

# Crossing the divide: student and staff responses to changing an institutional learning management system

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Learning management systems (LMSs) are a ubiquitous feature of the higher education landscape. As with any other technological system, change in LMSs is inevitable as advances in computer and communication technologies render older systems obsolete. In this paper we respond to the call for more research on the impacts of LMS change by documenting a relatively large scale and finely grained quantitative investigation of the changes in user perceptions (both students and academic staff) of the functions of an institutional LMS across the period of transition to a new system between 2011 and 2012. We address the question, “Did the new LMS dramatically change the student and staff experience of using the system?” To a large extent, the answer is, “No”. The median absolute difference between all 2011 and 2012 mean ratings (as a percentage of the 2011 rating) was only 0.21 % for students and 0.26 % for staff.

Keywords: learning management system, LMS change, staff and student evaluation

## Introduction

While particular definitions may differ (Ryan, Toye, Charron & Park, 2012) and specific appellations may vary (course management system, virtual learning environment, etc.) (McConachie, Danaher, Luck & Jones, 2005), learning management systems (LMSs) are a ubiquitous feature of the higher education landscape (Browne, Jenkins & Walker, 2006). An LMS is one of the largest purchases an institution will make in the provision of online learning, and the choice of system is necessarily an important decision (Petherbridge & Chapman, 2007) and often a key rhetorical element in institutional strategic positioning (Tickle, Muldoon & Tennent, 2009). From time to time institutions change their LMSs, and various reasons might be cited as the driver for such change (Ryan et al., 2012). Articulated reasons for change may include strategic rationales – improving online teaching and learning (Chao, 2008); gaining a competitive edge through innovation (Danaher, Luck & McConachie, 2005); establishing new directions for teaching and learning (McConachie et al., 2005; Tickle et al., 2009); or a move to open source systems (Beatty & Ulasewicz, 2006). However, the reasons for change may also be more prosaic – the expiry of the current contract with a system supplier (Draude, Clayton & Brinthaup, 2009); improving the efficiency of back-office work (Benson & Palaskas, 2006); consolidating multiple existing institutional LMSs (Smart & Meyer, 2005; Tickle et al., 2009); or the vendor of the current institutional LMS being acquired by a competitor (Petherbridge & Chapman, 2007). Whatever the specific reason(s) at a particular point in time for a change of LMS, one thing is certain, as with any other technological system, change in LMSs is inevitable as advances in computer and communication technologies render older systems obsolete (Draude et al., 2009; Petherbridge & Chapman, 2007; Ryan et al., 2012). Changing LMS platform is a frequent consideration in higher education (Instructional Technology Council, 2011) and changing an institutional LMS is a major undertaking (Rubin, 2007). An important element of implementing any new educational technology is evaluation of the impact and success of the change (Benson & Palaskas, 2006; Chao, 2008). However, change management in educational technology is still relatively new as a headline issue (Draude et al., 2009). We undertook a review of the literature and discovered only limited published research on the evaluation of LMS change. Some evaluations involved only relatively small numbers of staff (Ge, Lubin & Zhang, 2010; Ryan et al., 2012; Smart & Meyer, 2005), others were larger but still included less than 100 staff respondents (Draude et al., 2009; McConachie et al., 2005), and only one addressed student perspectives of LMS change (n=128) (Petherbridge & Chapman, 2007). There is a need for more research on the impacts of LMS change (Draude et al., 2009), and given that students are the predominant users of LMSs, there is a particularly important need for more investigation of the student perspective of LMS change (Petherbridge & Chapman, 2007).

In Australia, Deakin University is a major provider of distance and online education. In addition, it teaches on-campus at four campuses located in three cities in the State of Victoria. Iterating through a number of commercial learning management systems (LMSs), the university eventually settled on the WebCT LMS in

2003, branding it internally as Deakin Studies Online (DSO). The new LMS was trialled in 2003, and fully implemented in 2004. Concurrently, the university introduced policies requiring academic departments to migrate all online learning activity to the centrally supported LMS. Since that time, the LMS has been supplemented with a range of satellite technologies including, synchronous communications, lecture recording and streaming, plagiarism detection, etc. Another key initiative in the university's strategy to expand its online and distance education profile was to require that, from 2004, all of its units of study have at least a basic online presence. Additionally, from 2004, all students enrolled in Deakin University undergraduate courses had to undertake at least one unit in wholly online mode. In early 2006, WebCT was acquired by Blackboard Inc., leading to the phasing out of new development and support for the WebCT LMS. In 2010, following the expiry of the existing LMS licence, Deakin University selected the Desire2Learn LMS as the replacement system for the WebCT/Blackboard LMS, and during 2011 commenced a phased cut-over to the new system, migrating content and users throughout the year so that by the first teaching period in 2012 all online support for teaching and learning was provided via the new LMS.

