Turkish Journal of Computer and Mathematics Education *Vol.13 No.02 (2022), 78-97*

Research Article

Design of Knowledge Management System to Enhance Learning and Teaching among Libyan Academicians

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Abstract: Lecturing in higher institutes of learning is a profession that is defined by intellectual labour and academicians are required to apply knowledge from multiple domains. As knowledge workers academic staff can benefit from collaboration among themselves and sharing of their professional experience. The aim of this study is to develop a prototype Knowledge Management System (KMS) to assist academic staff to network, learn and share of knowledge and resources in Libya Institutes of Higher Learning. The methodology used in this research is Design Based Research (DBR). Six academicians from Libya Institutes oof Higher Learningwere interviewed to determine the system requirements. The prototype was modelled using UML and developed using HTML5 and CSS web development technologies. To evaluate the system, survey instruments were designed and administered based on Technology Acceptance Model (TAM) 2, ease of use constructs and the academicians' specifications. Fifty academicians were approached to evaluate the prototype after using the system. 96% of the academicians who evaluated the prototype, rated it as easy to use. 84% of the respondents said Yes, they will use it if it is fully implemented. 90% indicated that they will recommend it to their friends. This research findings contribute to the body of knowledge related to Knowledge Management System by applying Design Based Research methodology to develop an artefact and utilized TAM as theory in designing, developing and evaluating the prototype. The artefact from this study is an innovation that would be useful to academicians to connect, collaborate and share knowledge and resources. It also provides opportunity for researchers to develop applications for networking, collaboration and sharing of knowledge and learning.

Keywords: Knowledge Management System, Institutes of Higher Learning, Design Based Research, Prototype, Libya

1. Introduction

Davenport and Prusak, (1998) defined knowledge management as "*the mix of experience, values, contextual information and expert insight that allows individuals and groups to evaluate and incorporate new experiences and information*" The main goal for managing knowledge is to capture knowledge that serves the needs of the employees and the organization's strategic goals (O'Dell & Hubert, 2011). Like other business organizations, past studies indicated that, higher education institutions can apply Knowledge Management approach to support their performance and achievements (Kidwell, Vander Linde, & Johnson, 2000; Ramachandran, Chong, & Wong, 2013, Sunalai, 2017, Bakon et al. 2021). They can apply Knowledge Management to support their goals by aiming at increasing knowledge-based activities in line with their institutional achievements, particularly the improvement of quality performance. Knowledge management (KM), which used to be high on the list of many industries, has become a priority for higher education as well. There is a growing acknowledgement that an institutional-wide approach to KM will enable higher education institutions (HEIs) to evolve more effortlessly to a highly effective and dynamic educational environment which promises considerable improvements in institutional-wide knowledge-sharing activities and subsequently lead to the improvement in overall performance (Sharimllah Devi et al., 2007;Khalid, 2021.).

Having said this, however, only few educational institutions are found to have a full-fledged KM practice in place (Ramachandran, et al., 20013). In Libya, there is absence of strong knowledge management infrastructure and no evidence of knowledge management usage in educational institutions (Beleid et al., ,2020; Omrani and Azam, 2020). In other words, in the context of Libya, studies of Knowledge Management System practice in higher institutions are scant (Salam et al., 2020). There are currently very few researches of knowledge management systems

in Libya higher institutes of learning, particularly dealing with collaboration, interaction and sharing of knowledge among academicians(Olusegun, 2021).

In Libya Institutes of Higher Learning the roles of knowledge using even basic information technology tools, to develop a knowledge-intensive culture by aggregating and encouraging behaviour such as knowledge sharing and proactively seeking and offering knowledge are not practiced by faculty. As knowledge workers, academic staff can benefit from collaboration among themselves and sharing of their professional perception. Yet, academic staff are isolated in their lecture rooms or in their faculties. This discourages the development and sharing of knowledge and practice among members of the academic (Rouser, 2009; Trybulkevych et al., 2020). ,

To address the gap mentioned earlier, thisstudy investigates the development of a knowledge-management system that enables networking, learning sharing of knowledge for the purpose of improving learning and teaching among academicians in Higher education institutes in Libya. Therefore, this study aims to answer the following research questions.

2. Research Question

What are the features and functionalities of the knowledge management system that could support academicians at Libyan Institutes of Higher Learning?

3. Research Aim

The aim of this study is to develop a prototype Knowledge Management System to determine their prospect for academic staff networking, learning and sharing of knowledge in Libya Institute of Higher Learning.

4. Methodology

The methodology to be used for this research is Design Based Research (DBR). Design Based Research which is also known as Development Research. It is a research methodology that informs instructional design. It generates solutions to complex, real-world problems, using existing theory and practice. This research has adopted the designed based research (DBR) model developed by Reeves (2006). The steps involved in this research are; analysis of practical problems, development of solutions, evaluation and testing of solution and documentation and reflection to produce design principles. Figure 1.1 shows the graphical representation of the model.

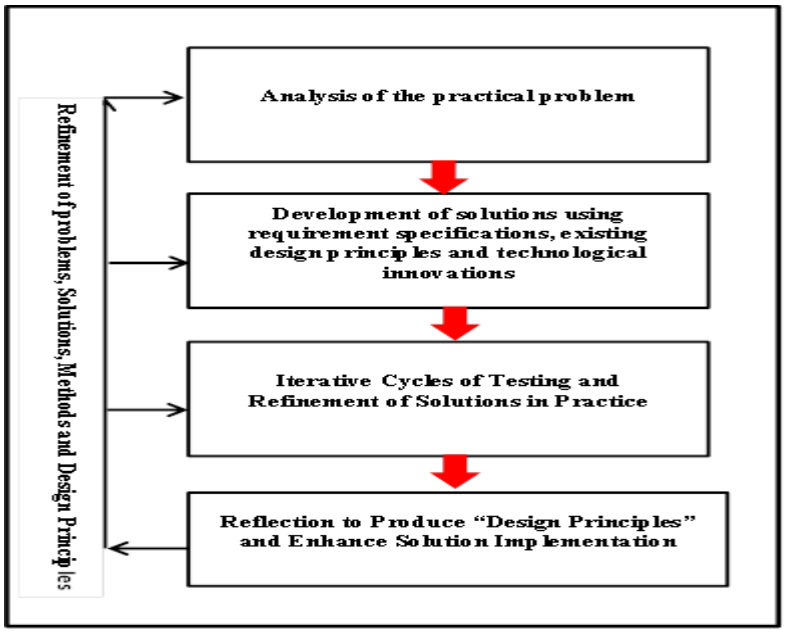

Figure1: Design Based Research Approach adopted from (Reeves, 2006)

4.1. Sample of the Study

Researchers used sampling to determine the content of Libyan-Academic Knowledge Management System (LA-

KMS). A total of six academicians from Libya were interviewed to determine the specification requirement of the system. Additional sixty five academicians were approached to evaluate the developed prototype. To ensure that the credibility of the study is intact, researchers ensured thatonly academicians in Libya were selected for this study.Some additional measures taken were to select only tertiary education academicians with minimum academic experience of two years.The selection strategy for the semi structured interview was based on purposive sampling since the aim is to receive rich information from the informants whereas convenient sampling technique was used to select the sixty five academicians to evaluate the protocols.

4.2. Research Instrument

Phase 1 - Semi Structured Interview

Two types of instruments were used to design Libyan-Academic Knowledge Management System.Semi structured interview protocol was used to gather requirement data in the 1 phase. The aim of the data gathering at this phase is to establish the perceive needs for knowledge management system in IHL and specify the requirement for prototype of the KM. Semi- structured interview conducted, explored the lack of knowledge sharing solutions among the academics in Libya Institutes of Higher Learning and if the academics perceive the needs of developing a solution to enhance knowledge sharing among faculty members. Face to face interviews were conducted with six faculty members from Tripoli University. The semi structured interview questions enabled the selected participants to freely express their opinions based on the guidance from the open-ended questions. The interview questions which were originally designed in English language were translated into Arabic language to enable the participants to clearly understand the questions and remove any sort of doubt. The answers from the participants were recorded with a mobile phone after gaining permission to do so. The recordings were transcribed and translated into English.

