (0.25)
Full-time			-2.57 (1.92)			-0.27 (0.31)
Number of classes			-0.01 (0.47)			0.05 (0.08)
Years of teaching			0.25 (0.48)			-0.05 (0.08)
Tenured or tenure-line			-1.19 (1.56)			-0.00 (0.25)
Commonwealth campus			4.75** (1.64)			0.36 (0.26)
Arts, humanities, communication			3.01 (2.21)			0.27 (0.35)
Business, IST			2.82 (2.42)			-0.11 (0.39)
Education			2.67 (3.06)			0.28 (0.49)
Social sciences, health, human dev.			3.83+ (2.41)			0.15 (0.36)
Math & natural sciences			2.58 (2.14)			-0.18 (0.34)
Other field or specialty			7.19 (5.60)			1.15 (0.76)
Constant	99.89** (2.55)	96.08** (4.53)	89.64** (5.60)	3.27** (0.40)	2.99** (0.71)	2.78** (0.90)

Notes: \*\* p<0.01. \* p<0.05. + p<0.10. Standard errors displayed in parentheses.

Table III displays results of OLS regression models predicting perceptions about the current LMS. The first panel uses mean perceptions of current LMS features as the outcome, while the second panel uses feelings about the switch to the current LMS as outcome. For both, positive coefficients indicate more positive feelings. Regarding mean perceptions of features, results show that early adopters and those with more positive perceptions of features in the past LMS had more positive views of features in the current LMS. Each one-unit increase in perceptions of features in the past LMS was associated with a 0.26-unit increase in perceptions of the current LMS. Adopting the new LMS one semester earlier was associated with a 0.16 increase in perceptions of the current LMS. In these models, no individual or academic characteristics were associated with use. In regards to feelings about the transition, early adopters reported feeling more positively. Single individuals had marginally more negative feelings about the switch than married individuals.

Table III: OLS regression predicting feelings about current LMS and switch to current LMS

Predictor	Mean perceptions of current LMS features			Feelings about switch		
	n = 196	n = 157	n = 153	n = 196	n = 157	n = 153
Mean perceptions of past LMS	0.12 (0.08)	0.26** (0.09)	0.26* (0.10)	-0.43** (0.12)	-0.26+ (0.14)	-0.24 (0.15)
Mean frequency past LMS use	0.10 (0.08)	0.11 (0.10)	0.16 (0.12)	0.21+ (0.12)	0.04 (0.14)	0.12 (0.17)
Timing of LMS switch	0.12+ (0.06)	0.16* (0.07)	0.16* (0.08)	0.30** (0.10)	0.39** (0.10)	0.42** (0.11)
Age		-0.13 (0.09)	-0.11 (0.12)		-0.10 (0.14)	-0.00 (0.18)
Male		-0.20 (0.19)	-0.13 (0.21)		-0.53* (0.27)	-0.43 (0.30)
Single		-0.24 (0.24)	-0.41 (0.26)		-0.43 (0.35)	-0.65+ (0.38)
Other marital status		-0.14 (0.40)	-0.05 (0.42)		0.47 (0.58)	0.43 (0.62)
White		0.20 (0.50)	0.10 (0.53)		0.35 (0.73)	0.43 (0.77)
Asian		0.21 (0.63)	0.18 (0.65)		0.65 (0.92)	0.82 (0.96)
Hispanic		0.57 (0.68)	0.15 (0.74)		1.27 (0.99)	0.96 (1.09)
Terminal degree		-0.05 (0.18)	0.13 (0.25)		-0.28 (0.26)	0.05 (0.36)
Full-time			-0.20 (0.31)			-0.16 (0.45)
Number of classes			0.02 (0.08)			-0.06 (0.11)
Years of teaching			-0.05 (0.08)			-0.12 (0.11)
Tenured or tenure-line			-0.06 (0.25)			-0.24 (0.37)
Commonwealth campus			0.38 (0.26)			0.18 (0.38)
Arts, humanities, communication			0.36 (0.34)			0.57 (0.51)
Business, IST			-0.01 (0.38)			-0.05 (0.56)
Education			0.45 (0.48)			0.49 (0.71)
Social sciences, health, human dev.			0.12 (0.36)			0.17 (0.52)
Math & natural sciences			-0.09 (0.33)			0.39 (0.49)
Other field or specialty			0.94 (0.76)			1.17 (1.12)
Constant	3.73** (0.55)	3.32** (0.77)	3.00** (0.96)	5.58** (0.81)	5.46** (1.11)	4.90** (1.41)

Notes: \*\* p<0.01. \* p<0.05. + p<0.10. Standard errors displayed in parentheses.