In 2003, a pilot survey of students and staff using DSO was conducted to establish perceptions of importance and satisfaction with various functions of the LMS. After the full mainstreaming of DSO in 2004, the survey instrument was revised, and the survey process was expanded to include all Deakin University students and staff, and repeated again in 2005. Following the commitment to move to the new LMS, an evaluation plan was developed to assess a number of aspects of the implementation project, including the re-introduction of the DSO evaluation surveys (last employed in 2005) as a measure of student and staff satisfaction with the 'new' DSO (Holt, Palmer & Dracup, 2011). In 2011, a revised DSO evaluation survey was developed and administered to all students and staff. Crucially, the set of question items relating to use and perception of the core functions of the LMS was largely common with the previous surveys run in 2004 and 2005. The findings from this longitudinal research series have been reported previously (Palmer & Holt, 2010, 2012, in print). The 2011 DSO evaluation survey provided a measure of the then state-of-play with the current (and soon to be retired) LMS, and it also provided a baseline benchmark measure against which the new LMS could be compared to. Across the period 2004-2011, both student and staff mean ratings of importance and satisfaction with a wide range of LMS functions generally increased, suggesting an increasingly positive engagement with the LMS over time (Palmer & Holt, in print). The achievement of a high level of overall satisfaction in 2011 begged the question; could such a high level of reported student and staff satisfaction be sustained through the migration to the new LMS? Following the full implementation of the new LMS in 2012, the DSO evaluation survey was run again for all students and staff, and contained the same core set of questions as the 2011 survey. We acknowledge that the change of the institutional LMS system represented both a change between system vendors and a change to a next generation LMS. However, the essential functions offered by both systems were virtually identical, such that the same survey instrument could be used with only very minor changes.

In this paper we respond to the call for more research on the impacts of LMS change by documenting a relatively large scale and finely grained quantitative investigation of the changes in user perceptions of the functions of an institutional LMS across the period of transition to a new system. We cover staff perceptions and, addressing the specifically identified need for additional research on the impact of LMS change on students, also include a large survey of student perceptions. Importantly, the same perception survey instrument is used before and after the system change, and for both student and staff respondent groups, highlighting the comparative experience of the LMS change between both key system user groups. Additionally, we gauge LMS user perceptions in a multidimensional way by collecting ratings of both importance of, and satisfaction with, a wide range of LMS functions. Did the new LMS dramatically change the student and staff experience of using the system? We probe through the rhetoric and reveal the reality.

## **Methodology**

Details of the student and staff 2011 DSO evaluation surveys, their methodology, respondent samples and results have been presented previously (Palmer & Holt, in print). In both 2011 and 2012, all versions of the DSO evaluation survey sought responses from students and staff relating to:

- demographic and background information;
- perception of importance and satisfaction with a range of LMS functions;
- a number of overall LMS satisfaction measures; and
- open-ended written comments about the LMS.

We use the demographic information obtained to test whether the sample respondent groups were representative of the overall populations of interest. The 2011 and 2012 student surveys contained items relating to 20 common

LMS functions for which respondents were asked to indicate both their rating of importance and their level of satisfaction using ordinal response scales. A response scale of 1 – 5 was used in both 2011 and 2012. The 2011 and 2012 staff surveys contained the same 20 common LMS functions as the student surveys, plus two additional items relating to the development of online learning resources. Staff were asked to respond in the same manner as students. The 20 common LMS functions on the student surveys, plus the additional two functions on the staff surveys were:

1. Accessing unit guide and other unit information
2. Accessing unit lecture, tutorial or lab notes etc.
3. Interacting with unit learning resources
4. Using the unit calendar
5. Reading unit announcements
6. Contacting teachers via internal unit messaging
7. Contacting students via internal unit messaging
8. Reading contributions to online discussions
9. Contributing to online discussions
10. Completing online quizzes/tests
11. Submitting assignments
12. Receiving feedback on assignments
13. Working collaboratively in a group
14. Reviewing unit progress
15. Using the e-portfolio
16. eLive synchronous communication session
17. iLecture class lecture recording
18. Other iLecture recording – podcasts, etc.
19. Deakin's social software – MediaWiki, etc.
20. Turnitin plagiarism detection

plus the following two functions for staff only:

21. Deakin's Learning Repository – Equella
22. Respondus online quiz authoring tool

Given the changes in the student and staff populations between 2011 and 2012, it was not possible to track the same cohort of specific respondents. Instead, we sought a representative sample of the student and staff population in each year/survey. We compare the ratings of importance and satisfaction for each of the 20/22 LMS functions in 2011 and 2012, for both students and staff, and identify any statistically significant differences between them. We also present the results of this analysis visually. While they form a valuable data set in their own right, the overall satisfaction and open-ended written comment data are not specifically addressed in detail here due to practical space limitations.

A definitive indication of the significance of the differences between the mean ratings for a survey item between 2011 and 2012 for a particular respondent group (students or staff) is obtained from an analysis of variance (ANOVA) test. While the simpler *t*-test of means would produce the same results, we use the ANOVA test here as it yields some additional information used in the analysis of the data. A requirement for the ANOVA test is that the variation of the mean rating be similar in all groups under test. Where Levene's test of homogeneity of variance failed, a robust ANOVA test using the Welch test statistic was performed instead. We acknowledge that the ratings provided by respondents here are fundamentally ordinal in nature. The use of ordinal data in many parametric statistical procedures, while commonplace in the social sciences, is not universally accepted as valid. However, there is a significant body of research that has demonstrated the practical utility of analysis of ordinal data, based on the robustness of many statistical methods to significant departures from assumptions about the underlying data, including departures from normality and 'intervalness' that might be present in ordinal scale data (Jaccard & Wan, 1996; Norman, 2010). In all statistical analysis, a two-sided significance level of  $p < 0.01$  was used. A discussion of the observed results is also presented. As required by Deakin University human research ethics procedures, all of the surveys were anonymous and voluntary.