Phase 2 - Evaluation Questionnaires

The aim of this study is to develop a knowledge management system that could enable the sharing of knowledge and enhance learning, among faculty members. Much of the prototype features and functions were be driven from the system requirement specification gathered in phase 1. In phase 2 the aim is to test and evaluate the prototype solution created to determine if the solution fulfills the requirements given by the members of the faculty. The survey was divided into five sections. The theory underpinning behind the survey will be Website Evaluation Framework (WEF) showcased in Policy Briefing Paper No 5 (November 2001) and as used by (Comensoli, 2014) and questions regarding perceive ease of use based on Davies et al. (1986) model were added. A total of fifty participants took part in the evaluation of the prototype. The respondents comprise lecturers, senior lecturers, assistance professors, associate professors and professors. The academician participation of the evaluation of the LA-KMS was purely voluntary. The participants were chosen because of these following reasons:

a. Timeframes determined the evaluation duration of the product. It is beyond the control of the student. Because of the time constraints respondents are needed to be academicians with good ICT-knowledge.
b. The academicians should be experienced in the use of academic management, learning or sharing systems.

5. Result and Analysis of the Interview Questions

Thematic analysis was carried outfrom the answers given by the respondents**.** The interviews were transcribed and the themes were manually analysed and under the following discussions:

- The importance of using knowledge management application to enhance teaching and learning.
- Usage of knowledge management system to share knowledge.
- The features of knowledge management systems that support knowledge sharing and learning among faculty members.
- The on-line resources currently used to support learning. Circumstances for the preference of the current website.
- Privacy, trust and intellectual property issues that impact content contribution.
- The importance of using other aspects of technology for knowledge-sharing.

5.1. Analysis of Interview Questions

After translating and transcribing the interview answers given by the respondents, below are the findings from the manual analysis of the interview answers given by the respondents.

Q1. Do you agree that using knowledge management application to enhance teaching and learning is important?

When the participants were asked if using knowledge management application to enhance teaching and learning is important, all of them supported the idea of having a more effective online knowledge-sharing and learning system. They posited that it will enhance resources sharing among academicians. All the six participants of the interview showed interest in using a web application as it enables teaching and learning resources to be shared. Some of the comments given by the participants are as follows:

"Each of us have unique way and capability of teaching, especially my academic colleagues who have several years of experience, would be able to share their vast experience, knowledge and resources to the new member of faculty via an effective knowledge resources sharing application" Participant 3

Participants 4 concluded that:

"Should knowledge related resources be readily available I could just modify them to match my own needs and utilize them whenever I needed them in and this could give me ample time to concentrate on actual lecturing.

Q2. To what extent have you used knowledge management system to share knowledge?

The academicians who participated in this study demonstrated that they faced a lot of challenges and difficulties in identifying and reaching fellow academicians who possess information or knowledge that they are looking for. They strongly support the prospect of obtaining new ideas and learning from experienced fellow academicians. Currently, some of the academicians use emails and WhatsApp to connect to other colleagues they knew from their past academic encounters and experiences. The participants indicated that they support the development of an application that could extend the ability of IHL academicians around Libya to be connected and utilize the professional network for the improvement of the profession. Below are some answers given by participants with regard to the above question:

"*There should be system that allows colleagues in the IHL to be connected to share and learn from each other without the need to depend on someone you know, which is currently the practice*". Participant 1

Another participant added that:

"*Currently, I have to consult some colleagues that I knew previously for guide using emails or WhatsApp and at times for resources. Having to always get back to them is embarrassing and I have a limited number of contacts. Hence, a system that could connect wider group of academicians in IHL in Libya would be very supportive*". Participant 5

Q3. How knowledge management application could benefits you?

All the six participants showed that knowledge management systems would enable them to have access to many fellow academicians, exchange rich and relevant materials, gain knowledge from experienced academicians, enhance learning and self-improvement. The other benefits highlighted by the informants are better coordination of teaching and learning approaches, better network creation and consistency of learning achievement among all the groups.The following were the comments given by the participants:

"With Knowledge Management System, I would be able to gain access to colleagues in similar discipline". Informant 3.

Another participant added that:

"*Should I be teaching a module that I have not thought before, I could find ideas, learn about how it is taught and to teach it easily*" Informant 6.

Q4. What features of knowledge management systems would support knowledge sharing and learning among faculty members?

In terms of the features the participants indicated that they would like to have in the knowledge management system, features such as chat rooms, forums, uploading and downloading resources, searching of resources, access control and wide variety of information including how to deal with difficult students and parents as well as aesthetics are some of the features that all the six participants suggested that they would like to have in the system. Below are some of the key features that the participants indicated that they would like to see in the system:

Access Features

All the participants mentioned that access to the system has to be controlled. Users should be academicians and their background has to be verified before they are authorised to use the system. Users should log in with an ID and password. Most of the members also indicated that they would like to have access to all the relevant materials uploaded by fellow members. One academician put it this way:

"I would like an individual to be listed as an academician before theycan access and contribute resources to the system, for the sake of reliability of the resources". Informant 3

Resources

The respondents commented that sharing of resources such as videos, texts, and useful resources that could facilitate their learning and teaching in the platform would be very useful. And ability to have access to the frequently asked questions would be very useful. These are the comments given by the respondents:

> *"I agree that a listing for the sharing of resources will be fine, for example Frequently asked Questions (FAQ) could give me a short cut to many useful information previously asked by other academicians".* Informant 5
>
> *"I should be able to use text or voice search engine to look for any resources that I am looking for"* Informant 5.
>
> *"Sharing of videos of best practices of colleagues regarding how they manage their lectures, students and assessments would be very beneficial to inexperienced academic like me".* Informant 2

Forum

The respondents commented having an academic forum where academicians would discuss, contributes and exchanges learning ideas and knowledge would be very useful. These are the comments given by the respondents:

> *"A forum where you could ask a question of someone with an experience from different institute for example; how do you teach this?"* Informant 3
>
> *"Discussing to find out what the experience lecturers would do to motivate weak students"* Informant 2
>
> *"Imagine a colleague in the same discipline advises me about what techniques that works for him/or her here or what he/she thinks it is a good idea or not. That would be absolutely wonderful"* Informant 1
>
> *"Forums for each faculty or discipline will enable me to post questions relating to my discipline"* Informant 5
>
> *"Having a group forum would be great but they should be a mechanism where individuals could interact and exchange ideas privately"*Informant 6

Uploading and contribution of material

The academicians indicated that they would like to contribute materials and share resources among themselves in easy manner without going through lengthy time consuming process and facing any technical issues. They also want to be able to share dynamic content.

"There are no knowledge sharing websites that allow academicians in Libya to be able to upload and download strategies, content and any kind of resources" Informant 6

"Ability to upload video, text and any kind of multimedia content that could facilitate an inexperience academician like myself would be a plus". Informant 5

Search functionality

Good search functionality is shown to be a very desirable function by all the informants. The informant would like to have an easy to use including voice and text searches.

"Having a good search engine is paramount and I would like to have an intuitive and easy to use search engine". Informant 5

"I want to be able to search using text or voice" Informant 6

System Capability

To use the Knowledge Management system would largely depend upon its infrastructure and the itsreliability. Academicians would use the system if they found it to be reliableand hassle free.

"I would like to be able to use the system without experiencing any system failure" Informant 3

"I would expect the system to be capable enough to process and give me the exact output that I am expecting" Informant 1

"Searching and finding the right content to read within a short period of time will hugely safe the time of the academicians who are always busy". Informant 6

Q5. What criteria or aesthetics are needed to be added to encourage knowledge sharing and learning?

Criteria or aesthetics that is relevant to the design of the Knowledge Management Systems are as follows:

"I would like to have content that are free and fast to download". Informant 2

"I would like to have documents that are supported by multiple platforms with high download speed". Informant 5

i. Aesthetics

The website should be attractive and induces the user to explore it further. Below are some of the comments given by the informants.

"I would like to see a site that is neat with clear navigation of pages. A boring and difficult to navigate site could discourage me form using it". Informant 3

"If possible a shortcut and easy access to the main page, could make the use of the site easier". Informant 5

"There should be current and accurate content especially in the era of fake news" Informant 1

6. What does knowledge management site have to provide in order to be meaningful to you and under what circumstances would you use it in preference to the sites you are already accessing?

