DEVELOPING WEB BASED QUALITY INFORMATION SYSTEMS FOR QUALITY IMPROVEMENT AT THE HORIZON CAMPUS

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Abstract

Quality Information Systems (QIS) provide quality related information to stakeholders. In e-learning applications, QIS should provide e-learning materials to the lecturers and the learners who use them. In Student Management Systems (SMS), QIS provide all the facilities to run the administrative functions smoothly. Electronic Research Repository (such as DSpace) enhances the quality of the institute as it reflects the research competencies of the academic staff of the institute.

Horizon Campus QIS include eLearning, SMS, DSpace, Library Management System, all based on a single platform. QIS provide better service to their stakeholders anywhere, anytime effectively and efficiently. Students' pass rate has been increased after introducing the Learning Management System (LMS). eLearning platforms immensely facilitate the teaching and learning process as they offer an environment-friendly and efficient mechanism for ensuring learner centered teaching and learning. As QIS implemented in a Cloud based System, it is easy to maintain and run with minimal cost.

Keywords

E-Learning, DSpace, Web based Student Management System, QIS

1.0 Introduction

Horizon Campus allocates a considerable amount of funds for operational costs such as photocopying of learning materials & student files, maintainance of lecture halls, payments to lecturers, etc. to facilitate traditional classroom teaching in each year. At present, these functions are handled by the Registrar's office. The documentation work, attendance tracking, time table & academic calendar, recording marks, programme are maintained by coordinators on the faculty level. Student payments and inquiries are handled by the Finance and Marketing Divisions. Basically all these activities are handled manually within various divisions and MS Excel is used to store records due to no proper Student Management System (SMS).

Horizon Campus also allocates significant amount of funds to improve teaching-learning resources. However, it has been noted that the student performance at Horizon College is very low as compated with the allocation of funds on the above quality parameters. Also, there is no proper mechanism to maintain repository for research papers, scholarly articles and publications of academia on Campus.

As a result we noted the increase in annual operational costs and high failure rates of students (Figures 1 and 2).

Due to the growing number of students, their requirements are also rising. In order to provide quality service to students/undergraduates during their academic process, a considerable amount has to be invested annually for electricity, equipment, salaries, lecture materials, internet & Wi-Fi, etc. According to the finance division of the Horizon Campus, the annual operational cost for providing teaching and learning facilities are illustrated in Figure 3.

Quality Assurance (QA) is an essential element that had gradually gained serious attention amongst the global Higher Educational Institutions (HEI). It must be a continuous and an on-going process.

Stakeholder satisfaction is one of the most important aspects when we consider quality. The important stakeholders include students, academic staff, nonacademic staff, employers, training organizations, graduates, government, professional organizations, parents, funding agencies, other interested parties, administration and society.
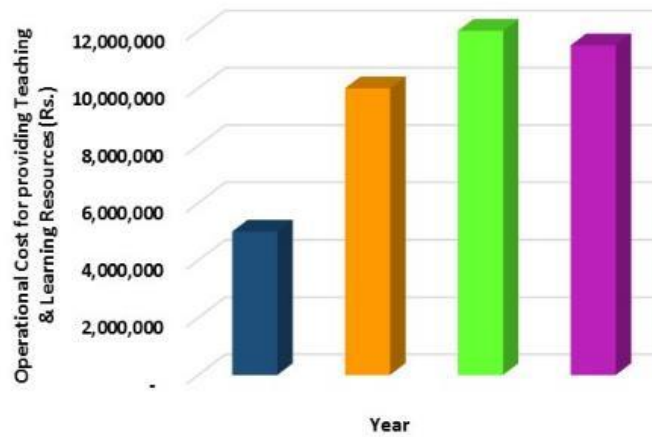
Figure 1 – Annual Operational Cost for providing Teaching and Learning Resources
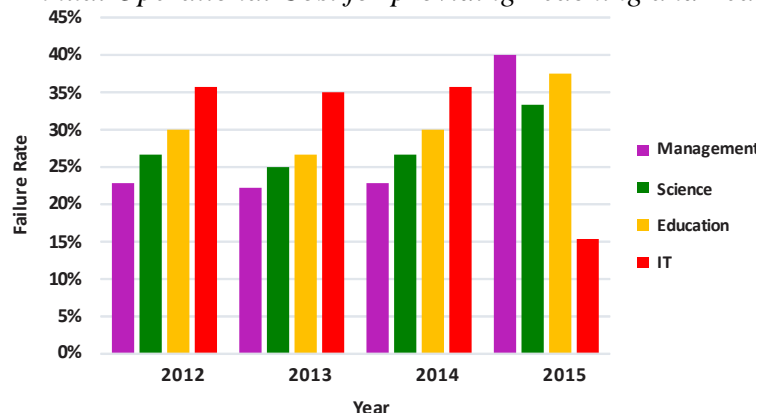

