TRANSFORMING PEDAGOGY WITH TECHNOLOGY: A LONGITUDINAL ANALYSIS OF INSTRUCTIONAL PRACTICES ON A UNIVERSITY ONLINE LEARNING MANAGEMENT SYSTEM

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ABSTRACT

Following the widespread adoption of the Learning Management System (LMS) by Ghanaian higher education institutions as a technology for facilitating teaching and learning, this study examined the adoption and usage of the Moodle LMS by instructors at a private university in Ghana. The objective was to determine: (1) the rate of adoption of the LMS by members of the university's instructional group, (2) the functionalities of the LMS that instructors mostly use, (3) the predominant teaching and learning activities that instructors use the LMS for, and (4) possible changes in instructor pedagogy on the LMS as they recurrently use the LMS every academic semester for 3 years (6 semesters). The study used unobtrusive data collection procedures to retrieve and analyze web server backend records of instructor activities on the LMS platform over the course of the six semesters. Findings reveal a rather slow rate of adoption of the LMS by instructors, whilst their instructional practices on the LMS did not change significantly as time progressed. Implications of these findings for further research and practice are discussed within the context of educational technology adoption and use in the Ghanaian higher education context, and the challenges and prospects therein.

Keywords: Moodle, Learning Management System (LMS), Diffusion of Innovations (DOI), Pedagogical Practices, LMS Adoption

Introduction

Web-based Learning Management Systems (LMSs), also known as Course Management Systems (CMSs) or Virtual Learning Environments (VLEs), are software packages that automate the administration and delivery of Internet-based learning courses, and are considered by most educators to be the most appropriate technologies for supporting and enhancing collaborative learning activities, particularly in higher education (West, Waddoups, & Graham, 2007; Yohon, Zimmerman, & Keeler, 2004). These applications provide an integrated set of web-based tools including content delivery, communication and assessment tools that instructors can apply in a variety of ways to implement Internet-based learning activities such as threaded discussions, file sharing, peer assessments etc. LMSs can also be used to perform a range of course housekeeping tasks such as registering and grading students, monitoring participation and receiving electronic copies of papers etc. (Venter, van-Rensburg, & Davis, 2012).

Dating from the mid- to late-1990s, LMSs have evolved rapidly, mostly due to efforts by technology savvy instructors who wished to manage their courses effectively and securely online. Currently, several products are available, notable among them are Desire2Learn, Moodle, Blackboard and a host of others. These products are being used extensively by higher education institutions all over the world as single integrated platforms for instruction delivery and interactions for both distance learning and campus based courses (Arabasz, Pirani, & Fawcett, 2003; Dutton, Cheong, & Park, 2004; Morgan, 2003). Indeed, a survey by Dahlstrom, Brooks and Bichsel (2014) revealed that 99% of higher education institutions in the USA have
an LMS in place. With regard to the African context, a similar survey by Dooga (2013) equally pointed to a high rate of LMS adoption by African higher education institutions.

Accompanying this increasing popularity of LMSs are several research works seeking to establish some parameters such as; their effectiveness in fostering student learning and satisfaction, faculty perceptions of their usability, faculty adoption and use of these technologies, institutional adoption rates etc. (Dahlstrom, Brooks, & Bichsel, 2014)

However given the fact that instructor responsiveness, student-instructor interaction, course organization and delivery etc. are known to have varying effects on student interest, and learning performance (Abrantes, Seabra, & Lages, 2007), it is worth investigating whether the LMS platform can be a contributory factor in influencing instructor pedagogy. Incidentally, this is an issue that has so far been overlooked by researchers as there is a dearth of research reports in this regard in the literature. This study therefore examined the usage of one such LMS -Moodle- by instructors (faculty members) at a private university in Ghana, with the objective of contributing to research in this area.

Moodle is the leading Open Source LMS used by higher education institutions and other corporate bodies worldwide (Medved, 2015). According to the Moodle developer community, the Moodle Learning Management System is a world-class software application that is intuitive and easy-to-use, and has powerful capabilities in three key areas: Instruction, Communication and Assessment. It is thus described as "the world's free learning platform that helps you create effective online teaching and learning experiences in a collaborative, private environment" (http://moodle.org).