Academicians in Libya indicated that they faced several challenges in identifying colleagues who possess experience, knowledge or information that they seek. The chances to get fresh ideas and experiences from a larger community of academicians are welcomed by the informants. Currently academicians in higher institute of learning use e-mail and WhatsApp to connect to other professionals who had prior experiences. Developing a system that enhanced the teachers' ability to use the larger, linked professional network is supported.

"Getting fellow academicians who have information or knowledge relevant to my expertise is very difficult in Libya". Informant 1

"If there are easier way of gaining knowledge from other academicians, I would definitely use it". Informant 5

"If you can get relevant resources that you can change to make it your own, it would reduce the time needed for other things". Informant 6

"Currently, if I need some information or knowledge from a fellow academicians, I need to consult the only ones that I know". Informant 2

Q6. What are the functionalities or features of thewebsites that meet your needs?

The examples of the features assumed to be useful by the academicians are as follows:

5.2. Features/Functionality of the proposed System

All in all academicians want an easy to access and to use websites. The participants highlighted that they want current and dynamic content and viewed it to be very important to the proposed system

- Good keyword search and ease of navigation functionalities were also viewed as critical needs
- Participants identified text size, layout, colour and fonts as essential for ease of use
- The majority of participating lecturers preferred the organisation of the subjects or results topics or subheadings
- The majority of the lecturers who took part in the interview preferred to organise their materials into subheadings based on subjects or results.
- For most lecturers the interaction among themselves is also key to on the site was highly important
- Most academicians participated in the interview ranked interactivity among teachers using the web as highly important.

5.2.1. Summary of Relevant Features Important to the Academicians

Academicians have idenfied various vital features that they would like to have in the LA-KMS and they are mapped in the ruberic as shown. The description of the features and quatation from the informants supporting them are given in Table 1.

Table 1. Summary of the Features and Functionalities

CRITERIA	Significance to Academicians
Technical Design Upload and Download of materials	• Uploads and Downloads • Documents should downloadable and adjustable – modify, copy, paste, delete,
Aesthetics- Attraction and neatness of the Website. Encourages the user to explore further because of it attractions.	• Simple – clear and uncluttered
Organisation - Good organisation, easy to navigate and intuitive.	• Organisation LA-KMS and stages and strands within the LA KMS. • The ability to search within the LA-KMS. • Picture icons that assist in the navigation
Navigation- Easy to navigate the website. Proper interlinking of pages and the links work.	• Easy to access • Easy to return to the home page • Links are clear
Use of Graphics - Graphics aid the user and enhance the site	Sounds and Video (Sounds and video load and enhance the site)
Content - Information and links areclearly labelled and organised; information is accurate and current.	• Ability to distinguish between resources • Information that is correct is important, needs to

	be current and renewed regularly
Currency- Up-to-datedness of the website	An up to date content
Access Only authorised academicians should be users	All the participants mentioned that access to the system has to be controlled.
Advanced Design	• Forum • Voice and Audio Search • E-mail • Frequently Asked Questions

5.2.2. Overall Summary of the Interviw Analysis

Mostly the lecturers wanted an easy to access and use website. Most of the interview participants have also identified current and dynamic content as critical. Besides, considered as critical requirements were a good search function with keywords and simple navigation. A number of groups identified colour as important for usability, together with text size, layout and font. The majority of academics participating in the interview preferred to organise LA-KMS materials with topics or results.

To most of the Interview participants, interactivity between lecturers using the website was very important. The academicians who were interviewed seems to be isolated professionally and showed a low level of involvement with other academicians especially outside their own respective universities. They have little interaction with other similar websites widely available as well as low use of external web-sites.

All the six participants of the interview indicated that they were prepared to use the website to interact with their colleagues, advising that it would be better used to obtain information and expert advice.

6. Design of the LA-KMS Prototype

Unified Modelling Language (UML) was the language used to model the LA-KMS. Table 2 and 3 show the Use Case scenarios based on the requirements and Figure 2 and 3 illustrates Use Case diagrams of the LA-KMS. The major actors for this proposed system are the administrator and the academicians. The Use Case diagram for the administrator starts from here followed by the academicians.To achieve the goal of LA-KMS prototype, the following key functionalities are required: 1. Creating a network platform for academicians; 2. discussion forums, 3. Public resources sharing portal (Download and upload capability) 3. Private email correspondence and 4. Voice and Text Search Engine Frequently Asked Questions. This is illustrated in Figure 2.

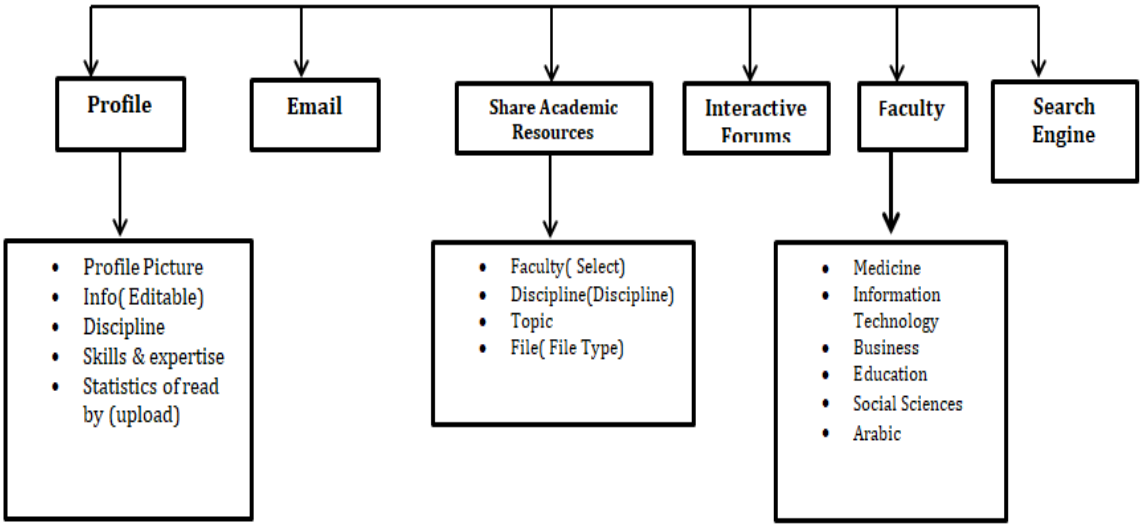

Figure 2. Key System Functionalities

Table 2.Administrator Use Case Scenario

Actor	Administrator
Use Cases	• Login into the system • Manage administrators • Manage users • Manage forum activities • Manage upload and download files • Update Frequently asked Questions