Figure 2 - Failure rate of students in the facultes of Management, Science, Education and IT

Every institute is accountable to its stakeholder in terms of the funds (public/private) spent. The concern for quality will ensure accountability of funds spent and inform the stakeholders about making appropriate decisions. QA is a process of establishing stakeholder confidence that provisions (input, process and outcomes) fulfils expectations or meets the threshold minimum requirements
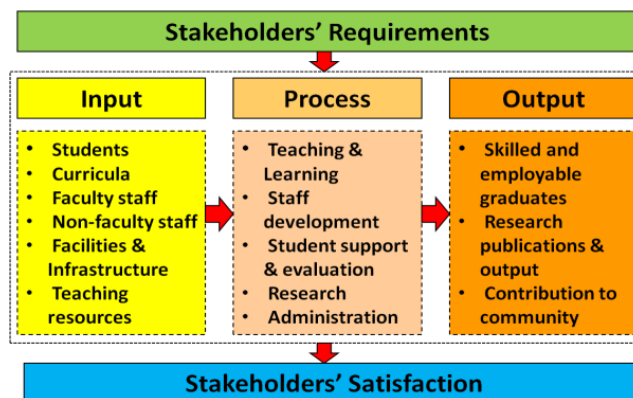

Figure 3 – Relationship between Stakeholders' Requirements and Satisfaction

Students want quality service and facilities which can make them responsible and competitive graduates. Academic staff want better teaching and working environment with appreciation of work quality and benefits. Employers want quality graduates with knowledge, skills and qualifications capable to contribute to their organizational success. The government wants smooth functioning of the universities with the facilities provided by them. The quality assurance system could be implemented in a variety of institutional arrangements. It could be implemented at least in two different ways at the same time, i.e. internally driven and externally driven. Internally driven is the priority way.

Therefore, the study was conducted to observe the positive impact of developing the quality information system and its effectiveness in order to improve the overall quality at Horizon Campus and how feasible QIS attempts to satisfy stakeholders' requirements.

2.0 Literature review

Many concepts of quality management are not only applicable in production and usage of physical products, but also in the context of immaterial ones, including e-learning applications (Sommer). Nevertheless, quality management concepts are hardly used as such today. As a basis for quality management the so-called quality information systems (QIS) can be used. It provides all the quality-relevant information during the whole life cycle of a product to all the stakeholders. In the context of e-learning it means that a QIS should provide all the quality-relevant information to the users of e-learning materials, instructors & tutors, and also to learners.

In this work after a close look some fundamental terms and ideas of quality information systems will be introduced, and it will be pointed out how they can be used in case of e-learning. Particularly, we will described what kind of information could be quality-relevant and how it should be prepared for the different users. Then, the focus of the work will be made on the implementation of this quality information system. After a detailed analysis of requirements the system design will be presented. Moreover, it will be shown how an information system like this could be integrated into the existing information system infrastructure of e-learning providers. Here the importance of standards for all the types of the data involved, for example, IEEE LOM for the learning objects, will be pointed out.

The results presented in this work have been obtained in the context of the research project "ViKar - Virtual University Group Karlsruhe" (Vikar, 2002). This project is being financed by the state of Baden-Württemberg as a part of the research program "Virtual University of Baden-Württemberg" (Baden, 2002).

