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Internet of Things and Libraries: An Empirical Study of Selected Educational Institutions in United Arab Emirates

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Abstract

Purpose: This study examines how the internet of things concept implements possible area and satisfying customers.

Methods: Data from a survey of a sample of 120 library users from selected educational universities and colleges in Dubai to analyze the importance and satisfaction of IoT based services and resources.

Results: Possible areas for implementing IoT in libraries - improve access to the library and its resources, collection management, recommendation service, location-based service, appliances management, usage statistics, and information literacy. The IoT technology will notify and fulfils the user-related queries through on internet i.e., self-check-in, self-check-out, overdue reminders, online fine payment, misplaced books on shelves, etc. The study observed that the maximum number of respondents used Instagram and LinkedIn respectively. Meantime, the libraries should concentrate more on interaction through videoconferencing and library tutorial. 35.83% of the respondents are highly using the coursera and the second highest is LinkedIn with 29.85%. The institutes provide remote based library resources and services through cloud-based access on the basis of IoT i.e. Deepknowledge – remote access, BookShelf - Mobile App and Ezproxy –Server. Among all, the Deepknowledge portal is user-friendly and updates daily. In modern library services. academic performance and counselling and training are having significant association with the satisfaction level at 5% and 1% level of significance respectively.

Conclusion: IoT can implement the all sectional areas of libraries functions and services i.e. collection management, Information literacy programs, effective utilization of online learning portals, accessing of library resources, etc.

keywords: *Internet of Things, IoT, Academic Library, Educational Institute, UAE*

Introduction

The world of Information and Communication Technology has always carried out its dynamic and evolutionary nature in the course of ever-stopping time. Mostly due to the emergence of new technologies born out of some new original ideas that have been immensely uplifting and reshaping the lives of humankind. In this context, a library stands not only as a storehouse of knowledge and exclusive ideas but also acts as an authentic platform where communication, interaction, and connectivity has their highlighted roles.

The Internet of Things (IoT) is the extension of internet connectivity into physical devices and everyday objects. Embedded within electronics, internet connectivity and other forms of hardware, it turns them into the smart ones which are interconnected via internet and also have the capability to collect and exchange data along with automatic decision making. Thus, in every emerging light of IoT, the libraries are to see the future that were once considered fictional only for the betterment of their life-line.

Modern Libraries

Usually, the libraries are defining as temple of knowledge, heart of the institute, backbone of any academic institutes etc. In recent day the libraries are transforming from print management to knowledge management. Thus, libraries are play an essential role in research and teaching-learning. In Modern Libraries are implementing new innovative ideas in resources and services i.e. Information sharing, Indexing, navigating bibliographical details and resource access remotely through computers and mobile apps. Whereas, “Library services are currently available in various forms and provide tools such as chat, e-mail, social media, mobile applications and others” (Qin, 2018).

Review Literature

The academic Library is a center for information sharing, an essential part of the knowledge, teaching, and scientific research (Nie, 2017). The important role is to disseminate information and mediation of access to information (Wojcik, 2014). In recent days the libraries are facing many challenges in providing information to users in terms of physical resources, shortage of human resources, lack of financial support, etc. (Liang & Chen, 2017). For handling the physical library challenges, Internet or Information Communication Technology (ICT) leads to improve and innovate the library quality services i.e., mobile services, library notification, on table services (Pera, 2014). Libraries will add more addition to their services through IoT i.e. managing, monitoring, circulating, security and self-servicing. Its helps to improves collection, disseminate, made easier decision making in in-house operations. IoT as information literacy tool to educate the users to know about the library (Mohammadi & Yegane, 2018).

Objectives

This study mainly focuses possible areas for implementing IoT in libraries - improve access to the library and its resources, collection management, recommendation service, location-based service, appliances management, usage statistics, and information literacy (Pujara & Satyanarayana, 2015). This study examines how the selected institutional libraries are serving and satisfying their customers using internet of things concept.

Methodology

a structured questionnaire has been designed to collect data from the target of students from selected universities and colleges in Dubai, i.e. American University in the Emirates, SP Jian Global Management, Al Dar University College and Institute of Management Technology Dubai. A survey was conducted with a sample of 120 questionnaires through simple random sampling method and the results were analyzed and fulfill the stated objectives.