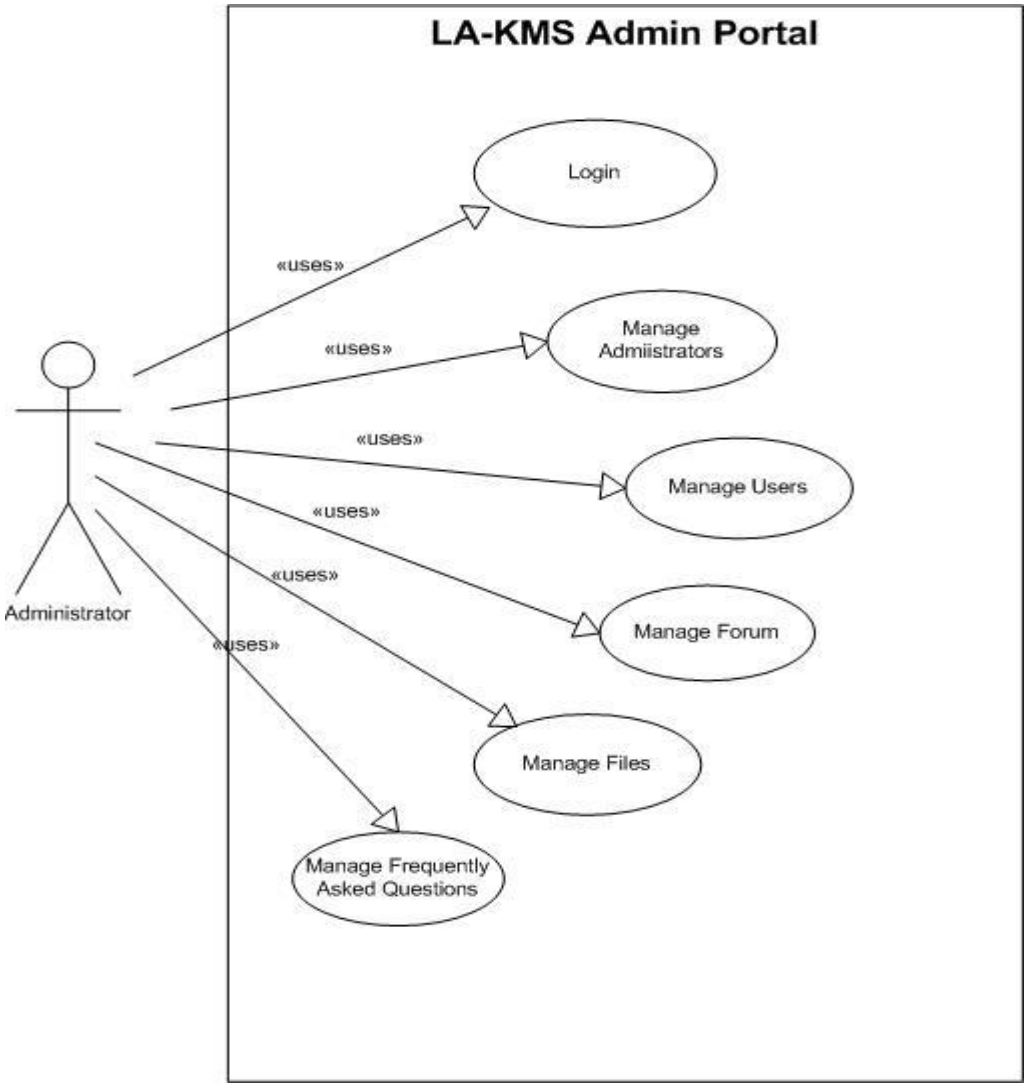

Figure 3. Administrator Use Case

Table 3 Academician Use Case Scenario

Actor	Academicians
Use Cases	• Login into the system or register before login • Use voice/ text to search for information • Start a discussion/write a thread on the discussion forum • Receive or send emails to other academicians in the platforms • Upload and download files • Access the frequently asked questions

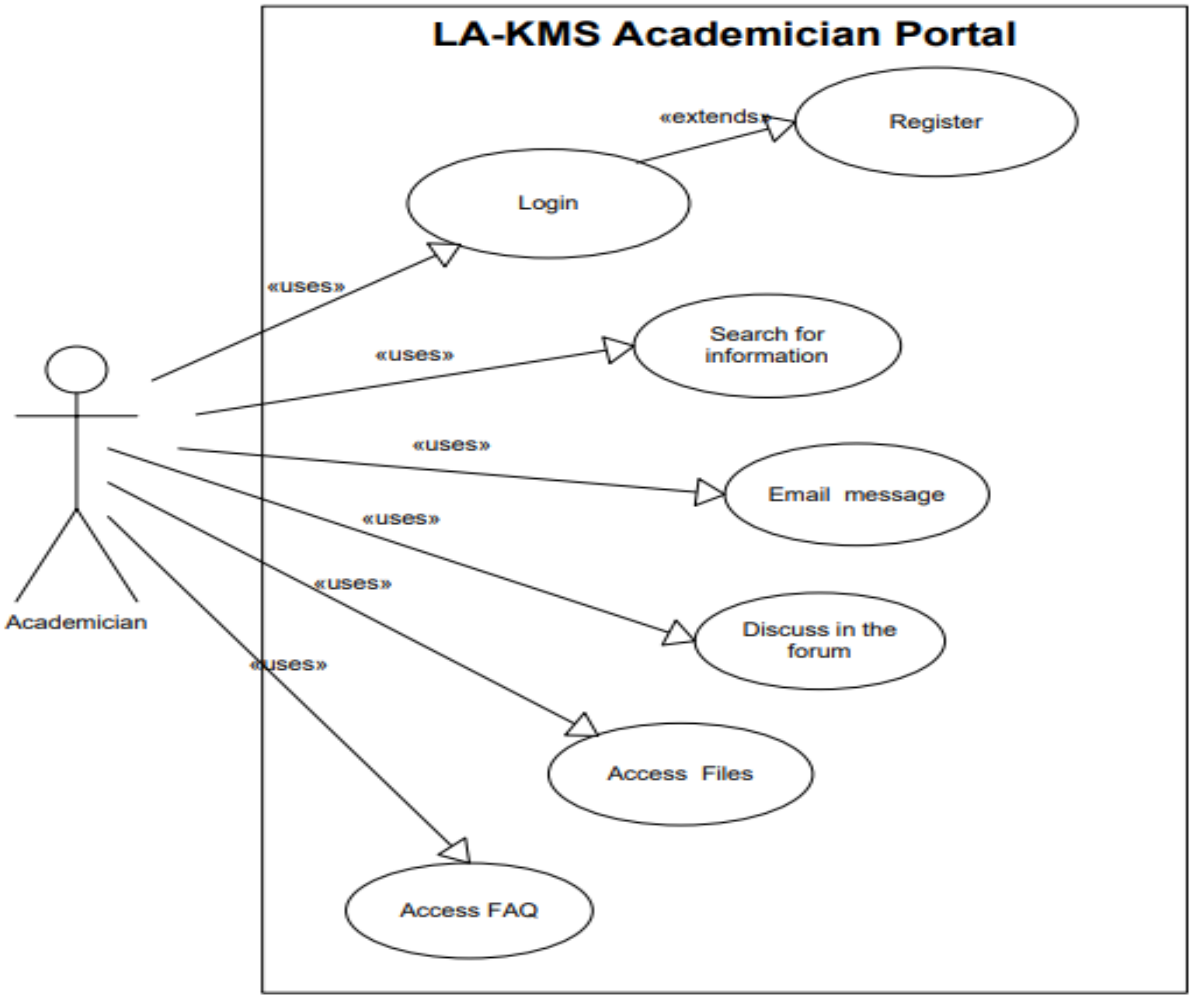

Figure 4 Academicians Portal Use Case Diagram.

7. Prototype Development

The system was developed using the following web application development tools and technologies and they are as follow; Hypertext Markup Language version 5**(**HTML5) and Cascading Style Sheets (CSS)for front- end. PHP for backend and MySQL for the database. The interfaces of the prototype and their brief explanations are provided below.

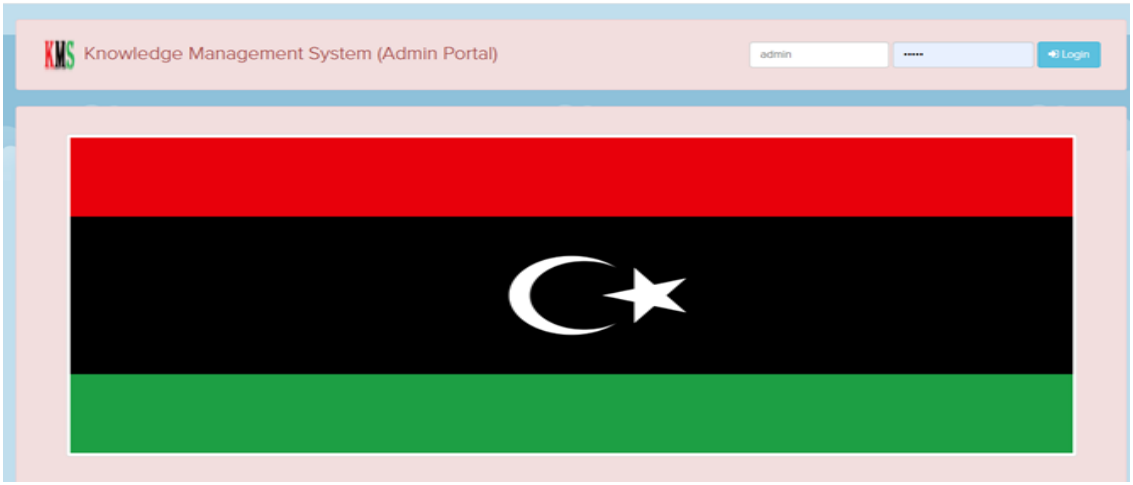

Figure 5 Admin Login

Figure 5 illustrates the admin log in page of the system. For and admin to log in, username and password has to be provided to the system. Another function that enables enhances ease of use is the immediate change of Admin portal to User portal when the KMS Icon is clicked. The admin portal allows administrator to manage administrators and users, manage the content of forums, resources