One commonality across the models in Tables II and III was that timing seemed to be a key factor in perceptions and use. Table IV displays results of exploratory OLS regression models predicting timing of the switch. Here, a positive coefficient indicates that the predictor is associated with earlier adoption of the current LMS. As shown, those who had more positive perceptions of the past LMS made the switch later than others who felt more negatively towards the past LMS. Older respondents were more likely to be early adopters. Those with more classes were marginally more likely to be early adopters as well.

Table IV: OLS regression predicting timing of LMS switch

Predictor	n = 196	n = 157	n = 153
Mean perceptions of past LMS	-0.20* (0.09)	-0.30** (0.11)	-0.34** (0.11)
Mean frequency past LMS use	0.07 (0.10)	0.07 (0.11)	0.04 (0.13)
Age		0.25* (0.11)	0.36* (0.14)
Male		-0.06 (0.22)	-0.12 (0.24)
Single		0.04 (0.28)	0.08 (0.30)
Other marital status		-0.64 (0.47)	-0.56 (0.49)
White		0.71 (0.59)	0.58 (0.61)
Asian		0.89 (0.74)	0.85 (0.76)
Hispanic		0.36 (0.80)	0.38 (0.86)
Terminal degree		0.11 (0.21)	-0.01 (0.28)
Full-time			0.11 (0.35)
Number of classes			0.15+ (0.09)
Years of teaching			-0.08 (0.09)
Tenured or tenure-line			0.30 (0.29)
Commonwealth campus			-0.09 (0.30)
Arts, humanities, communication			-0.37 (0.40)
Business, IST			-0.37 (0.44)
Education			0.14 (0.56)
Social sciences, health, human development			-0.21 (0.41)
Math & natural sciences			-0.05 (0.39)
Other field or specialty			0.61 (0.88)
Constant	4.46** (0.53)	3.27** (0.86)	3.23** (1.08)

Notes: \*\* p < 0.01. \* p < 0.05. + p < 0.10. Standard errors displayed in parentheses.

**Qualitative Results**

Results of the open-ended question asking respondents to indicate their concerns about switching to a new LMS are displayed in Table V. For parsimony, only the top 10 most common themes from respondent answers are displayed. Respondents could list as many concerns as they preferred, though no respondent had more than three main ideas in their answer. As shown, the most common concern, expressed by 23% of respondents, was the time and effort involved in making the switch.

*Table V: Respondent-reported concerns about switching to a new learning management system (n = 173)*

<b>Concern</b>	<b>Percent of respondents</b>
Time and effort to switch	23.1%
Learning the basics	22.5%
Importing material from past LMS	11.0%
Will same features be available?	10.4%
Instructor difficulty with use	9.8%
Having to make a change	8.7%
None	8.7%
Possibility of errors in new LMS	5.8%
Will new LMS be user friendly? (student or instructor)	5.8%
Email options	5.2%

Note: Respondents could report multiple concerns

For example, one respondent wrote that they were concerned about the “time needed to transition course materials and learn the ins and outs of a new system while working a more than full-time job as educator and administrator.” Similarly, another respondent wrote that their concerns regarded “uncompensated work for which no additional time is afforded me.” Faculty at the university were not offered course buyouts, financial compensation, or any other incentives for re-developing their courses in the new LMS.

The second most commonly reported concern, reported by 22% of respondents, was anxiety, dread, or fear of learning the basics of the new system. For example, one respondent wrote that a concern was “learning it at a pace not my own (I attended workshops that were little help since we were all figuring things out a different speed).” Another respondent wrote simply: “Just the learning curve of having to learn and use a whole new system.” These responses seemed to focus on the learning curve or process rather than strictly the time or effort involved. The third most

common concern, noted by 11% of respondents, was with importing content from the past LMS to the current LMS. One respondent, for instance, reported “the inconvenience of transferring items over” as a concern. Another respondent questioned “would my course material transfer easily and whether the interface would be simple to acquire.” As shown by these two examples, respondents with this concern focused on issues of convenience, or seamlessness, between the two systems.

Lastly, the fourth most common response theme, reported by 10% of respondents, was whether the same features would be available in the current LMS as were available previously. For instance, one respondent wrote of concerns regarding “the ability to have the same analytics for student participation and engagement...” Some respondents were not quite as specific, but reported similar concerns. One respondent wrote that “it does not do some of the things that [past LMS] did that I used in my courses. This has forced me to change my teaching style.”