Results

Collection management

Selected libraries are automated with library management software's integrated with institutional ERP (Enterprise Resource Planning). The library physical resources and user Identity Cards are enables with RFID tags (contains the bibliographical data). The tags are synchronized with library management software. The data can be read through computers and

RFID devices. In term of IoT, the library collection process and activities are notifying through internet. The IoT technology will notify and fulfils the user-related queries through on internet i.e., self-check-in, self-check-out, overdue reminders, online fine payment, misplaced books on shelves, etc.

Information Literacy

Information literacy “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information through Internet of Things” (ALA, 2005). Information Literacy educate the library users about the library, resources, and services.

Table 1: Information Literacy

Awareness	Nos.	%	Cumulative %	Channels	Nos.
Library Orientation/ Video Monitor Display	41	35.96	35.96	LO/LH/SM/LT/LT	4
Library Hour	23	20.18	56.14	LO/LH/SM/LT	9
Library Website/ Social Media	28	24.56	80.70	LO/LH/SM/LT	17
Library Tour	14	12.28	92.98	LO/LH/SM/LTU	37
Video conferencing/ Library Tutorials	8	7.02	100.00	LO/LH/SM/LT/LTU	4
	114	100.00			67

LO: Library Orientation; LH: Library Hour; SM: Social Media; LT: Library Tour; LTU: Library Tutorials

Libraries are providing the information literacy program for their users through offline and online as well. Libraries are follows many channels to reach their users about the library and services. Apart from physical presentation, the libraries are promoting their library services and resources through internet of things i.e. video display, library website/webpage, social media, video conferencing etc. The above table 1 shows that how the respondents aware about the library resources and services. Maximum 35.96 % of respondents aware the library resources and services through library orientation and video monitor display. The reason is libraries organize library orientation before the academic year begins and continuously displays the services and resources through monitor. The second-highest channel is Library website, webpage and social media 24.56%. Only 19.30% of respondents were aware the library resources and services through Library tour and library tutorial. The study reveals that the selected libraries are providing the orientation through the mentioned channels and practices. The study reveals, out of four, one institute effectively provides information literacy through the mentioned channels i.e. Library Orientation, Library Tour, Library Hour, Online Social Media and Library Tutorial.

The study reveals that, in terms of IoT, the information literacy or marketing of library resources and services effectively reached the respondents through library website and social media. The libraries are using the Facebook, Instagram, LinkedIn, Twitter and youtube. The study observed that the maximum number of respondents used Instagram and LinkedIn respectively. Meantime, the libraries should concentrate more on interaction through videoconferencing and library tutorial.

Accessing of Library Resources Through Internet

The surveyed library resources can access through library website, LMS (learning management system), Remote access, and mobile app. In UAE, most of the institutes provide good IT infrastructure to library. So, the libraries are highly implement the technology-based services.

Usually, most of the libraries and users access the e-resources through their institutional library webpage. In surveyed library, users are highly familiar with LMS, remote access and mobile apps. This study reveals that, apart from library website (44.82%), maximum number of respondents (31.59%) are using remote-based access and mobile app. During the time of assignment submission and classroom activities, the respondents are accessing the resources with help of LMS.

The institutes provide remote based library resources and services through cloud-based access on the basis of IoT i.e. Deepknowledge – remote access, VitalSource, Bookshelf - Mobile App and EZproxy –Server. Among all, the Deepknowledge portal is user-friendly and updates daily. Most of the higher educational institutes prefer to subscribe the Deepknowledge portal on the basis of users' satisfaction.

Online Learning Portals

The surveyed libraries regularly notify their customers about the online courses conducted by various learning portals. The below table 2 reveals that the 35.83% of the respondents are highly using the coursera and the second highest is LinkedIn with 29.85%. The least usage is MIT courseraware. But, compare to LinkedIn and coursera, the MIT coursera conducts more career-related courses through leading professors from MIT and all around globe.

Table 2: Online Learning Portals

Online Learning Portal	Response	%	Cumulative %
Swayam	8	5.97	5.97
LinkedIn	40	29.85	35.82
Skillsoft	24	17.91	53.73
Coursera	48	35.83	89.56
MIT Courseware	14	10.44	100
Total	134	100	

E-book Access

In recent days, higher educational institutes in UAE are procuring electronic textbooks instead of print copies. The textbooks are being procured through the leading publisher products i.e. VitalSources, Growmore, Coretext, McGraw-Hill Series, Pearson Textbooks, etc. The electronic textbooks are accessed through Internet (individual access code and LMS). The purpose of e-textbook procurement is to ease the accessibility possible anywhere and anytime. The students easily access them without depending on anyone.