3.0 Research methodology

Questionnaires and Interviews are mainly used to collect primary data and secondary data is collected through existing details and LMS log reports.

3.1 Collection of Primary Data

a) Questionnaire

A questionnaire has been distributed among students of the faculty of IT in order to check whether it was necessary to develop a new Student Management System (SMS), the use of LMS in order to encourage independent learning and the use of LMS in order to increase students' motivation to learn.

Questionnaire is attached in Annex 1, 3, 4 and the information collected is listed under section 4 and 5.

b) Interviews

A registrar, an accountant, a programme coordinator, a Dean, and a lecturer have been selected to conduct interviews as they are the people who are mainly involved in student registration at present. The combination of formal and informal ways of interview used to gather information for the SMS. The structured format used for conducting the interviews is in Annex 2 and the summary of interview findings is described in section 4 and 5.

Informal interviews have been conducted with the academic staff members to get their views on developing an electronic research repository for their publications.

3.2 Collection of Secondary Data

LMS log/activity reports (details are attached in Annex 4) and students' pass rate after introducing LMS, Operational Cost after introducing the LMS, Position of the Webometric ranking system after implementing DSpace have been taken as the secondary data for the research.

3.3 Conceptual Framework

In conceptualizing the study, the research allowed building relationship between independent and dependent variables. Learning Management System (LMS), Student Management System (SMS) and DSpace (Electronic Research Repository) are the Independent Variables and Improving

Quality is the dependent variable. This would enable the researcher to interpret the findings in a more comprehensive manner.

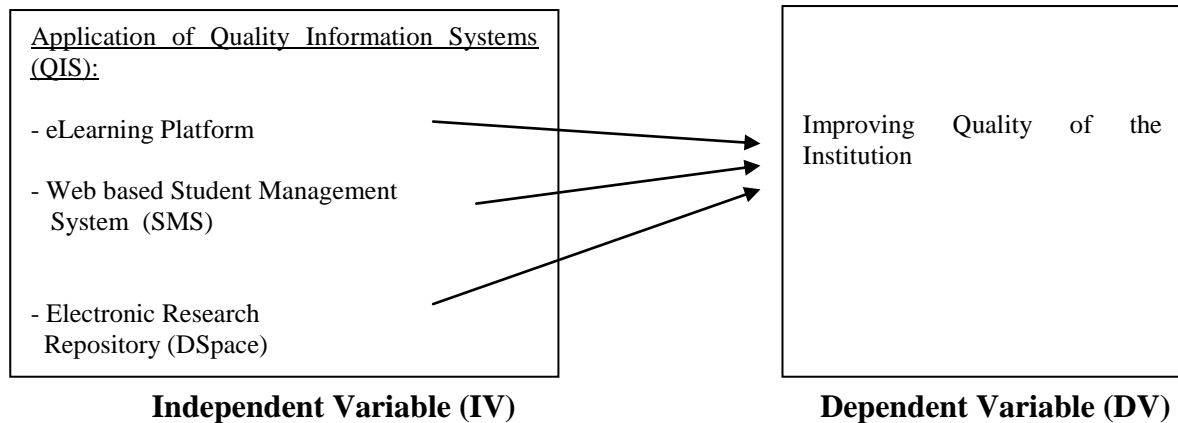The conceptual framework used in the research is illustrated in figure 4.

Application of Quality Information Systems (QIS):

- eLearning Platform

- Web based Student Management System (SMS)

- Electronic Research Repository (DSpace)

Improving Quality of the Institution

Independent Variable (IV) **Dependent Variable (DV)**

Figure 4 – Conceptual Framework for the proposed research

4.0 Data presentation

Interviewer used a specific set of questions to ask different interviewees and completed the form during the interview. Noted information transformed into Excel sheet for analyzing and was listed in Table 8.