## Discussion

This study investigated the impact of a university’s transition to a new LMS on teaching faculty. As hypothesized, faculty who used the previous LMS more frequently reported more frequent use of the new LMS. Neither frequency of past LMS use nor number of features used in the past system were associated with the variety of features used in the new system. Also as hypothesized, perceptions of past LMS features were positively associated with perceptions of current LMS features. There was no association between perceptions of the past LMS and feelings about the transition. Results fully supported the third hypothesis that early adopters would report more frequent and varied use of the new LMS, more positive views of the transition, and more positive perceptions of the new LMS. The top-reported concerns of respondents about the transition were the time and effort involved, difficulty in learning the basics, ability to import content from one LMS to another, and ability to use the same features.

Like Rucker and Frass (2017), this study found that neither demographic traits nor academic characteristics were associated with use of the new system, perceptions of the new system, or feelings about the transition. Yet, some interesting exceptions to this pattern emerged. First, faculty from commonwealth campuses reported substantially more varied use of

the new LMS than faculty from the central campus location. While this finding may be partially due to the small percentage of the sample originating from the central campus, another possibility is training offered. The university offered some training opportunities to faculty across campuses using a combination of face-to-face and remote access options. However, representatives from each campus also offered and encouraged local training opportunities. This resulted in a great deal of variability in support and training from campus to campus. Training opportunities could affect perceptions of ease of use, one of the three intervening variables suggested by TAM (Davis, 1985) as impacting user adoption of technology.

Another possibility could be cultural and organizational differences. In the late 1990's Nickerson and Schaefer (2001) analyzed data from a national survey of branch campus administrators. Results indicated that branch campuses had a significantly higher ratio of part-time to full-time faculty, more female faculty, more junior faculty, and a greater emphasis on teaching experience in the hiring process than their main campuses. In a case study of a rural branch campus, Wolfe and Strange (2003) found that the campus' small size meant that faculty had to take on multiple roles, that faculty sometimes felt isolated (small departments), but also that faculty felt more collegial as a whole. Participants also acknowledged the primacy of teaching in institutional mission (Wolfe & Strange, 2003). These differences in campus climate may not have been captured by other demographic or academic predictors in the present study. Further, they may relate to perceptions of subjective norms, or pressures to adopt certain technologies, another intervening variable suggested by TAM (Davis, 1985).

Other interesting demographic trends emerged in examination of the timing of the LMS transition. As noted previously, faculty transitioned over a two-year period. Even after controlling for past LMS use and perceptions, older respondents and those teaching more classes were more likely to be early adopters. The Pew Research Center (2014), however, found that technology use and comfort increased fairly linearly with generation group, meaning that younger individuals are more comfortable with technology. In line with this idea, Georgina and Hosford (2009) found that those with less than five years of teaching experience were more comfortable with the newest technologies than other faculty. Thus, it is somewhat surprising that older respondents were

more inclined to be early adopters. However, plans to change to a new LMS began roughly five years before the actual transition itself. As a result, older respondents or those with more teaching experience may have had more time to become aware and comfortable with the upcoming transition. Teaching, research, and service responsibilities also vary by career status. It is possible that the time and effort involved in adopting the new LMS carried a different meaning for older and younger respondents.

The finding that those teaching more classes were more likely to be early adopters is not surprising given prior literature. Respondents in the study by Alturki et al (2016), for instance, found that faculty were primarily motivated by convenience and ease of use. For faculty teaching many classes, rather large or small, time management is essential. The LMS adopted by the university examined in the present study was largely billed as a time-saving software, which may have been especially appealing for these faculty. Indeed, Lonn and Teasley (2009) determined that the most highly regarded features in a LMS were those that assisted faculty with class management and organization.

A related finding of interest in the present study was that timing of the switch was positively associated with use of the new LMS as well as perceptions of the new LMS. This finding matches the process of adoption noted by West and colleagues (2007). West et al (2007) found that faculty were more likely to use or experiment with one or two features before whole-scale inclusion into their courses. More experienced users were more inclined to adapt or adjust existing features to their own particular teaching needs (West et al., 2007). In line with these observations, the present study found that early adopters, who consequently had more time to adjust to and use the new LMS, used a greater variety of features and reported more positive perceptions of the LMS features. Thus, the findings of West et al (2007) for first-time LMS users seem to parallel those for faculty transitioning from one LMS to another.

Results of the present study differed in some respects from the work of Ge and colleagues (2010). Ge et al (2010) found that faculty with positive experiences in a past LMS approached the transition more openly. The current study found that those with more positive views of the past LMS were less likely to be early adopters. Prior to the addition

of academic controls, more positive perceptions of the previous LMS were also associated with more negative feelings about the transition. Together, these trends suggested resistance to the new LMS, even among those with positive past experiences. This difference in results highlights the importance of university context and culture, a key direction for future research in this area.