The institution involved in this study uses Moodle as the sole platform for supporting traditional face-to-face courses, blended (hybrid) learning courses, and fully online courses. The institution encourages, and periodically trains instructors to use the LMS fully in their instructional activities. However, as is the case with many other innovations, whilst some instructors embraced the technology and quickly moved to adopt and use the system, others had a lukewarm attitude, with the rest adopting a laissez-faire approach.

A preliminary survey revealed that the instructors who were more enthusiastic about adopting the system were interested in exploring and possibly using other technological functionalities to augment their course delivery in ways that they thought would improve learner engagement and learning outcomes. Investigating the Moodle usage patterns of such instructors over a given period, should therefore shed more light on whether they modified their pedagogical practices as they continued using the system, and whether the platform played any role in such transformations.

The research thus sought to answer the following questions:

1. What is the rate of adoption of Moodle by instructors for instructional activities in the institution under study?
2. What features and functionalities of Moodle do the institution's instructors typically use in their instructional activities?
3. Does continual use of an LMS each and every academic semester contribute in transforming the pedagogical practices of particular instructors over time?

Answering these and other related questions will provide information that can assist higher education institutions address more general issues pertaining to LMS adoption, including issues such as policies for training, instructor evaluation and a host of others.
Theoretical Perspective

Two main theoretical frameworks guided this study - Rogers' (1995) Diffusion of Innovations (DoI) theory, and Imershein's (1977) approach to the issue of changing teaching/learning paradigms. DoI theory discusses how a new technological idea, artifact or technique, or a new use of an old one, migrates from creation to use. This theory defines diffusion as the process by which an innovation is communicated through certain channels, over time, among the members of a social system. Diffusion is thus a special type of communication concerned with the spread of messages that are perceived as new ideas. The four main elements in the diffusion of new ideas are therefore (i) the innovation itself, (ii) communication channels, (iii) time, and (iv) the social system (Everett M. Rogers & Scott, 1997).

With regard to the first element, i.e. the innovation itself, the DoI theory postulates that innovations that are perceived by individuals as having greater relative advantage, compatibility, trialability, observability, and less complexity will be adopted more rapidly than counterpart innovations that do not possess these qualities (Rogers & Scott, 1997). In the context of this study, the innovation is the Moodle LMS. As an open-source technology, this was customized to provide an appealing and usable interface, and with functionalities that offered easy access to content as well as flexibility in its usage. Periodic training activities for faculty were also held to give them the opportunity to observe its usage, try it out and then proceed to put it to use. All these activities were to ensure that end users of the system had positive perceptions of its compatibility, trialability, observability and less complexity.

Communication channels (the second element) are the means by which messages get from one individual to the other. Rogers and Scott (1997) again assert that individuals are more likely to adopt an innovation through subjective evaluations of near-peers who have adopted the innovation, than through the mass media or research findings. The main communication channel adopted by the institution to get messages pertaining to Moodle adoption and use across was mostly the "near-peer" approach. Thus meetings, demonstrations, question and answer sessions were regularly held to bring prospective users up to speed with any changes, updates etc. It is thus necessary to determine if this approach was worthwhile by assessing the rate of adoption of the system.

The third element that has an influence on the diffusion of innovations is time. Prospective users of an innovation need time to make the decision as to whether to accept or reject it. During this innovation decision process, the individual seeks information so as to decrease uncertainty about the innovation's expected consequences. Also, depending on the innovativeness of the individual or group, the time lapse between exposure to the innovation and actual use will vary. In this regard, Rogers (1995) identified different adopter attributes as:

i. Innovators - the mostly very few (2.5%) venturesome types that enjoy being on the cutting edge.
ii. Early adopters - the respectable group (13.5% - mostly opinion leaders) that use data from innovators' activities to make their own adoption decisions.
iii. Early majority - a large subsection (34%) of the social group that follows the trusted early adopters
iv. Late majority - the skeptical group (34%) that joins as adoption becomes a necessity
v. Laggards - the "traditionalists" (16%) who take much longer to adopt any innovation, if at all.