## Results and discussion

### Sample and demographic information

Table 1 presents a summary of the response rates obtained in the 2011 student and staff DSO evaluation surveys. The demographic match between the sample and population for both groups was generally very good across the demographic dimensions available for comparison. The full demographic comparisons have been detailed elsewhere (Palmer & Holt, in print). For the 2012 DSO evaluation surveys, a range of demographic information was available for the overall Deakin University student and staff populations, as well as collected as part of the surveys, including gender, enrolled faculty, enrolled campus and duration of current enrolment for students, and, gender, age range and home campus for staff. This permitted a comparison between the respondent sample and the overall population for both students and staff, as presented in Table 2.

**Table 1: Response summary for 2011 student and staff DSO evaluation surveys**

Group	Enrolled population	Respondent sample	Response rate
Students	22760	1353	5.95%
Staff	2126	263	12.37%

**Table 2: Response rate and demographic information for 2012 DSO evaluation survey**

	Students		Staff	
	Sample	Population	Sample	Population
<b>No. of respondents</b>	1710	24805	330	2291
<b>Response rate</b>	6.89%	—	14.40%	—
<b>Gender</b>				
Female	70.5%	59.9%	61.8 %	59.8 %
Male	29.5%	40.1%	38.2 %	40.2 %
<b>Faculty</b>				
Arts and Education	30.5%	31.3%	33.0%	24.3%
Business and Law	26.6%	35.1%	20.3%	20.6%
Health	26.3%	20.1%	32.4%	37.8%
Science & Technology	15.6%	13.5%	13.3%	13.9%
Other	1.1%	— †	0.9%	3.3%
<b>Campus ‡</b>				
Burwood	42.0%	49.8%	—	—
Waurnd Ponds	14.3%	12.5%	—	—
Waterfront	7.3%	6.0%	—	—
Warrnambool	4.4%	3.0%	—	—
Off-campus	32.1%	28.7%	—	—
<b>Mean enrolment duration §</b>	2.33 (1.48) years	2.22 (1.63) years	—	—
<b>Age range</b>				
<25	—	—	1.5%	2.7%
25-29	—	—	7.0%	6.5%
30-34	—	—	9.7%	12.2%
35-39	—	—	9.4%	13.7%
40-44	—	—	15.8%	14.1%
45-49	—	—	19.1%	14.5%
50-54	—	—	14.5%	14.2%
55-59	—	—	11.8%	11.6%
60-64	—	—	5.8%	7.5%
>64	—	—	5.5%	2.9%

† Respondents were given the option to nominate 'Other' for their home Faculty, but the student population data does not contain this option.

‡ Campus location was not available in the student population data – here the general 2010 Deakin University student enrolment campus location data are used as a comparison.

§ Standard deviation given in parenthesis.

The online system used for the administration of the survey saved all progressive responses entered, resulting in differential response rates for different sections of the survey. The response rates given above are those obtained for all fully completed surveys. Higher response rates were obtained for some sections of the surveys, and the most complete relevant data set available was used in the analyses below. Although the response rates obtained for both students and staff in both years were comparatively low, they were not unexpected for an online voluntary survey (Cook, Heath & Thompson, 2000). The generally good match between the sample and population demographic characteristics in both groups in both years, and the relatively large absolute numbers of respondents, suggests that we can have some confidence in drawing more general inferences from the respondent data for the Deakin University context.

### Importance-satisfaction analysis

In both 2011 and 2012, the DSO evaluation survey asked respondents to rate the importance of, and their satisfaction with, a range of functions of the LMS at Deakin University. A rating scheme of 1 – 5 was employed. For both importance and satisfaction a ‘not applicable’ option was also provided to permit respondents not using a particular function to avoid having to provide a contrived rating. Table 3 provides a summary of the mean student responses for the importance and satisfaction ratings for both 2011 and 2012, with the standard deviation of the mean ratings shown in parenthesis. Table 3 also shows the associated statistical significance test result based on the appropriate ANOVA test of the difference in mean ratings between 2011 and 2012, with significant results ( $p < 0.01$ ) indicated in bold. Table 4 shows the same data for the staff surveys.