## **Directions for Future Research**

Future research may benefit from a more detailed examination of university history and context. It is currently unknown to what extent previous software or LMS transitions might affect the way faculty perceive the current transition. Educause found that universities had been using their existing LMS for eight years, on average, but that nearly a fifth of universities had plans to change LMS in the next three years (Dahlstrom et al., 2014). Thus, more experienced faculty (10+ years) may encounter more than one LMS change over the course of their careers. Additionally, it is unknown how university characteristics might shape faculty perceptions. The present study found differences between campuses, but could not identify the precise reasons for these variations. A multi-university study may be able to account for other factors such as campus size, class sizes, part-time to full-time ratio of faculty, student demographics served, concurrent changes occurring at the institution, etc. Factors like these may explain inconsistency across the extant literature, which is composed largely of single-institution studies.

A second area that may prove fruitful for future research would be to examine the possible difference in impact between all-at-once LMS changes versus more gradual change. The university examined in the present study opted for a gradual change over a two-year period. It is unknown to what extent faculty perceptions or concerns might differ if the university had, instead, required all faculty to change to the new LMS at the same time. Conversely, it is also unclear whether a more gradual transition (i.e. three years) poses any advantage over a shorter transition period. Differences in the structure of the transition have the potential to impact perceptions of LMS usefulness or ease of use (Davis, 1985) since a longer transition period gives faculty more opportunity to become familiar with features and engage in training opportunities.

## Practical Implications

One practical consideration is related to differences found between commonwealth and main campus respondents. Students may have very specific reasons for choosing a branch or commonwealth campus. Hoyt and Howell (2012), for instance, found that students identified ease of scheduling, class size, convenience of location, and personal attention as key reasons for attending a branch campus. However, responses varied among adult learners, traditional-age undergraduates, and other student types (Hoyt & Howell, 2012). About half of the faculty in the Nickerson and Schaefer (2001) study reported that student characteristics were at least somewhat influential in their choice to teach at a branch campus. As these findings indicate, universities adopting a LMS may find that a one-size-fits-all approach is inappropriate. Faculty at different campuses may gravitate towards different features, may need more time for the transition, may serve different student demographics, and may benefit from training specific to these demands.

Training itself was a second practical implication identified in the present study. Nearly a quarter of respondents expressed that learning the new system was a major concern. Many more identified other concerns that could be addressed through training including importing material from one system to another and feature availability. Few respondents expressed concern over the student-side experience. Rather, faculty were worried about their own ability to master the system. Results further indicated that faculty who had been using the system for a longer period of time were also more inclined to use a greater variety of LMS features, suggesting that advanced use takes time. Together, these results highlight the importance of early (well before LMS implementation), concurrent (during implementation), and follow-up training for teaching faculty.

Lastly, the results of this study indicate that younger faculty, and faculty with less teaching experience, are not necessarily more comfortable using or changing to a new LMS than other faculty. While it is often assumed that younger generations are more technology adept because of growing up with many available technologies, there is a difference between being familiar with a technology and using that technology effectively. While the results of this study indicate change in number of features used, further study is needed to determine whether those additional features are being used optimally, whether there is true benefit

to students, and whether there is improvement to instruction as a result of increased use.

## **Limitations**

This study had several limitations. Response rates were low. Views of faculty members who chose to participate may not be representative of all teaching faculty at the institution. Further, the sample is not representative of all teaching faculty across U.S. colleges and universities as a whole. The survey was cross-sectional. Changes in views over time could not be assessed. Results may also be subject to recency bias, meaning that respondents' memories of their past concerns, use, or perceptions may be skewed by their most recent experiences with the current LMS. Lastly, due to a small sample, detailed examination of subgroup differences, such as across fields of expertise, was not feasible.

## **Conclusion**

The present study examined how teaching faculty perceived the change to a new LMS, how LMS use changed from one system to the next, and the demographic and academic characteristics associated with these trends. Using self-report data from a public university in Pennsylvania, the study found that faculty perceptions and use of the new LMS were shaped, but not fully determined, by their experiences with the previous LMS. Early adopters reported more frequent and varied use of the new LMS, more positive views of the transition, and more positive perceptions of the new LMS. Respondents expressed transition concerns including time and effort involved, difficulty in learning the basics, ability to import content from one LMS to another, and ability to use the same features. Results revealed different levels of use between the commonwealth and main campuses. Differences by age were also observed. As a whole, results pointed to the importance of faculty training and the consideration of campus context.

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