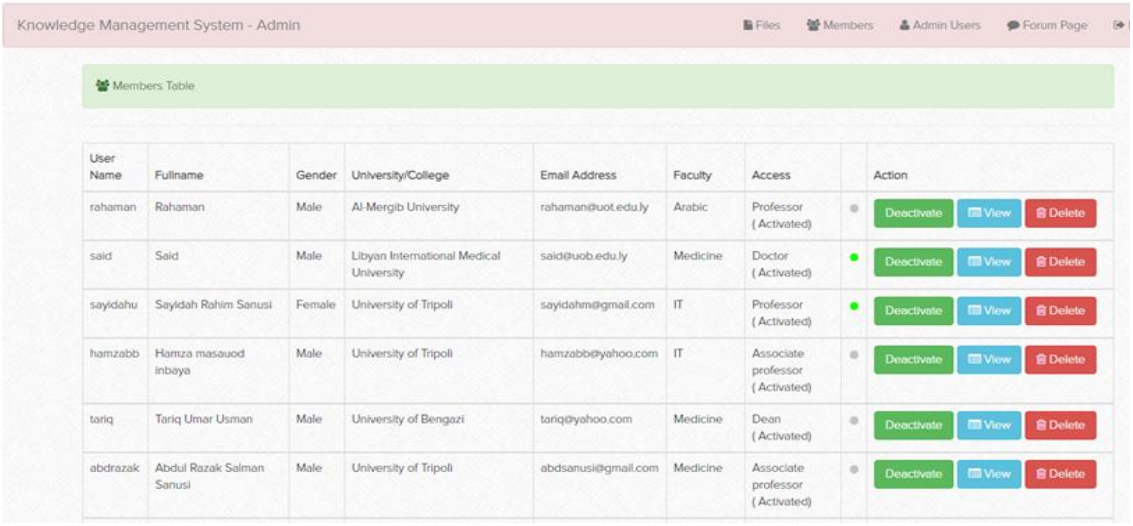

Figure 6: User/Member Management Page

Figure 6 illustrate the membership or user management component of LA-KMS. When a new member registers, the admin would either approve by clicking (activate) or disapprove or reject the registration of a new member by clicking (deactivate). In this page, the admin can also view the detail registration information and delete an existing member.

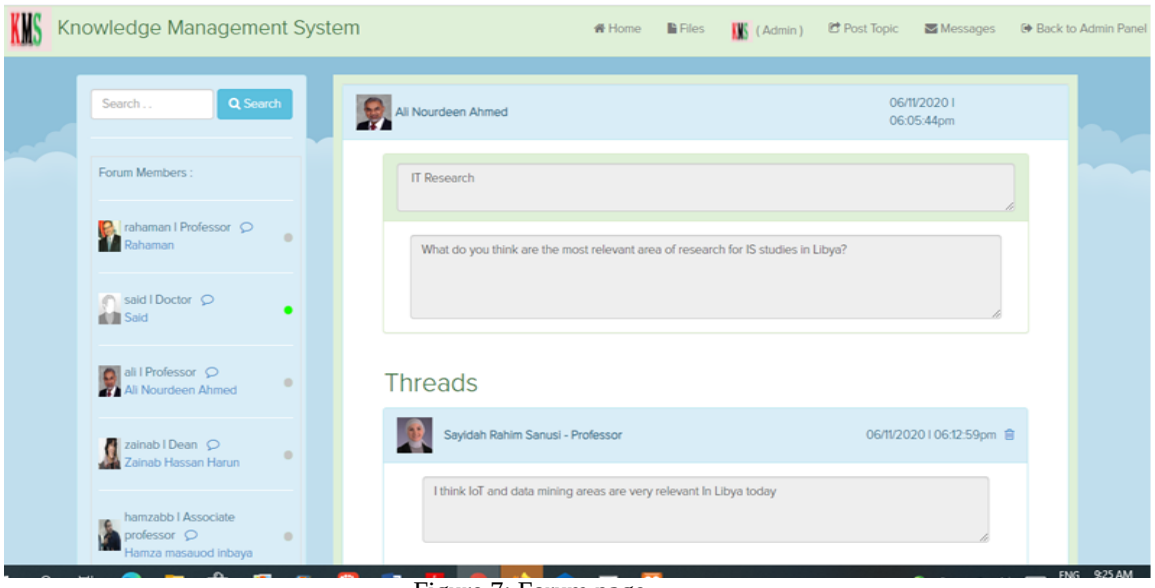

Figure 7: Forum page

Figure 7 shows the forum page of the admin portal. From this page, admin can monitor the forum discussion content, delete some content that are deemed inappropriate and block user.

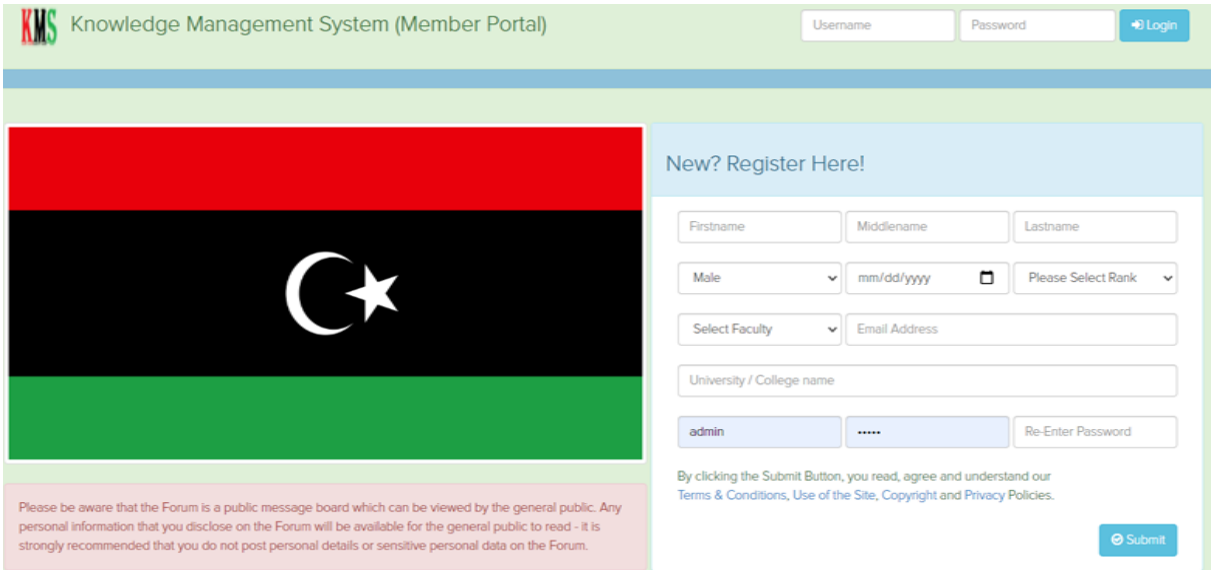

Figure 8: Member Login and New User Registration Form

Figure 8 shows the member login page. Existing member login and password has to be provided before a member could have access to LA-KMS. New users need to register before they could use the system. For a new user to register, the new user has to provide, details such as full name, gender, date of birth, affiliation, faculty email address and the name of the institute that he/she is affiliated with.