One of the main focal issues of this study was to determine the rate of adoption of Moodle by instructors of the institution under study. The rate of adoption is usually measured as the number of members of the system that adopt the innovation in a given time period. As instructor activities on the LMS are recorded on the server, the study retrieved and analysed these data on a semester
by semester basis over a three (3) year period to determine the numbers of instructors accessing and using the system each semester, as well as how they used the system.

The final factor in the diffusion of innovation is the social system - defined as "a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal" (E. M. Rogers, 2003, p. 23). A social system's leadership, structure, norms etc. all contribute in influencing the way an innovation diffuses through the system. In the context of this study, the social system is the academic environment, and therefore has all the needed structures and support systems that can foster the diffusion of an innovation such as a Learning Management System. This study however did not exhaustively address the influence of the various social system factors on the adoption of the LMS innovation by instructors, but considered the fact that some leadership decisions could potentially impact on the diffusion process.

DoI theory is more of a descriptive framework, rather than one for explanation or prediction, and in this study it provided a lens with which we describe the adoption of Moodle by instructors over a three year period (i.e. 6 semesters).

The second theoretical perspective for this study is the framework developed by Imershein (1977) in his study of health care services, but which is very much applicable in education, particularly where knowledge in institutional settings is the major focus. Based on Kuhn's (1970) idea that allegiance to a paradigm in science implies an adherence to particular ways of “doing” science, and that advances in science occur because scientists as a group perceive a need for a paradigm shift, Imershein (1997) pointed out that membership of organizations can be explained in much the same way. Thus, organizational change requires shifts in the “world views” of those involved in the change.

One particularly relevant aspect of Imershein's theory is his thesis that exemplars provide group members with concrete models for their activities, with a critical element being a shared knowledge of ways of undertaking tasks and procedures (Imershein, 1977). In the context of this study, exemplars are the pedagogical techniques used, especially by the early adopters of the Moodle platform, and the understanding is that exemplars provide a useful way of identifying the teaching/learning paradigms which guide the ways instructors design and teach courses through Moodle. What these exemplars are, and how (and whether) they evolve over a given period is investigated in this study.

Literature Review
Research works into LMS adoption and use, as well as whether they provide useful, authentic and effective learning environments abound in the literature. With regard to adoption and use by instructors, findings generally suggest that most instructors are optimistic about the potential benefits of these systems (Ng & Gunstone, 2003). This is notwithstanding the fact that many instructors tend to use only the parts or functions of these systems that replace older techniques for reproducing and distributing course documents, whilst features for creating interactive learning activities are used to a much lesser extent (Bongalos, Bulaon, Celedonio, deGuzman, & Ogarte, 2006; Dahlstrom et al., 2014; Malikowski, Thompson, & Theis, 2007). Other studies on the usefulness and usability of some of these LMSs from the student perspective have also been carried out but with mixed results (Arbaugh & Benbunan-Fich, 2005; Morgan, 2003).

When put to effective use however, LMSs have been proven to:

- help achieve effectiveness in the development of both teaching practices and students' learning (Santos & Boticario, 2007).
- positively affect instructor attitudes towards the learning environment (Dahlstrom et al., 2014)
• foster collaboration among learners leading to increased motivation to learn from peer work and to produce high-quality assignments (Yang & Chang, 2012).

LMSs thus have the potential of influencing the way instructors carry on their instructional activities, either in LMS supported face-to-face courses, blended courses or fully online courses. Indeed, Morgan (2003) points out that as instructors become more comfortable and agile with LMSs, they tend to rely more on them as facilitators of their instructional activities. It is based on this understanding that the researchers of this present study hypothesized that continuous use of the LMS over a significant period of time should result in instructors transforming their pedagogical approaches in ways that will harness the potentials of these systems to optimize learning outcomes in both the cognitive and affective domains. The study was thus conducted as a first step in a long term study aimed at testing this hypothesis.

Methodology
The institution under study has used Moodle since September 2013 as the main platform for the delivery of fully online courses, and for the support of hybrid and face-to-face courses. The population of interest was thus all full-time teaching staff of the institution. In order to obtain an accurate and objective picture of the rate of adoption and trend of usage by instructors in the institution, and how the respective components and tools are being used by each individual instructor, the researchers (who are also the technical administrators of the application), adopted the unobtrusive approach of web server Transaction Log Analysis (TLA). A transaction log is an electronic record of interactions that have occurred between a system and users of that system. Also known as online monitoring, or site usage log analysis, TLA is an unobtrusive method of obtaining large volumes of data at relatively low cost, and can be used to build quantitative models or assist in qualitative interpretations of quantitative models (Villen-Rueda, Senso, & Moya-Anegon, 2007).