Table 1 – Gathered information at the Interview on developing SMS

Question	Accountant	Coordinator	Dean	lecturer	Registrar's Office
What are the issues/problems facing in current system	Sharing information among Financeoivision, Coordinators and Registrar's Office is less on payments matters	Difficult to track the Student Attendance Percentage	individual Student tracking is less	Difficult to monitor student attendance in course wise	No proper communication among Registrar's Office, Coordinators, Finance Division and Deans Office
	Delays occurs in verifying Visiting Lecturers Payment	There 15no mechamsmto send reminders to Students on Outstanding Payments	There is no common template available among faculties	There isno proper mechanism to view Time Tableand Academic Calendar	No proper mechanism to Send notificationsto Students regarding outstanding payments. Results and other events
	Incomplete information	Difficult to locate past Students Marks/Grades to issue Transcript	Difficult to locate past records	Duplication of data in multiple locations	Difficult to locate students past records
	No backup system	Difficult to track eligibility requirements of students to sit for the exam before issuing Admission	No records for students achievements, awards and extra curricular activities	Data Inconsistency	
	There isno mechamsmto send reminders to Students on Outstanding Payments	There is no link among Finance Division, Library, Registrar's Office and Coordinators on common functions	Duplication of data in multiple locations		
How long that you are working with this manual system	3 Years'	5 Years	3 Years	2 Years	5 Years

Do you need a new system	Yes.	Yes.	Yes	Yes	Yes
What are the features/fu rationalities expecting through the new System	Integration among Finance, Marketing. Registrar's Office. Coordinators and Faculties	View Outstanding Payments Details	To view and maintain Student Attendance	To view Student Attendance Course Wise	View Students Personal Details
	Generate Customised Report	To track Attendance of Students in monthly, course, semester wise	To view and maintain Student Results, Awards and Achievements, Extra CurricularActivities	To view Students Results and Special Achievements	To view Students Results and Special Achievements
	Generate reports on comparison between income and expenditure of each faculty	integration among Finance Division. Registrar's Office, Library and Coordinators for common operational activities	To view pass rates and failure rates in batch wise, semester wise and course wise	To view student pass rate of particular course m batch wise	To view Lecture Time Tables, Academic Calendars and Exam Time Tables
	Automatic notification on outstanding payments	Send notifications to Students regarding outstanding payments. Results, Assignment Reminders and other events via email or SMS through a system	To view Student Details	To view Student Details	To view Lecturers Workload
			To maintain Student Workload Details		
What are the performance do you think are necessary to equip in the system	Level of access for confidential information	Efficient and Effectively access information	User Friendliness	User Friendliness	User Friendliness
	Accuracy of Information	Generate reports	Accuracy	Accuracy	Accuracy
	Reliability	Accuracy of Information	Availability	Availability	Availability
	Easy access	User Friendliness	Access of information efficiently	Accessibility	Access of information efficiently

* Using a less featured automated accounting system

Table 2 – Gathered information from the Questionnaire Survey

Faculty	1. Have you ever used a Student Management System before?	2. Do you think It Is necessary to implement a Student Management System for Horizon Campus?	3. Select which functionality you are expecting through the Student Management System?	4. Write any of your suggestions
Managament	NO	Yes	View Student Personal Details, View Course Details, View Current Semester Time Table, View Academic Calendar, View Student Attendance, View Exam lime table. View Student Profile (Grades R GPA, Awards R Achievements, Extra-Curricular Activities]	Like to get Reminders arid Notifications
	Yes	Yes	View Student Personal Details, View Current Semester lime I able. View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA, Awards 8 Achievements, Lxtra-Curricular Activities)	if you can send reminders on next installment day, to collect admission etc.
	No	Yes	View Student Personal Details, View Course Details, View Current Semester Time Table, View Academic Calendar. View Student Attendance, View Exam Time Table, View	Need Reminders or Notifications option