**Table 3: Mean student importance and satisfaction ratings for 2011 and 2012**

LMS function (Importance and Satisfaction)	Mean rating (1-5) (Std. dev. in brackets)		Statistical significance of difference 2011-2012
	2011	2012	
1.Accessing unit guide & other unit information (Imp)	4.72 (0.63)	4.72 (0.60)	$F(1,3096)=0.18 p>0.669$
1.Accessing unit guide and other unit information (Sat)	4.13 (0.87)	4.10 (0.92)	$F(1,3095)=0.97 p>0.323$
2.Accessing unit lecture, tutorial or lab notes etc. (Imp)	4.81 (0.51)	4.83 (0.51)	$F(1,3056)=0.78 p>0.376$
2.Accessing unit lecture, tutorial or lab notes etc. (Sat)	3.90 (0.98)	3.88 (1.08)	$F(1,2970)=0.16 p>0.686$
3.Interacting with unit learning resources (Imp)	4.43 (0.80)	4.44 (0.78)	$F(1,3073)=0.28 p>0.594$
3.Interacting with unit learning resources (Sat)	3.73 (0.96)	3.70 (1.04)	$F(1,2967)=0.42 p>0.518$
4.Using the unit calendar (Imp)	2.91 (1.40)	2.93 (1.36)	$F(1,2846)=0.11 p>0.738$
4.Using the unit calendar (Sat)	3.18 (1.04)	3.21 (1.08)	$F(1,2489)=0.70 p>0.400$
5.Reading unit announcements (Imp)	4.44 (0.81)	4.11 (1.01)	$F(1,3079)=98.69 p<1x10^{-22}$
5.Reading unit announcements (Sat)	3.84 (1.02)	3.81 (1.01)	$F(1,3056)=0.40 p>0.525$
6>Contacting teachers via internal unit messaging (Imp)	4.08 (1.09)	4.09 (1.12)	$F(1,2952)=0.02 p>0.875$
6.Contacting teachers via internal unit messaging (Sat)	3.59 (1.11)	3.84 (1.02)	$F(1,2571)=37.57 p<1x10^{-8}$
7.Contacting students via internal unit messaging (Imp)	3.61 (1.20)	3.30 (1.31)	$F(1,2784)=43.04 p<1x10^{-10}$
7.Contacting students via internal unit messaging (Sat)	3.56 (1.01)	3.53 (0.98)	$F(1,2624)=0.64 p>0.424$
8.Reading contributions to online discussions (Imp)	4.28 (0.87)	4.26 (0.90)	$F(1,3064)=0.45 p>0.500$
8.Reading contributions to online discussions (Sat)	3.82 (0.97)	3.68 (1.16)	$F(1,3025)=13.59 p<0.001$
9.Contributing to online discussions (Imp)	3.97 (1.02)	4.01 (1.04)	$F(1,3044)=0.87 p>0.349$
9.Contributing to online discussions (Sat)	3.75 (0.95)	3.68 (1.06)	$F(1,2953)=4.05 p>0.043$
10.Completing online quizzes/tests (Imp)	4.32 (0.97)	4.36 (0.98)	$F(1,2692)=0.95 p>0.328$
10.Completing online quizzes/tests (Sat)	3.76 (1.04)	3.79 (1.05)	$F(1,2612)=0.45 p>0.501$
11.Submitting assignments (Imp)	4.70 (0.69)	4.70 (0.66)	$F(1,2976)=0.04 p>0.838$
11.Submitting assignments (Sat)	3.70 (1.19)	3.90 (1.14)	$F(1,2698)=21.61 p<1x10^{-5}$
12.Receiving feedback on assignments (Imp)	4.63 (0.75)	4.60 (0.75)	$F(1,2865)=1.65 p>0.198$
12.Receiving feedback on assignments (Sat)	3.29 (1.28)	3.53 (1.20)	$F(1,2586)=25.58 p<1x10^{-6}$
13.Working collaboratively in a group (Imp)	3.76 (1.22)	3.82 (1.18)	$F(1,2617)=1.40 p>0.236$
13.Working collaboratively in a group (Sat)	3.09 (1.14)	3.26 (1.10)	$F(1,2454)=14.63 p<0.001$
14.Reviewing unit progress (Imp)	4.07 (1.01)	3.86 (1.10)	$F(1,2734)=26.02 p<1x10^{-6}$
14.Reviewing unit progress (Sat)	3.24 (1.14)	3.34 (1.10)	$F(1,2643)=4.47 p>0.034$
15.Using the e-portfolio (Imp)	3.09 (1.24)	2.93 (1.32)	$F(1,1925)=6.77 p<0.010$
15.Using the e-portfolio (Sat)	3.11 (0.97)	3.12 (0.97)	$F(1,1720)=0.05 p>0.833$
16.eLive synchronous communication session (Imp)	3.77 (1.23)	3.75 (1.21)	$F(1,2177)=0.11 p>0.734$
16.eLive synchronous communication session (Sat)	3.28 (1.16)	3.35 (1.09)	$F(1,2024)=2.08 p>0.149$
17.iLecture class lecture recording (Imp)	4.54 (0.83)	4.47 (0.89)	$F(1,2544)=4.14 p>0.041$

17.iLecture class lecture recording (Sat)	3.48 (1.23)	3.50 (1.20)	$F(1,2503)=0.22$ $p>0.637$
18.Other iLecture recording – podcasts, etc. (Imp)	4.13 (1.05)	4.22 (1.01)	$F(1,2349)=4.65$ $p>0.030$
18.Other iLecture recording – podcasts, etc. (Sat)	3.35 (1.13)	3.47 (1.12)	$F(1,2222)=5.57$ $p>0.017$
19.Deakin's social software – MediaWiki, etc. (Imp)	2.83 (1.33)	2.71 (1.29)	$F(1,1564)=3.41$ $p>0.064$
19.Deakin's social software – MediaWiki, etc. (Sat)	3.03 (0.99)	3.11 (0.86)	$F(1,1264)=2.09$ $p>0.147$
20.Turnitin plagiarism detection (Imp)	3.88 (1.15)	4.01 (1.10)	$F(1,2252)=7.75$ $p<0.006$
20.Turnitin plagiarism detection (Sat)	3.41 (1.13)	3.56 (1.08)	$F(1,2310)=10.22$ $p<0.002$