Evaluation of Modern Library Services

Table 3: Evaluation

Parameters	Chi-Square	Sign
Supports for academic performance	33.590	0.029**
Counselling and Training	37.544	0.001*
Information Sharing	30.619	0.060
Resource Guide	20.606	0.421
IT Infrastructure	30.619	0.060

*Significance at 1% LOS **Significance at 5% LOS

The above table 3 analyzed using Pearson chi-square test to find out the significant association between the modern library services and the satisfaction level. From the test statistics, it is understood that two parameters such as supports for academic performance and counselling and training are having significant association with the satisfaction level at 5% and 1% level of significance respectively.

Satisfaction vs Online Literacy Program

Table 4: Satisfaction

Parameters	Chi Square	Sign
Knowledge about the Library	28.411	0.000*
Self-Independent	29.331	0.000*
Finding Library Resources	22.076	0.000*
Academic Performance	12.849	0.005*
stated policies and procedures	20.715	0.000*
Improves productivity	33.037	0.000*
Learning Activities	35.822	0.000*

*Significance at 1% LOS

The above table 4 analyzed using chi-square test to find out the significant association between the Online literacy program and the satisfaction level. The study indicates that the respondents are highly satisfied the online literacy program helps academic performance and self-independent. Meantime supports know about the library and finding resources on easy manner. From the test statistics, it is understood that the parameters significant association with the satisfaction level at 1% level of significance respectively.

Evaluate the online learning

Table 5: Online Learning Evaluation

Parameters	Mean	Std. Dev.	Skewness		Kurtosis		Rank
			Statistic	Std. Error	Statistic	Std. Error	
Academic Performance	1.71	.80385	1.179	0.226	1.816	0.449	5
Essential in Internet World	1.79	.80022	0.593	0.226	-0.570	0.449	4
Easy to Use	1.87	1.00565	1.260	0.226	1.477	0.449	3
ICT Challenges	1.90	.93097	1.066	0.226	1.072	0.449	2
Digital Teacher	2.00	1.02617	1.033	0.226	.610	0.449	1

Concerning the evaluation of the internet-based learning, the above table 5 Indicates that the respondents agreed that Internet plays as teacher with the mean value of 2.00, followed by facing ICT challenges (meaning value of 1.90). The study inferred that Internet-based learning is play as a teacher whenever they need an assistance and easy to use/find the solution without anyone help. Secondly, respondents were agreed that facing challenges using internet due to lack of technical knowledge in ICT and its very essential in the recent internet world. The study reveals that the academic curriculum should implement and teach the students about how to handle and overcome the ICT based challenges.

Features of Internet-Based Learning

Table 6: Internet-Based Learning

Parameters	Mean	Std. Deviation	Skewness		Kurtosis	
		Statistic	Statistic	Std. Error	Statistic	Std. Error
Flexible Schedule/Save the Time	1.8596	.85058	.713	.226	-.199	.449
Lower Costs	2.1930	1.07157	.615	.226	-.335	.449
Self-Discipline	2.0000	.92171	.690	.226	.022	.449
Multiple Learning Possibility	2.0351	1.03846	1.184	.226	1.384	.449
Learn at Your Own	1.9825	1.03036	1.123	.226	.970	.449

The above table 6 describe the features of online learning based on respondents' perspective. The respondents strongly agreed that the online courses are lower costs with mean score of 2.19 followed by its possible to multiple learning with mean score of 2.03. Moreover, the respondents are agreed that it's purely learn their own and the flexible schedules help to save the time on productive manner.

Conclusion

Recent development of Internet of Things completely changes the human lifestyle in every sector. As like other sectors, the academic libraries also meet users' needs in the way of implementing the innovative services and resources through IoT. However, our findings reveal that the surveyed institutional respondents are highly satisfied with IoT based resources and services. The study exposes high tech facilities and services are motivating the students to use the library resources without any barriers. Furthermore, respondents are highly satisfied with performance of IoT based modern libraries. The study concluded that IoT can implement the all sectional areas of libraries functions and services i.e. collection management, Information literacy programs, effective utilization of online learning portals, accessing of library resources, etc.

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