			Student Profile (Grades 8 GPA. Awards 8 Achievements, Extra Curricular Activities)	
	No	Yes	View Student Personal Details, View Current Semester Time Table, View Academic Calendar. View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA. Awards 8 Achievements, Extra Curricular Activities)	
	No	Yes	View Student Personal Details, View Course Details, View Current Semester Time Table, View Academic Calendar, View Student Attendance, View Exam Time Table. View Student Profile (Grades 8 GPA. Awards 8 Achievements. Fxtra-Curricular Activities)	
IT	NO	Yes	View Student Personal Details. View Course Details. View Current SemesterTime Table, View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades R GPA. Awards R Achievements, Extra-Curricular Activities)	Need to get Notifi-cations
	res	Yes	VlewCurrent Semester Time Table, View Academic Calen-dar, VlewStudent Attendance. View Exam lime Iable, View Student Profile (Grades R GPA. AwardsR Achievements, f xtra-Currlcular Activities)	if you can Inte-grate MIS and LMS would be great
	No	Yes	View Student Personal Details, View Current Semester lime table. View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades 8 GPA. Awards 8 Achievements, Extra-Curricular Activities)	
	Yes	Yes	View Course Details. VicwCurrcnt Semester Time Table, View Academic Calendar. View Student Attendance. View Exam Time Tabic. View Student Profile (Grades 8 GPA. Awards 8 Achievements, Extra Curricular Activities)	Like to receive reminders on as-signment submis-sion and exam dates
	No	No	View Course Details. VicwCurrcnt Semester Time Table, View Academic Calendar. View Student Attendance, View Exam Time Table. View Student Profile (Grades R GPA. AwardsR Achievements. Extra Curricular Activities)	Do not give access to our parents
Science	No	Yes	View Student Personal Details, View Course Details, View Current Semester Time Table. View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA, Awards & Achievements, Extra-Curricular Activities)	like to view spe-cial event details
	Yes	Yes	View Student Personal Details, View Current Semester Time Table. View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA, Awards & Achievements, Extra-Curricular Activities)	
	No	Yes	View Current Semester lime Table, View Academic Calen-dar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA, Awards & Achieve-ments, Extra-Curricular Activities)	If you can add another feature to get reminders would be appre-ciated
		Yes	View Current Semester Time Table, View Academic Calen-dar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA, Awards & Achieve-ments, Extra-Curricular Activities)	
	Yes	Yes	View Student Personal Details, View Course Details, View Current Semester Time Table, View Academic Calendar, View Student Attendance, View Exam Time Table, View Student Profile (Grades & GPA. Awards & Achievements, Extra Curricular Activities)	Need Remind-er/Notification feature
	No	Yet	View Student Personal Details, View Course Details. View Current Semester Time Table. View Academic Calendar. Viev/ Student Attendance. View Exam Time Table. View Student Profile (Grades 8 GPA. Awards 8 Achievements. Extra-CurrlcularActivities)	
	Yet	Yet	View Student Personal Details. View Course Details. View	Can you IlnklMS.

Education	No	Yet	Current Semester Time Table. View Academic Calendar. View Student Attendance. View Exam Time Table. Viev/ Student Profile (Grades 8 GPA. Awards 8 Achievements. Extra-CurncularActivities)	MIS and Library Management System
	No	Yet	View Course Details. View Current Semester Time Table. View Academic Calender. View Student Attendance. View Exam Time Tab e. View Student Profile(Grades& GPA. Awards 8 Achievements. Extra-Curricular Activities)	
	No	Yet	View Student Personal Details,View Course Details, view Current Semester Time Table. Viev/ Academic Calendar. Viev/ Student Attendance. Viev/ Exam Time Table. Viev/Student Profile (Grades & GPA. Awards & Achievements. Extra-Curricular Activities)	Reminders about payments and Exam Dates & Assignment Dates
	No	Yes	View Course Details. View Current Semester Time Table. View Academic Calendar. View Student Attendance. View Exam Time Tab e. View Student Profile (Grades 8 GPA. Awards £ Achievements, Extra-Curricular Activity)	Can you connect IMS and Mi$ both and we like to get notifications on ass«nment deadlines

5.0 Finding of the survey

The objective of the findings analysis is to summarise and interpret the survey outcomes in a way that relates to the the research objectives.