On the Moodle platform therefore, since every click by a user on the interface is recorded on the server, together with other details such as the identity of the person, the particular resource (link) clicked on, time of access etc., using TLA strategies to retrieve and analyzing these data can yield a wealth of information pertaining to individual users' online activities such as pages visited, content accessed, collaborative activities etc.

In this study, the TLA approach involved checking individual course sites of all courses offered in the college through the Moodle platform from the first semester of the 2013-2014 academic year (September 2013), to the end of the second semester of the 2015-2016 academic year (May 2016) - six semesters in all. For each course, and for each semester, the researchers retrieved data on the activities of the corresponding instructor, i.e. frequency of logins, content uploaded/downloaded, email messages sent/received, assessment tools used, and all Moodle features and components that were employed in the instructional processes.

Though this method represents a limited approach to studying instructor adoption and usage of a LMS, the researchers believe that it represents the most suitable way of obtaining large quantities of objective and reliable data, and can thus represent a step towards providing a backdrop for more exhaustive and comprehensive studies using additional methods and instruments.

The TLA approach thus yielded quantitative data pertaining to;

• the numbers and identities of instructors using the resource each semester
• total numbers of courses offered each semester
the various Moodle tools and features employed in each course and the extent to which they were used.

Using Microsoft Excel spreadsheets, the data was compiled, sorted, coded and in some cases displayed graphically to establish trends and relatiivities. Instructors who were identified as having been using Moodle continuously for the six semesters had their courses re-examined to establish whether or not, any transformation in their practices and tool usage took place over time.

Results & Discussion
Rate of Moodle Adoption
At the beginning of each semester, the Moodle administrators create course shells for all courses offered at the institution that semester, and assign instructors to their respective courses. Courses were set to self-enrollment, and so students had the opportunity to enroll in courses they were taking for the semester. As an institutional policy, all instructors were expected to log into the platform at the beginning of each semester and post at least the course syllabuses for their respective courses. Instructors were however encouraged and supported to use all the features of Moodle to facilitate the delivery of their courses.

The rate of Moodle adoption by instructors was thus measured by looking at data pertaining to the number who posted at least the course syllabus for their respective courses during each semester, and over the six semester period. Based on the total number of full-time instructors on roll, the percentage that had carried out this minimum activity on Moodle was calculated. Table 1 and Figure 1 below show the trend of adoption of the LMS over the course of the six semesters.

The results show that, over the three (3) academic year period, the trend of adoption and usage of Moodle for course delivery by instructors at the university college increased steadily at a rate of about five (5) additional users per each subsequent semester. With only 38% of instructors using the LMS by the close of the 2015-2016 academic year, it is clear that Moodle use in the college is still at the early majority stage of adoption. At this rate, it will probably take another 5 to 6 semesters to achieve appreciable adoption of the system.

<table>
<thead>
<tr>
<th>Semester</th>
<th>Number of Instructors Using Moodle</th>
<th>Total Number of Instructors</th>
<th>Percentage of Instructors Using Moodle</th>
</tr>
</thead>
<tbody>
<tr>
<td>September, 2013</td>
<td>12</td>
<td>75</td>
<td>16 %</td>
</tr>
<tr>
<td>January, 2014</td>
<td>15</td>
<td>77</td>
<td>19 %</td>
</tr>
<tr>
<td>September, 2014</td>
<td>25</td>
<td>83</td>
<td>30 %</td>
</tr>
<tr>
<td>January, 2015</td>
<td>28</td>
<td>85</td>
<td>33 %</td>
</tr>
<tr>
<td>September, 2015</td>
<td>32</td>
<td>92</td>
<td>35 %</td>
</tr>
<tr>
<td>January, 2016</td>
<td>26</td>
<td>94</td>
<td>38 %</td>
</tr>
</tbody>
</table>
Figure 1. Trend of Overall Moodle Adoption

**Extent of Moodle Adoption**
Server logs of instructor activities on the LMS over the three (3) year period were also analysed to determine how individual instructors use the system. Moodle's resources can be grouped into three main categories - Content Delivery, Communication and Assessment (Table 2).