**Table 4: Mean staff importance and satisfaction ratings for 2011 and 2012**

LMS function (Importance and Satisfaction)	Mean rating (1-5) (Std. dev. in brackets)		Statistical significance of difference 2011-2012
	2011	2012	
1.Accessing unit guide & other unit information (Imp)	4.60 (0.81)	4.70 (0.67)	$F(1,573)=2.55$ $p>0.110$
1.Accessing unit guide and other unit information (Sat)	4.01 (0.99)	4.07 (0.98)	$F(1,572)=0.44$ $p>0.508$
2.Accessing unit lecture, tutorial or lab notes etc. (Imp)	4.76 (0.58)	4.79 (0.56)	$F(1,551)=0.37$ $p>0.540$
2.Accessing unit lecture, tutorial or lab notes etc. (Sat)	4.02 (0.96)	4.04 (0.97)	$F(1,551)=0.07$ $p>0.787$
3.Interacting with unit learning resources (Imp)	4.48 (0.83)	4.60 (0.67)	$F(1,478)=3.61$ $p>0.057$
3.Interacting with unit learning resources (Sat)	3.63 (1.06)	3.80 (1.01)	$F(1,557)=3.50$ $p>0.061$
4.Using the unit calendar (Imp)	2.48 (1.34)	2.85 (1.30)	$F(1,466)=8.92$ $p<0.004$
4.Using the unit calendar (Sat)	2.98 (0.93)	3.31 (0.89)	$F(1,394)=12.36$ $p<0.001$
5.Reading unit announcements (Imp)	4.42 (0.85)	4.38 (0.89)	$F(1,562)=0.24$ $p>0.620$
5.Reading unit announcements (Sat)	3.76 (1.03)	3.96 (0.99)	$F(1,553)=5.49$ $p>0.018$
6>Contacting teachers via internal unit messaging (Imp)	3.10 (1.57)	3.21 (1.46)	$F(1,423)=0.62$ $p>0.432$
6.Contacting teachers via internal unit messaging (Sat)	3.12 (1.19)	3.45 (0.97)	$F(1,370)=8.32$ $p<0.005$
7.Contacting students via internal unit messaging (Imp)	3.83 (1.34)	3.82 (1.25)	$F(1,493)=0.00$ $p>0.957$
7.Contacting students via internal unit messaging (Sat)	3.17 (1.35)	3.64 (1.07)	$F(1,347)=15.48$ $p<0.001$
8.Reading contributions to online discussions (Imp)	4.41 (0.91)	4.46 (0.94)	$F(1,551)=0.43$ $p>0.513$
8.Reading contributions to online discussions (Sat)	3.64 (1.16)	3.62 (1.16)	$F(1,552)=0.06$ $p>0.801$
9.Contributing to online discussions (Imp)	4.41 (0.90)	4.43 (0.96)	$F(1,547)=0.05$ $p>0.824$
9.Contributing to online discussions (Sat)	3.65 (1.17)	3.65 (1.14)	$F(1,544)=0.00$ $p>0.981$
10.Completing online quizzes/tests (Imp)	3.70 (1.34)	3.81 (1.28)	$F(1,404)=0.68$ $p>0.409$
10.Completing online quizzes/tests (Sat)	3.19 (1.09)	3.47 (0.94)	$F(1,374)=7.29$ $p<0.008$
11.Submitting assignments (Imp)	4.29 (1.18)	4.51 (0.94)	$F(1,386)=4.55$ $p>0.033$
11.Submitting assignments (Sat)	3.39 (1.20)	3.44 (1.26)	$F(1,459)=0.22$ $p>0.638$
12.Receiving feedback on assignments (Imp)	4.14 (1.26)	4.32 (1.10)	$F(1,438)=2.68$ $p>0.102$
12.Receiving feedback on assignments (Sat)	3.27 (1.30)	3.39 (1.28)	$F(1,403)=0.93$ $p>0.333$
13.Working collaboratively in a group (Imp)	3.80 (1.22)	3.93 (1.18)	$F(1,383)=1.62$ $p>0.261$
13.Working collaboratively in a group (Sat)	3.14 (1.17)	3.15 (1.03)	$F(1,353)=0.02$ $p>0.898$
14.Reviewing unit progress (Imp)	3.73 (1.17)	3.54 (1.23)	$F(1,388)=2.39$ $p>0.122$
14.Reviewing unit progress (Sat)	3.22 (1.09)	3.26 (0.88)	$F(1,350)=0.19$ $p>0.664$
15.Using the e-portfolio (Imp)	3.02 (1.30)	3.26 (1.31)	$F(1,281)=2.28$ $p>0.131$
15.Using the e-portfolio (Sat)	2.80 (0.88)	3.04 (0.91)	$F(1,247)=4.01$ $p>0.045$
16.eLive synchronous communication session (Imp)	3.57 (1.43)	3.80 (1.28)	$F(1,358)=2.65$ $p>0.104$
16.eLive synchronous communication session (Sat)	3.15 (1.12)	3.27 (1.08)	$F(1,320)=0.93$ $p>0.334$
17.iLecture class lecture recording (Imp)	4.27 (1.09)	4.19 (1.19)	$F(1,427)=0.42$ $p>0.514$
17.iLecture class lecture recording (Sat)	3.40 (1.19)	3.52 (1.15)	$F(1,403)=1.00$ $p>0.317$
18.Other iLecture recording – podcasts, etc. (Imp)	3.90 (1.22)	3.94 (1.14)	$F(1,349)=0.09$ $p>0.768$
18.Other iLecture recording – podcasts, etc. (Sat)	3.37 (1.01)	3.38 (1.04)	$F(1,315)=0.01$ $p>0.906$
19.Deakin's social software – MediaWiki, etc. (Imp)	2.94 (1.42)	2.82 (1.35)	$F(1,237)=0.47$ $p>0.492$
19.Deakin's social software – MediaWiki, etc. (Sat)	3.00 (0.99)	2.97 (0.81)	$F(1,186)=0.05$ $p>0.829$
20.Turnitin plagiarism detection (Imp)	3.86 (1.21)	4.23 (0.98)	$F(1,320)=11.47$ $p<0.001$
20.Turnitin plagiarism detection (Sat)	3.26 (1.09)	3.73 (1.01)	$F(1,390)=18.96$ $p<0.001$
21.Deakin's Learning Repository – Equella (Imp)	3.40 (1.41)	3.65 (1.18)	$F(1,284)=2.51$ $p>0.113$
21.Deakin's Learning Repository – Equella (Sat)	3.22 (1.06)	3.00 (1.07)	$F(1,250)=2.59$ $p>0.108$
22.Respondus online quiz authoring tool (Imp)	3.32 (1.38)	3.41 (1.31)	$F(1,236)=0.28$ $p>0.596$
22.Respondus online quiz authoring tool (Sat)	3.06 (0.89)	3.14 (0.92)	$F(1,202)=0.44$ $p>0.508$