5.1 Findings of the Questionnaire

a) Students' responses concerning SMS development

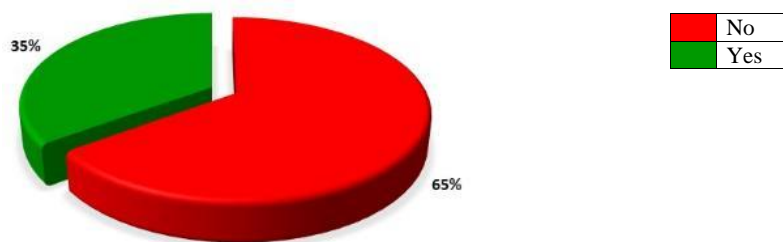The results of the survey are shown in Figures 5 - 7.

Figure 5 - Responses to Question 1: Have you ever used a Student Management System
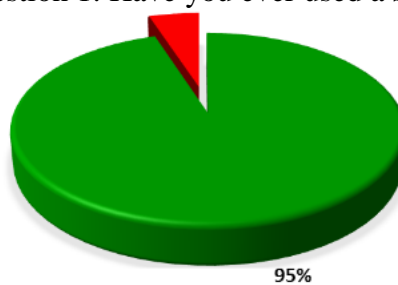

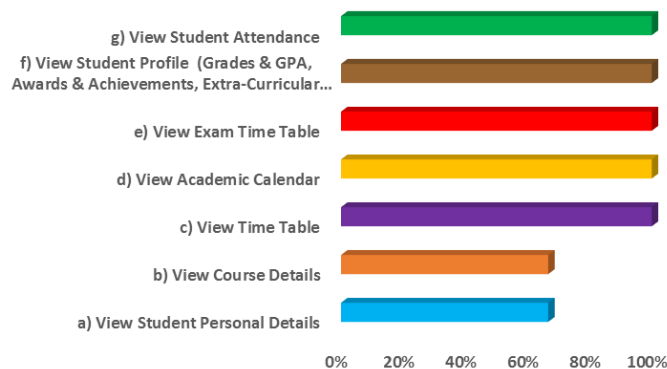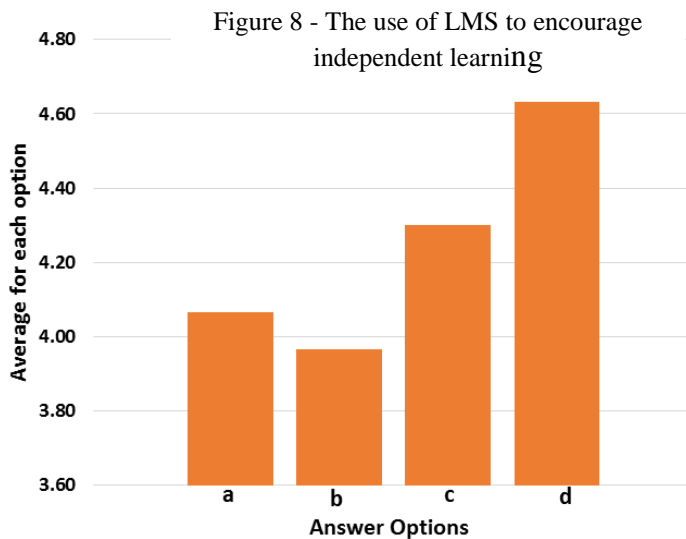Figure 6 - Responses to Question 2: Do you think it is necessary to implement a Student Management System?

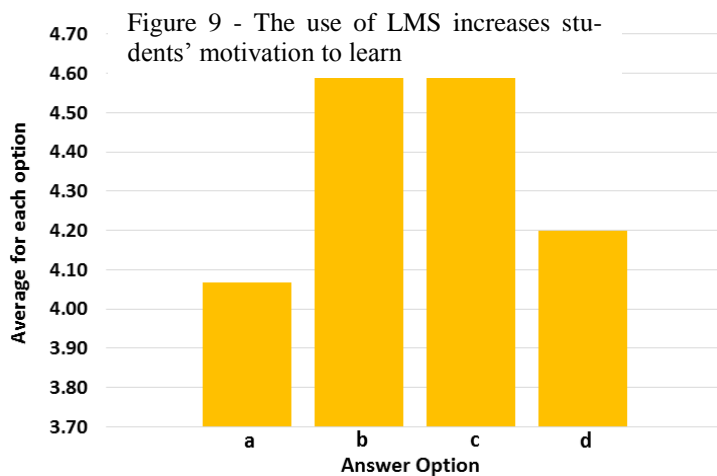Figure 7 - Responses to Question 3: Select which functionality you are expecting through the Student Management System

Figure 8 - The use of LMS to encourage independent learning

Most of students expected the lowing features/functions (other than the ones mentioned in the questionnaire) from the new SMS:

▪ to receive Reminders and Notifications via SMS or email about special notices and events related to their academic matters (examination dates, assignment deadlines, etc.)