<table>
<thead>
<tr>
<th>Category</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course Content</td>
<td>Files: Course Readings, Course Syllabus, PowerPoint slides, audio/video, Links to external resources</td>
</tr>
<tr>
<td>Communication</td>
<td>Discussion Forum, Chat, Email, Announcements/News Items</td>
</tr>
<tr>
<td>Assessment</td>
<td>Quiz, Assignment, Survey, Grades</td>
</tr>
</tbody>
</table>

For each semester, the researchers retrieved user activity data on individual courses to determine the extent to which Moodle's resources were being put to use by the respective instructors. These data were then compiled to give the number of instructors using the various categories of Moodle's resources each semester (Figure 2).
As can be seen in Figure 2, most of the instructors use the LMS for managing course content, comprising course readings, PowerPoint slides, audio/video and links to other web-based learning resources. This is quite understandable, given that instructors mostly use the system to support their traditional face-to-face classes by posting learning materials onto the LMS for students to access.

Significantly also, the rate of instructor adoption of the LMS for content delivery purposes far outstrips the adoption rate for communication and assessment purposes. This finding is in keeping with findings of other research works that have determined that instructors typically use LMSs for distributing course documents, whilst the communication and assessment features are used less often (Dahlstrom et al., 2014; Malikowski, Thompson, & Theis, 2007).

With regard to the use of the other Moodle features, a maximum of ten (10) instructors were using the communication features (in addition to the content features) by the second semester of the 2015-2016 academic year, whilst a maximum of six (6) instructors were using the assessment features as well. This finding indicates that only six (6) instructors at the college can be said to have fully adopted the LMS after three (3) years of implementation. This six (6) can be classified as the innovators, whilst the remaining thirty (30) instructors who are using only some features of the system are the early adopters.

**Possible Impact of Moodle Use on Instructor Pedagogy**

Having established the rate of instructor adoption of Moodle, and purposes to which the various features of Moodle are put, the research team then investigated whether, in broad terms, an instructor's pedagogical practices are influenced in any way by his/her continued use of this resource as an instructional tool. Of the six (6) instructors that were established as advanced users of the LMS, four (4) had been continuously using the system since its inception (i.e. over the last 6 semesters), one (1) had been using the system over the last 4 semesters, and the sixth person had been using the system over the last three (3) semesters.

Being categorized as innovators, the researchers examined extensively, the course platforms of these instructors for each semester. Incidentally, all of them handled more than one course each semester, and so a total of about 60 courses were examined as shown in Table 2. Most of the course offerings were however different semester iterations of the same course.

Table 2. Numbers of Advanced Moodle Instructors and their Respective courses
### Table 1: Semester-wise instructor activity

<table>
<thead>
<tr>
<th>Semester</th>
<th>No. of Instructors</th>
<th>No. of Respective Courses Examined</th>
</tr>
</thead>
<tbody>
<tr>
<td>September, 2013</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>January, 2014</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>September, 2014</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>January, 2015</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>September, 2015</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>January, 2016</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

Data on the six (6) instructors' activities on the course platforms were thus accessed and compiled as follows:

i. The semester a particular instructor first started using *Moodle* was located, and the course(s) he/she offered that semester were examined individually to determine all the resources utilized, as well as the specific activities the instructor carried out. Thus evidence of activities such as participating in, and moderating online discussions, marking assignments and giving feedback, communication with students etc., were all gathered and analysed.

ii. This process was repeated for the subsequent semester for that particular instructor, and so on to the sixth semester.

iii. These longitudinal data were then studied to establish any variations in instructor pedagogy on the system as the semesters went by.

iv. These steps were repeated for each of the remaining 5 instructors.

Findings revealed that, four (4) of the (same) courses offered each semester can be classified as online courses, since the respective instructors conducted all teaching and learning activities on the LMS platform. Students only sat in class to write the final exam (since the college has not officially moved into implementing fully online courses). For such courses therefore, the instructors deployed all the relevant *Moodle* resources, and also carried out several activities online all aimed at getting students to participate actively in the learning activities. The remaining nine (9) courses (i.e. as at January, 2016) can be classified as blended/hybrid courses, as the online learning and assessment activities were rather sparse.