A method for visualising the difference between importance-satisfaction mean ratings was developed. Using a two-dimensional grid, importance and satisfaction rating pairs for a survey item can be plotted as a point, with the importance rating as the vertical coordinate and the satisfaction rating as the horizontal coordinate. By using the corresponding 2011 and 2012 importance-satisfaction rating pairs for a survey item as end points, a line segment can be plotted for each LMS function that visually represents the difference in mean importance-satisfaction rating between the old and the new LMS. Based on a significance level of  $p < 0.01$ , Figure 1 summarises the mean importance and satisfaction ratings obtained for students. Where there was no significant difference in the mean importance and satisfaction ratings between 2011 and 2012, the overall mean ratings are plotted as a diamond-shaped point pair. Where only the mean importance rating was significantly different, a vertical line is plotted with the horizontal location given by the overall mean satisfaction rating, and the two endpoints of the line identifying the mean importance ratings separately for 2011 and 2012. Similarly, where only the mean satisfaction rating was significantly different, a horizontal line is plotted with the vertical location given by the overall mean importance rating. Where both the mean importance and satisfaction ratings were significantly different between 2011 and 2012, a diagonal line is plotted with the endpoints representing the mean importance and satisfaction ratings separately for 2011 and 2012. Figure 2 presents the same results for academic staff. Note that both Figure 1 and Figure 2 have expanded scales on both axes.

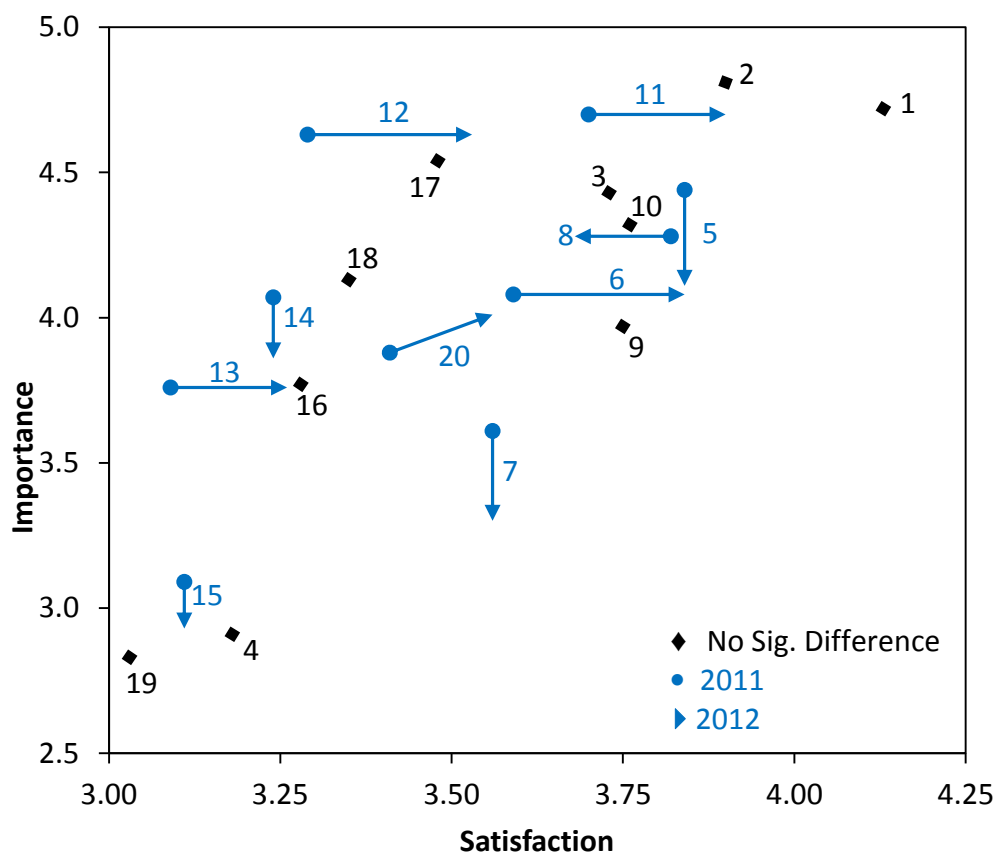


Figure 1: Mean importance and satisfaction ratings for LMS functions for students 2011-2012