▪ to integrate Student Management System (SMS), Learning Management System (LMS) and Library Management System.

b) Students' responses concerning the use of LMS

The students of IT faculty were surveyed on whether the 'use of Moodle encouraged independent learning' and the 'use of LMS increased students' motivation to learn'. The survey outcomes are illustrated in figures 8 -9 as follows.

Figure 9 - The use of LMS increases students' motivation to learn

According to the survey outcomes, the average of 4.63 indicated that the use of LMS encouraged them to talk to other students about the work. The average of 4.07 and 3.97 respectively indicated that they had an opportunity to learn using LMS at the time, place and pace to suit and encourage them to learn independently and in the way in which subjects/courses are set up to encourage students to learn independently. The average of 4.30 agreed LMS are mainly for information purpose and generally for their subject resources.

Figure 9 depicts the survey outcome of the use of LMS in terms of the increase of students' motivation to learn. The opportunity to be in control of student's learning via Moodle and learn at the time, place and pace individually adjusted, increased students' motivation to learn and amounted to the average of 4.07. The most of the students' motivation to learn is the variety of course tools including resources, PowerPoints, quizzes, hyperlinks, news feeds, and forums, available on LMS as the average of 4.63. The average of 4.60 indicated the variety of formats available on LMS, for example, text, images, audio clips, podcasts used in the educational process increased students' learning motivation. Feedback obtained as a result of activities. For example, LMS-based assignments and quizzes increased students' motivation to learn and amounted to the average of 4.20.

5.2 Findings of the interviews

a) Staff responses concerning SMS introduction

According to the findings, the identified issues/problems of the current/manual system are listed as follows:

▪ There is no or little information and communication sharing among the Finance Division, the Registrar's Office and the Academic Coordinators of the Faculty;

▪ It is difficult to maintain students' Data (exam results, personal details, payment details)

▪ It is difficult to monitor student attendance;

▪ There is no proper mechanism to send notifications to students regarding the delayed payments, academic results and other issues.

Most stakeholders of the current system expect the following features/functions from a new SMS.

- to integrate finance and marketing divisions, a registrar's office, coordinators and faculties;
- to send notifications to students regarding delayed payments, academic results, assignment reminders and other issues sent using email or SMS within a system;
- to monitor student attendance in a course, in a group, in a semester, on a daily, monthly or annual basis;
- to monitor student academic results, awards and achievements and extra-curricular activities;
- to view lecture timetables, academic calendars and exam timetables;
- to compile a customized report

b) Staff responses on DSpace (Electronic repository for Research Publications)

The academic staff of the Horizon Campus are very much interested in doing research, and the college administration is always encouraging them to do research as it is helpful to gain new knowledge in the course they teach. Many research articles, research papers, conference proceedings are published by the academic staff. It was important to make these publications available from one location.

Therefore, DSpace (an open source software of choice for academic, non-profit, and commercial organizations building open digital repositories) has been introduced.

6.0 Data analysis

6.1 Analysis of Secondary Data

a) LMS log/activity reports

Horizon Campus introduced LMS in September 2014. The teaching staff and students of IT faculty extensively use LMS in the teaching and learning process. The graph below illustrates the use of LMS at the faculty of IT from 2014 to 2016.
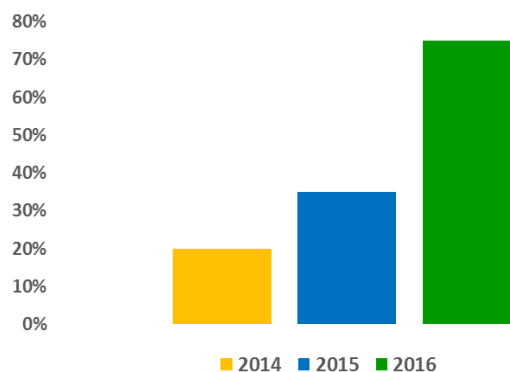