An issue of interest that came to light was the fact that as time progressed, no significant change in instructor activities and resource usage on the platform was observed, though some instructors progressively adopted advanced content sharing (e.g. instructional videos) and collaboration (e.g. group discussions, group presentations etc.) tools. In terms of instructor pedagogical approaches therefore, the continued use of *Moodle* had no noticeable impact, at least for the 4 advanced *Moodle* instructors under study. The researchers were also hopeful that the approaches and activities that the six (6) innovator instructors adopted in their use of the LMS will serve as exemplars (Imershein, 1977) for the early adopters to emulate, but evidence to this effect could not be adduced from the methods used.

It is however worth noting that, for instructors who used the LMS to facilitate some face-to-face course(s), and also deliver some online course(s), i.e. teaching two streams of the same course (or two different courses), one online, and the other in class, changes were observed in the way such instructors progressively handled the face-to-face courses. Thus face-to-face courses which hitherto had no *Moodle* presence, or were present but made very little use of the resource beyond document delivery, began featuring more online collaborative activities including discussions.
and group works. It can thus be interpreted that such instructors increasingly found the Moodle platform more useful and usable as time progressed, and this also explains the steady, albeit slow, increase in the use of Moodle for delivering hybrid courses within the college. This is also in agreement with Solomon and Makara's (2010) study which revealed that majority of students and instructors indicated that the LMS positively affected instructors' use of in-class time by providing access to materials and facilitating logistics. The preferences of such instructors and their general approaches to instruction however changed very little with time.

Another issue that became apparent in the analysis was that, some instructors tried one Moodle tool or the other (e.g. synchronous chat) in one semester only to drop that tool in the next delivery of the same course in the subsequent semesters. This is understandable though, as instructors generally would like to control and make their own decisions as to how to teach, and what tools to use.

It was thus determined that whilst instructors' style and pedagogical approaches influenced the way they used the various Moodle tools, the opposite scenario was not evident. Instructors were therefore willing to try out any tools if only such tools were deemed to be capable of facilitating their work, but were generally reluctant to change their practices in ways that could further harness the affordances of the technological tools available. For example even though a survey tool is integrated in Moodle, and educators generally agree that knowing the learner is an important step towards successful learning outcomes, instructors of online courses hardly used this tool to conduct pre-course surveys.

Conclusions and Recommendations
Learning Management Systems are playing an increasingly critical role in the fulfillment of the academic goals of higher education, as they have become the main platform for the delivery of online courses, and for supporting traditional courses. Indeed, for most instructors, these applications are the primary entry point into the use of technology for instruction delivery (Morgan, 2003). However, despite heavy investments being made by higher education institutions in the procurement and use of LMSs, less research and analysis has been invested in determining whether these resources are being put to effective use.

As instructor pedagogy greatly influences learning outcomes, this study, among other things, sought to establish whether as instructors become more agile in the use of these LMSs, their pedagogical approaches will likely be transformed in ways that will further make LMS use more beneficial. Acknowledging that the singular method of only analyzing usage data over a three year period is probably inadequate to draw firm conclusions in this direction, the findings thus far can be seen as pointing to the fact that instructors who voluntarily adopt LMSs, progressively use the available tools and resources in ways that will facilitate their instruction delivery. Their efforts are thus more directed towards selecting the particular tools that will aid them in this direction, rather than allowing the presence of these tools to compel them into rethinking their instructional activities in ways that will maximize the potentials of the tools.

Further research work is thus required to establish an understanding into why instructors voluntarily use LMSs, what motivates them to continue using these technologies and in what context, and more importantly, the effects of such instructional strategies on student learning and satisfaction.

Furthermore, institutions hoping to adopt LMSs and also get instructors to put them to effective use, need to be mindful of the fact that it is the individual instructors that make the decisions as to how the technology will be put to use. Involving instructors in much of the decision making regarding the policies and practices of deploying and using the LMS will help greatly in
accelerating the adoption rate, and also ensuring that usage levels of the system are not only sustained, but improves with time.

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