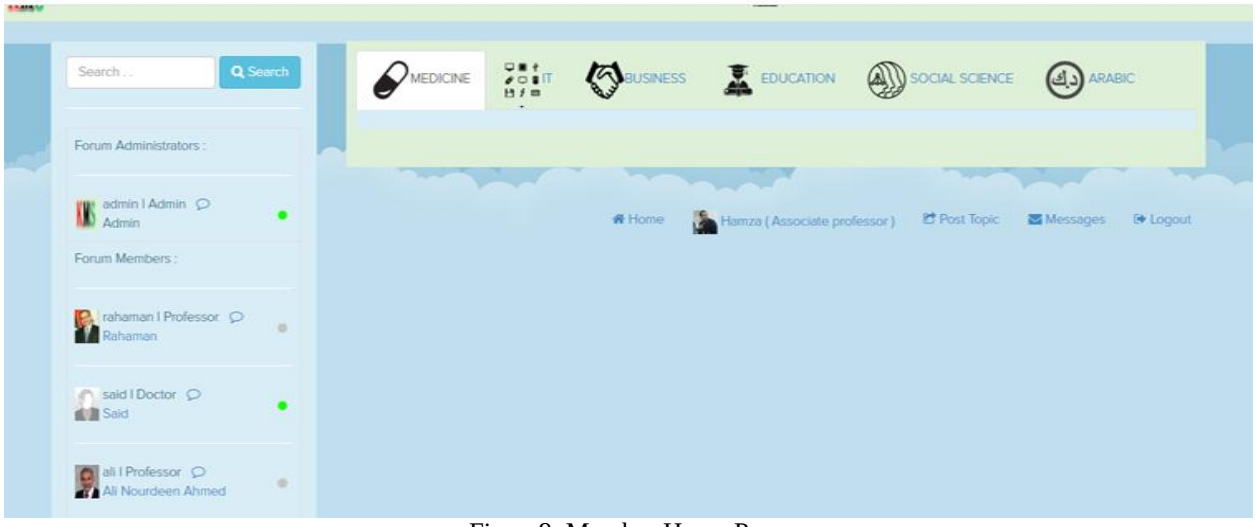

Figure9. Member Home Page

Figure 9 illustrates a registered member's home page. The home page shows other registered members who are online, the discipline that the members are affiliated with, the joining and posting of comments in the forums, the email message and the text and voice search option.

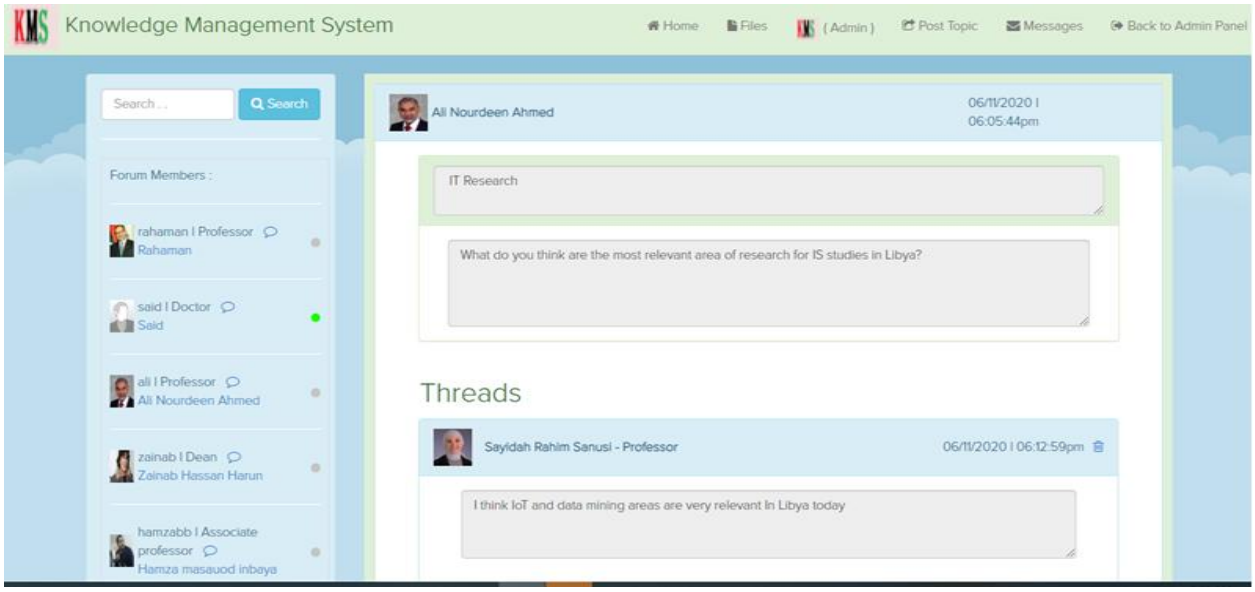

Figure 10 Forums Discussion Board/ Forum Page

Figure 10 shows the discussion board or forums page of the LA-KMS. Users can join the forum, post their topics and reply to ongoing discussions. Users can modify their replies and delete their own replies

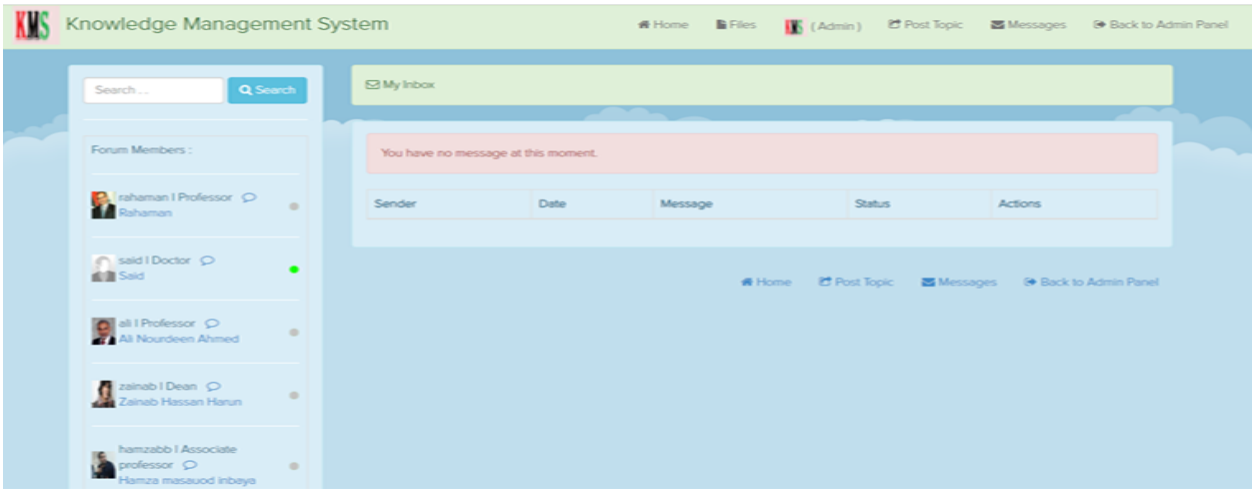

Figure 11 Email Function

Figure 11 illustrates the email functionality of the administrator. The administrator can use this tool to send messages to the users. Update them about some important activities. This tool allowsadministrators to be connected to the users. Members in the platform can send and receive private emails to other members in the platform. This functions enhances privacy for member seeking assistance but feel uncomfortable to search for it from the forums

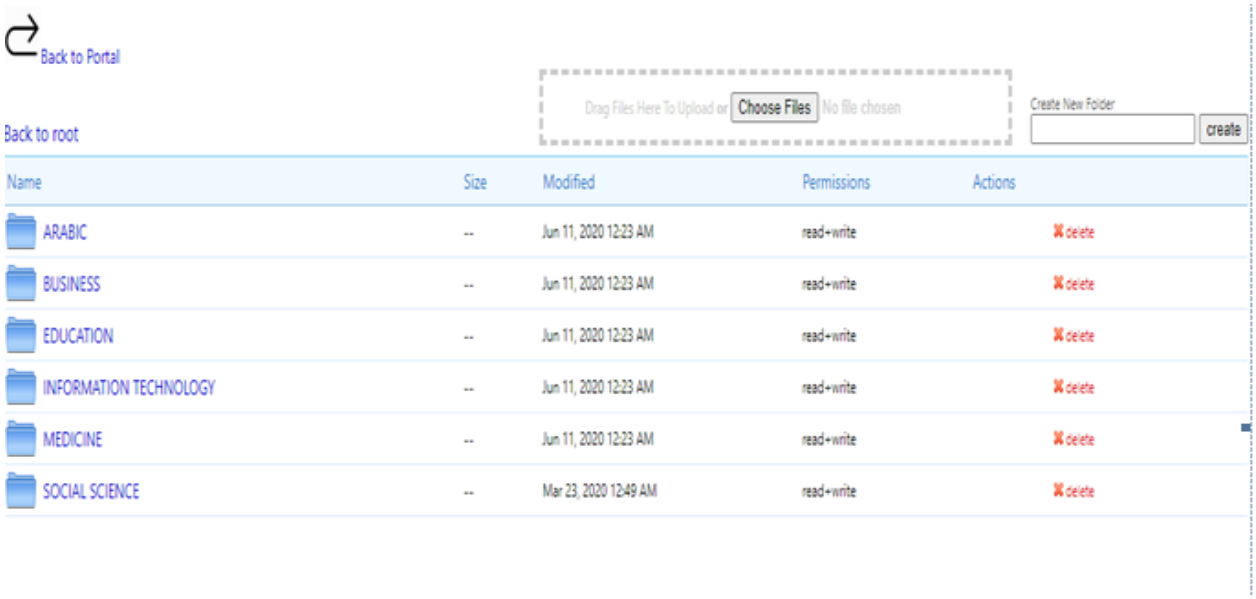

Figure 12. Upload Teaching and Learning Resources Page

Figure 12, indicates that users can upload the resources for teaching and learning to their respective discipline folder. They can delete or remove the resources that they updated. Ability to share resources among fellow academicians is one of the most important function of this system.