### Notable results

In both Figure 1 and Figure 2 it can be seen that for both students and staff there is a group of LMS functions situated at the lower left, having both relatively low mean ratings of importance and satisfaction. These functions are:

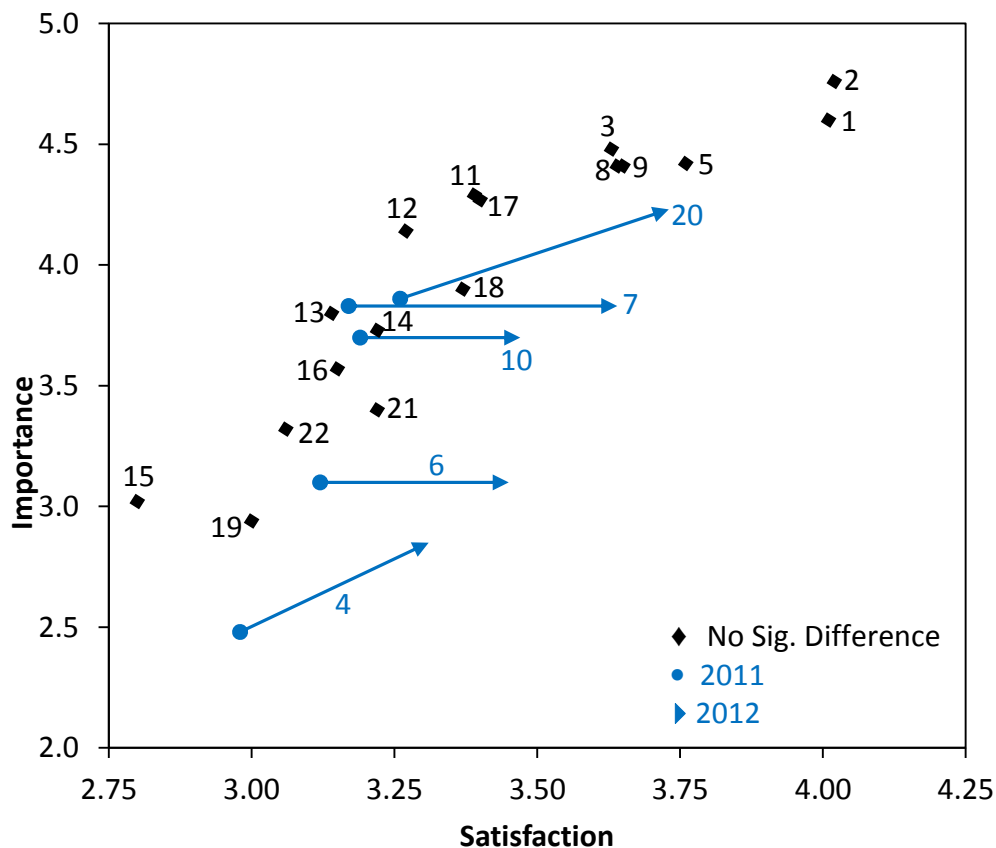
- 4. Using the unit calendar
- 15. Using the e-portfolio
- 19. Deakin's social software – MediaWiki, etc.

In the period 2011/2012 these three LMS functions had a relatively low level of use across the university. The LMS calendar function was seen as duplicating existing calendar tools available to students and staff, and the LMS e-portfolio and linked social software tools were used in only a very small number of classes. Conversely,

for both students and staff, there is a group of LMS functions situated at the upper right, having both relatively high mean ratings of importance and satisfaction. These functions are:

1. Accessing unit guide and other unit information
2. Accessing unit lecture, tutorial or lab notes etc.
5. Reading unit announcements

These three items could be considered ‘basic’ LMS functions. The provision/transmission of learning materials and information electronically may not necessarily be seen as high value adding educational LMS functions, but the high importance and satisfaction ratings attributed to these functions by students and staff suggests that they nevertheless value these LMS functions, and there is support for this view in the literature (Jones & Jones, 2005; Sharpe, Benfield & Francis, 2006).



**Figure 2: Mean importance and satisfaction ratings for LMS functions for staff 2011-2012**

Another notable feature of both Figure 1 and Figure 2 (and Table 3 and Table 4) is the limit of the significant differences in mean ratings for both students and staff. For students, ten out of the twenty LMS functions investigated recorded no significant difference at all. Only four functions recorded a significant difference in mean importance rating, only five functions recorded a significant difference in mean satisfaction rating, and only one function recorded a significant difference in both mean importance and satisfaction ratings. For staff, 17 out the 22 LMS functions investigated recorded no significant difference at all. Only three functions recorded a significant difference in mean satisfaction rating, and only two functions recorded a significant difference in both mean importance and satisfaction ratings. The median absolute difference between all 2011 and 2012 mean ratings (as a percentage of the 2011 mean rating) was only 0.21 % for students and 0.26 % for staff. Taken as a whole, there was surprisingly little change in the mean ratings for students and staff between the two LMS systems. Previous investigations have found staff equivocal in their opinion of the impact of a new LMS on their teaching (Smart & Meyer, 2005), that changing LMS does not automatically mean that it will be easier to use (Petherbridge & Chapman, 2007), that any one of a range of LMS systems evaluated would have met the identified technical requirements (Danaher et al., 2005), and that the specific LMS chosen is unlikely to be the most important influence on student learning (Beatty & Ulasewicz, 2006).