Figure 10 - Log/Activity report summary of using LMS at the faculty of IT

b) Student Performance

Students' pass rate at the faculty of IT has significantly increased from 2014 to 2016 (Figure 11).
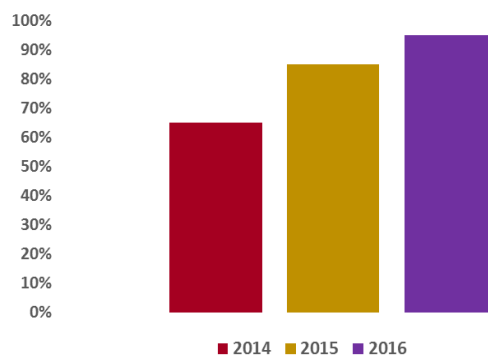

Figure 11 – Students' pass rate at the faculty of IT

c) Operational Cost for providing teaching and learning resources

Due to implementation of LMS, the operational cost of teaching and learning resources has been considerably decreased. The following figure illustrates a significant decline of annual operational costs for providing teaching and learning resources.
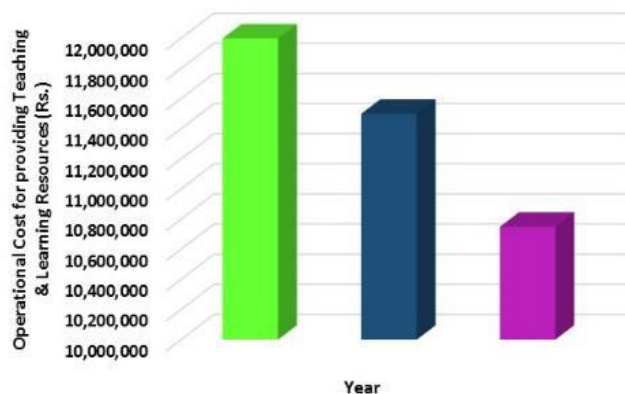

Figure 12 – Operational Cost for providing Teaching and Learning Resources after implementing LMS

d) Repository of Research Publications

The Webometrics Ranking of World Universities, also known as Ranking Web of Universities, is a ranking system for the world's universities based on a composite indicator that takes into account both the volume of the Web contents (number of web pages and files) and the visibility and impact of these web publications.

At present, DSpace of Horizon Campus contains a large number of research papers, conference papers, research articles and etc. DSpace was introduced at the Horizon Campus at the end of 2015. As a result Horizon Campus was ranked in 41st position of Sri Lankan Universities according to the latest result of Webometrics *(http://www.webometrics.info/en/Asia/Sri%20Lanka).*

7.0 Conclusion

It is clear that there is a relationship between eLearning Platform (LMS) and Improving Quality of the Institution. When comparing figures 10 and 11, it is evident that the pass rate of students increased after introducing LMS. Working efficiency and effectiveness is one of the key indicators of the measuring quality. eLearning platforms, considerable facilitate the educational process as it is an student-friendly and efficient mechanism for implementing learner centered teaching and learning. By analyzing the information listed in section 5, we assumed that there is a positive impact of QIS in relation to eLeaning application (LMS), web based Student Management System (SMS) and Electronic repository for research publications (DSpace) and the quality of the institute.

Cloud-based system provides uninterrupted e-learning facilities to students simultaneously hosting all other IT related services such as DSpace, SMS, library management, etc. Cloud based implementation installed and configured with an open source operating system and the application software, proves cost efficiency of approximately USD 170 per month. By comparing figures 1 and 2, it is clear that as a result of LMS implementation there is a significant reduction of operational costs related to educational resources.

Horizon Campus has implemented LMS, DSpace and SMS (still to be implemented). Students and teachers use the website links. Hence, QIS provides effective and efficient services to the stakeholders via the common platform.

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