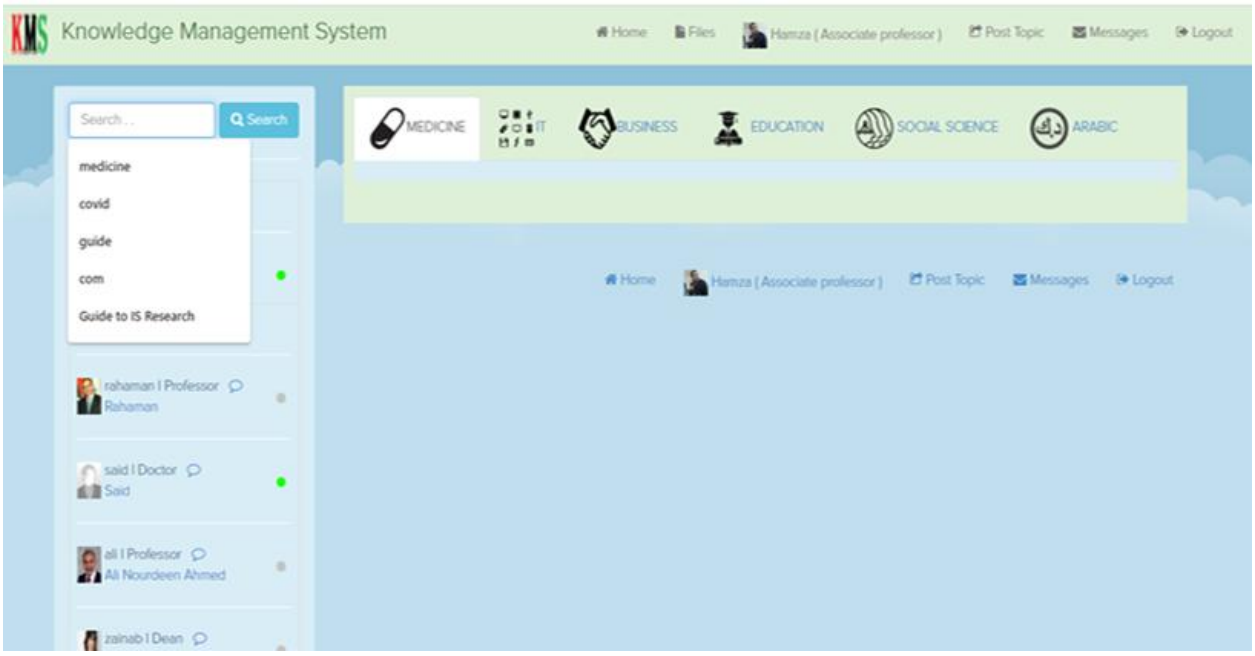

Figure 13. The Text Based Search

Figure 13 shows the text based search from the top left hand corner of this page. Users can search for frequently asked questions from the system using text search and the result would be shown by the system after retrieving it from the database.

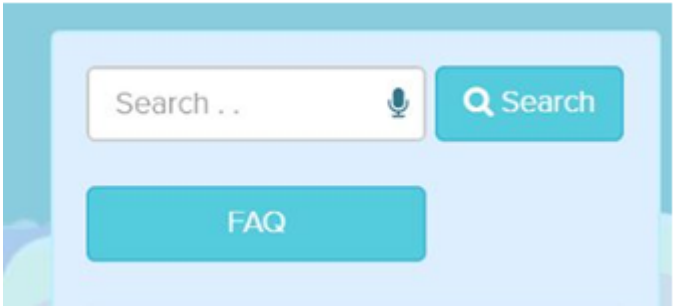

Figure 14 Voice Search Function

Figure 14 shows the voice search function. This function allows voice search of information from both the forums and the Frequently asked Questions. Information that are sought are queried from the database through voice inputs.

8. Finding from the Evaluation Analysis

8.1. Evaluation of Features and Functionalities of the System

Upon usage of the system by the 50 academicians, the results of the rating of the features and functionalities of the system are illustrated in Table 4 below:

Table 4.Evaluation Survey Results

System Features	Very Poor	Poor	OK	Good	Very good
Creating a Virtual Learning opportunity	0%	4%	44%	44%	10%
Capability to Personalize Learning	0%	2%	48%	42%	8%
Searching for Digital Resources	0%	2%	52%	42%	4%
Sharing for digital resources	0%	2%	44%	38 %	18%
Communication tools	0%	0%	36%	40%	24%
Learning and Collaboration Space	0%	2%	42%	48%	8%
Discussion Forum tool	0 %	2 %	30%	52%	16%
Multimedia Interaction	2%	2%	36%	54%	8%
Voice and Text Search Tool	0%	2%	60%	34%	4%
Privacy and Security	0%	4%	60%	26%	10%

As demonstrated in Table 4, the 50 academicians who evaluated the LA-KMS prototype after it was developed rated it features and functions as follows;

- Creating a Virtual Learning opportunity10% of the users rated it to be, 42% of users found it to be good and 44% of the users found it to be OK. A mere 4% of the users found it to be poor.
- Personalising learning 8% of the users found the second prototype to very good, 42% found it to be good and 48% found it to be OK. Meanwhile, 2% of the users found it to be poor.
- Searching for digital resources .4% of the participants suggested that the second prototype is very good for use in searching for digital resources, 42% indicated that it is good and 52% suggested that it was ok whereas 2% of the users indicated that it was poor.
- Sharing for digital resources 18% of the participants suggested that the second prototype is very good for use in sharing for digital resources, 38 % indicated that it is good and 44% suggested that it was just OK whereas 2% of the users indicated that it was poor.
- The search for learning resources using voice and text inputs was ranked to be very good by 4% of the users. Another 34% of the users rated the system to be good and 60% of the users rated the system to be OK. Just 2% of the users found the system to be poor. The total number of users who found these functions to be very good and are 36%. This rating is lower compared to other functionalities of the system.
- Communication tools such as the private email inbox and announcements of the second prototype and it was found that 24% of the participants suggested that the second prototype is very good. 40% indicated that it is good and 36% suggested that it was just OK.
- Learning and collaboration among to the users. During the trial, 8 of the of the participants suggested that the second prototype is very good. Another 42% of the users indicated that it is good and 48% of the users suggested that it was just OK. Meanwhile just 2% of the users indicated the system was poor.
- The discussion forum tool was rated to be very good by 16% of the participants. Up to 52% of the users rated the system ability to be used for discussion to be good while 30% of the users rated it to be OK. Just 2 % of users rated the discussion forum tool to be poor.
- The system ability to be used to work with images, audios, videos and texts too were rated to be very good by up to 8% of the users who tried the second prototype.54% of the respondents who tried the system found it to be good while 36% of users found it to be ok A mere 2% found it to be poor.
- The search for learning resources using voice and text inputs was ranked to be very good by 4% of the users. Another 34% of the users rated the system to be good and 60% of the users rated the system to be OK. Just

2% of the users found the system to be poor. The total number of users who found this function to be very good and are 36%. This rating is lower compared to other functionalities of the system.