It is observed that only one mean rating of satisfaction with an LMS function, across both students and staff,



significantly declined following the introduction of the new LMS – that was the student mean satisfaction with reading contributions to online discussions (LMS function 8). While this result wasn't expected in advance, the separate analysis of the open-ended survey questions supported this observation. In response to the question "What are the aspects of DSO that most need improvement?" 1217 student comments were received. Of this number, 370 (30.4 %) were related to the discussion function – this was nearly three times as many comments as the next most common identifiable 'needs improvement' theme. This confirmatory triangulation between the quantitative and qualitative DSO evaluation data suggests that there was a real level of student dissatisfaction with the new discussion function. The initial configuration of the new LMS meant that discussions posts were not displayed in the same threaded format that students were used to from the old LMS. Also, the new LMS did not initially provide the function of easily identifying new discussion postings. The user's experience of a new LMS is likely to be referenced to, and strongly influenced by, the past experiences of the previous LMS and how its various functions facilitated their learning needs (Ge et al., 2010). In this case, the relatively high 2011 mean student ratings for both importance and satisfaction for the reading of discussion posts suggests that any reduction in the utility of this function in the new LMS would be noticed by students. Others have also observed that changes in the operation of the discussion function interface were a critical point of comparison and dissatisfaction when changing LMS (Ryan et al., 2012).

Only a single LMS function had significantly higher mean ratings of importance and satisfaction for both students and staff across the change of LMS – that was for Turnitin plagiarism detection/originality assessment (LMS function 20). Positive attitudes to the use of Turnitin by both students and staff are reported in the literature (Ledwith & Rísquez, 2008; Rolfe, 2011), along with various reasons why this might be so. However, it is interesting to note that while both old and new LMSs provided the ability to integrate a link to Turnitin from within the LMS, and that the Turnitin functionality was promoted under the DSO institutional online learning environment umbrella/brand, the essential value offered by the Turnitin system is quite separate from, and not directly attributable to, the LMS itself or the change in LMS. This again lends weight to the proposition that the substantive differences in mean ratings of LMS core functions between 2011 and 2012 were small. In addition to the use of Turnitin, there was one other area of LMS functionality where relatively large and significant increases in the mean rating of satisfaction (but here without a corresponding increase in importance rating) were observed for both students and staff. This was contacting teachers via internal unit messaging (LMS function 6). Additionally, staff also gave a significantly higher mean rating of satisfaction to the associated function contacting students via internal unit messaging (LMS function 7). The old LMS had a messaging system that students and staff could use, but it did not link to the university email system, and was implemented as an entirely separate email system that could only be accessed when logged into the LMS. The messaging system in the new LMS linked to the university email system, and so it is perhaps not surprising that students and staff were significantly more satisfied with the functionality of the new LMS messaging system.

## Conclusions

In this paper we present a relatively large scale and finely grained quantitative investigation of the changes in user perceptions of the functions of an institutional LMS across the period of transition to a new system. We address the question, "Did the new LMS dramatically change the student and staff experience of using the system?" To a large extent, the answer is, "No". The mean ratings of importance and satisfaction for the majority of LMS functions, for both students and staff, did not change significantly between 2011 and 2012, through the period of the immediate transition to the new LMS. The median absolute difference between all 2011 and 2012 mean ratings (as a percentage of the 2011 mean rating) was only 0.21 % for students and 0.26 % for staff. Taken as a whole, there was surprisingly little change in the mean ratings for students and staff between the two LMS systems. Of the few significant differences in mean ratings observed, most were as might be expected – the functioning of reading online discussions in the new LMS was more limited than the previous system and student satisfaction declined significantly; and the functioning of the internal messaging in the new LMS was more useful and both student and staff satisfaction increased significantly. Essentially, the transition seems to have been steady as it goes. This could be viewed as a success in that there were minimal significant declines in user perceptions of the LMS. However, if the aim of moving to the new system was to significantly improve the experience of students and staff using the LMS, then the initial period of the system changeover was objectively somewhat underwhelming.

As noted in the literature, because LMSs are underpinned by information and communications technologies, future system changes are inevitable, and in some senses reasonably predictable – there will be no rest for the weary (Draude et al., 2009; Ryan et al., 2012). Looking forward, University LMS users should expect that their current system will be retired at some point. We present here an evaluation of the immediate transition to a new LMS; however this should not be considered the end point of the evaluation. There is a need for on-going

monitoring before a definitive assessment of the success or otherwise of the transition can be made (Benson & Palaskas, 2006; Chao, 2008). We recommend strongly to Deakin University (and to any university ‘crossing the divide’ to a new LMS) that it continue with periodic institution-level evaluation of the user (students and staff) perceptions of the new LMS. Only such an on-going evaluation can provide an ultimate measure of the value and utility of the significant resources, both financial and human, devoted to the transition and on-going development of the new LMS. As we have observed previously, it can take many years before significant increases in perceptions of LMS value emerge (Palmer & Holt, 2012, in print). LMSs and LMS usage continue to evolve – any new survey should address emergent issues in online learning, including student and institutional use of social media and mobile platforms. Such on-going evaluation is also essential to provide a new benchmark reference point, in the same way that the 2011 data set did here, as a comparison point for whatever new LMS system is eventually selected.

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