- According to the findings from the survey, 10% of the users found the system to fulfill their privacy and security needs very well. 26% of users rated the security and privacy aspects of the system to be good, 60% of the users found it to be OK whereas the remaining 4% of the users found it to be poor.

8.2. Evaluation of Overall LA-KMS Ease of Use Rating

As shown in figure 15, the overall rating of LA-KMS in terms of Ease of use show that 16% rated the system to be easy to use, 50% rated it to be mostly easy to use with some parts difficult to follow, whereas 28% found it to be OK to use – with some parts easy, some parts difficult to use. Only 6% of the participants indicated that the second prototype was mostly difficult to use with some parts easier to follow.

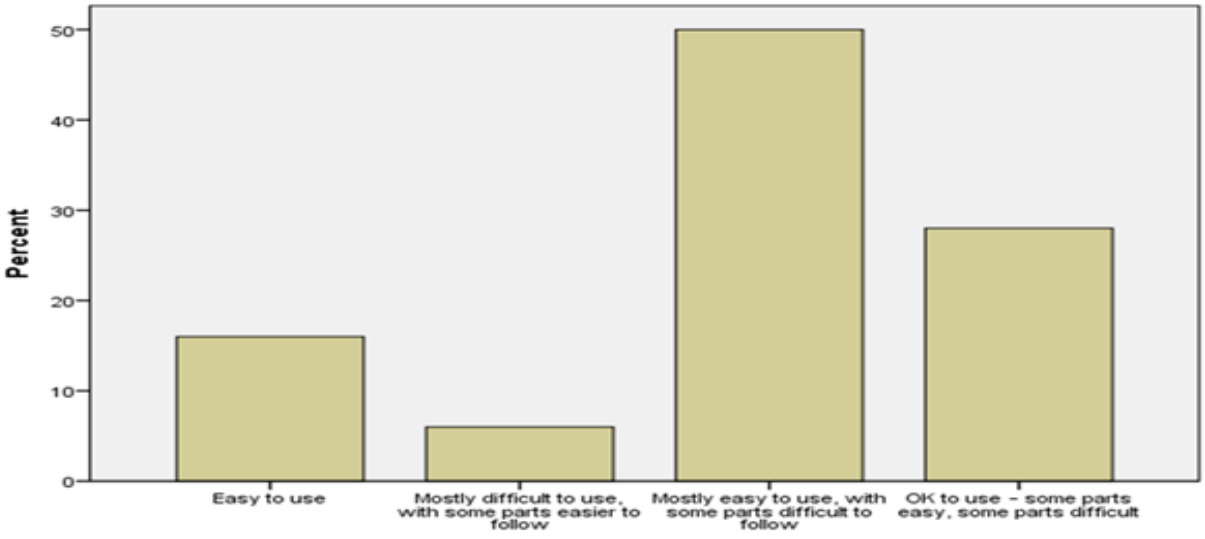

Figure 15 Ease of Use Rating

8.3. Adoption of LA-KMS

The respondents were asked if they would adopt the LA-KMS when it is fully implemented. As illustrated in Table 5, 84% of the respondents said yes, they will adopt LA-KMS if it is fully implemented. The number of respondents who were undecided was 10%. Whereas 6% of the respondents indicated that they will not adopt it if it was fully implemented. This is a significant increase from the first prototype where only 33% of the respondents indicated that they would adopt the system. This 84% increase in the number of users who demonstrated that they intend to use the system means that they perceive the second prototype to be very useful to them.

Table 5. Adoption of LA-KMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No	3	6.0	6.0	6.0
	Undecided	5	10.0	10.0	16.0
	Yes	42	84.0	84.0	100.0
	Total	50	100.0	100.0	

8.4. Recommendation of LA-KMS

When the respondents were asked if they would like to recommend LA-KMS to their institutes and colleagues. As illustrated in Table 6, the 90% of the survey participants indicated that they would recommend LA-KMS to their institutes and colleagues. 4% of users indicated that they were still not sure whereas the remaining 6% of users indicated they would not recommend the adoption of LA-KMS to their institutes and friends.

Table 6. Recommendation of LA-KMS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	No idea yet	2	4.0	4.0	4.0
	We would recommend the LA-KMS	45	90.0	90.0	100.0
	We would not recommend the LA-KMS.	3	6.0	6.0	100.0
	Total	50	100.0	100.0	

9. Conclusion

9.1. Comparison of Evaluation Results Against Ease-of-Use Constructs

Table 7 shows an analysis of perceived usefulness against the antecedents outlined in the TAM2 model (Venkatesh& Davis, 2000). Below is the summary of the results with specific references from the results of the evaluation.

Table 7. Summary of Results against Ease-of-Use Constructs

Constructs	Definitions	Results Analysis
Subjective Norm	"*The degree to which an individual perceives that people important to him/her think that he/she should or should not use the system*". (Venkatesh& Davis, 2000).	The majority of the evaluators suggested their fellow academic colleagues would adopt the system as they could found it to be very useful and significant to their profession.
Image	"*The degree to which an individual perceives that use will enhance status". (Venkatesh& Davis, 2000*)	Academicians expressed a view that collaboration with other experienced colleagues would assist their job. It allows them to seek relevance information from experienced professional within their discipline
Job-relevance	"*The degree to which the system is applicable to the job". (Venkatesh& Davis, 2000).*	Academicians expressed a view that collaboration with other experienced colleagues would assist their job. It allows them to seek relevance information from experienced professional within their discipline
Output Quality	"*The degree to which the individual believes that the system performs his/her tasks well*". (Venkatesh& Davis, 2000).	The ability for the system to enhance learning collaboration, sharing resources, searching resources and to communicate with fellow academicians from the second prototype were well received.
Result Demonstrability	"*The degree to which the individual believes that the results of using the system are tangible, observable and communicable*". (Venkatesh& Davis, 2000).	The users expressed the view that the result of download and uploading of resources, result of the materials sought from the system and other outputs after processing are well demonstrated

9.2. Research Contribution

To the best of the researcher's knowledge, this research is the first in Libya to apply Design Based Research Methodology to develop an artifact (Libya Acadmics Knowledge Management System) and utilized Technology Acceptance Model (TAM) as theory in designing, developing and evaluating the proptotype. The evaluation results from this study suggestd that if ease of use criteria are met, users woul;ld be willing to adopt and recommend the artifacts to their colleagues and friends. Similarly, researchers such as Al-Adwan, et al.,(2013)., Fayad & Paper(2015). Salloum, et al. (2019) applied it their studies to TAM to predict the use of new technology by users. Therefore this research has contributed to the academic discourse on Design Based Research Methodology, and Technology Acceptance Model in Libya context. Besides, this study used interview method to collect data for the LA-KMS system specification and used questionnaire to evaluate the prototype. This approach, was the first to be applied in developing knowledge management systems for Libyan academics. Similar approaches could be applied to other design based research. Moreover, this study has developed a web based Knowledge Management System for Libyan Higher Institute of Learning. This is a new innovation which has never being developed in Libya or anywhere in the Arab countries. This innovation could be very useful to all academicians around the world to connect, collaborate and share knowledge among themselves. These could enrich students around the world.To provide a practical contribution to higher education institutes, by offering a tool that enables the Higher Education institutes to plan KM systems acceptance both effectively and successfully, to improve performance, competitive advantage, and to enhance their work.

Based on the findings from this study the following implications are noted:

- From the perspectives of this study, it is recommended that institutes of higher learning in Libya should enhance the ability of academicians to collaborate, interact and share knowledge and learning resources in ways that meets the requirements of academicians.
- Knowledge sharing and learning among academicians needs to change from traditional face to face or partial dependence on application to the utilization of fully interactive applications to share knowledge and enhance learning among academicians
- In terms of design, content of LA-KMS provides opportunities for academicians throughout Libya to converge, interact, network share and learn from each other. As the contents of this prototype wereimplemented based on the inputs and the needs of the academicians, this application provides great opportunity for inexperienced academicians especially to learn and gain experiences from fellow academicians
- The availability of LA-KMS provides the opportunity for researchers to develop applications that meet the requirements of networking, sharing of knowledge and pear learning among academicians in Higher Institutes of Learning. Also academicians would be able to improve their skills and prepare themselves in teaching and managing students. This in return would benefit higher institutes learning students

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