

Implementation of the LiveChat Service: A Case Study at the University Of Malaya Library

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ABSTRACT

In this digital era, libraries are trying to meet the users' need by improving their services and enhancing their resources. Virtual Reference Services (VRS) is a web-based information assistant provided to the library users. It is an effort taken by the librarians to communicate with the public without being physically present. One of the common communication channel used as virtual reference is known as Live Chat. The purpose of this study is to explore the experiences of the University of Malaya Library (UML) in implementing the Live Chat service to support the usage of library resources. Some analysis was conducted to a total of 2179 chat transcripts and coded into two categories: 'question types' and 'questions handling'. The data extracted from the Live Chat platform to discover the information that users are looking for through the type of questions being asked during the live chat sessions; and to analyze the approach of the librarians in handling the questions submitted to them to ensure that the Live Chat service meets the users' need and expectations. All of these, 1968 questions was asked by the users from May to October 2018. Each transcript was individually read by the team and coded to reflect question types, question handling and also feedback from users. Users approaches the librarian on duty via Live Chat service if they need quick answers or immediate action to assist and solve their problems while they are using the UML digital resources or online services remotely. Most of the questions were answered completely by the librarian and there are positive and negative feedbacks. Users will be provided with URL or file attachment if the answers cannot be explained in detail via Live Chat. Live Chat service gave a positive impact to the reference service at the University of Malaya Library and has supported the delivery of library of library resources and services. This new service provided by UML has increased the usage of the library services and help users to get immediate response from the librarians. We also found that this service benefits users who have hearing and speech impairments as they can communicate with librarian comfortably using VRS. Further research is recommended to evaluate the efficiency and capability of the librarian in handling this virtual reference service.

Keywords: Electronic reference services (Libraries); Reference librarians. -- Effect of technological innovations on; Academic library automation

INTRODUCTION

Reference services is one of the core businesses of the library crucial in reaching library users. No matter how huge the collection in the library, reference services is the most important and the last element to ensure that the information disseminate get to the

users. Nowadays, reference services are provided to library users through many different technologies.

Virtual reference is a significant component and method used by libraries to approach users more effectively. Advancement in wireless communication and mobile technology provide the opportunities to support learners in solving their problem in the real-world with other alternatives, one of which is by using digital-world learning resources.(Hwang, Shi, & Chu, 2011).

“Virtual reference is a type of reference service initiated electronically for which patrons employ technology to communicate with public services staff without being physically present. Communication channels used frequently in virtual reference includes chat, videoconferencing, Voice-over-IP, co-browsing, e-mail, instant messaging, and text”. RUSA (Reference and User Services Association)

Mu, Dimitroff, Jordan, and Burclaff (2011) found in their survey that virtual reference has been applied in the libraries to answers reference enquiries. Chat forms, instant messaging, MOOs and virtual environment has been used to approach users, which is linked from their OPAC or library websites. Virtual reference is divided into 2 categories which are asynchronous and synchronous communication. Asynchronous communication is a services provided to the user in the form of email or web form enquiries which allow users to submit enquiries anytime and everywhere and allow the librarian to respond anytime with well-prepared answers. Synchronous communication are real time services where users can submit questions through a chat window and received almost instant replies from a librarian.

The advancement and the evolution of the technology still requires a touch of a librarian in helping users to choose the relevant information. According to Miller (2018), users or individuals attempts to seek information initially on their own, using powerful technologies such as websites, social media platforms, apps, blogs, Wikipedia, videos, podcasts and many more. However, they are unable to sort and find reliable information due to the overwhelming amount of information. Some of them might then turn to librarians for help.

Erickson (2016) mentioned that the evolution of the technologies will not change the validity of the reference answers by librarian. It is a personal relationship between librarian and users which is more interactive and a more integrated approach to service delivery and new reference staffing model. Libraries have used technologies and communication tools to best suit their users changing needs.

The reference model that will be discussed and shared in this paper is about virtual reference, synchronous services- online chat, which is new reference service implemented at the University of Malaya library mediated by the LiveChat software to enable chatting between librarian and users in search for library information, resources or services.

Reference Service at the University of Malaya Library

The University of Malaya Library was established in 1959 and support University of Malaya as a research University with the population of 50++ K active library users from 12 faculties, 2 academies, 5 Institutes and 6 Centres with programmes of study that includes medicine, law, engineering, sciences, social sciences, humanities, religion and other continuing education programs in various areas of interest.

University of Malaya Library consist of Central Library, 3 branch libraries, 10 special libraries, the Museum of Asian Art and the Art Gallery located at the main campus and 1 special library located at Nilam Puri, Kelantan.

A model of reference service that has been use is a traditional walk-in reference service which is located at the Central Library and also the telephone reference for users. Outsiders or the public and external members can also access the electronic resources within the library subject to rules and regulations.

In order to improve the services, library also provides digital content and virtual library services as follows:

- Library Portal – Interaktif Portal which provide access to more than 100,000 subject based Web links to resources and is a user-driven, customizable information service, includes online past year exam papers, e-services (Publication supply, suggestion for collection, books on approval, Information Skill session)
- Library website which provide links related to the library and also information about library.
- Social media platform such as Facebook, twitter, Instagram and blog.
- Library guides which provide quick and easy access to essential resources within your subject area
- Digital@UM which provide open access digital repository containing of the details of published and unpublished research works produced by the UM researchers, valuable photos with historical context, news coverage relating to University of Malaya, manuscript contents and online archives for the written work of University of Malaya students such as academic exercises, dissertations and theses.

The evolution of the wireless communication and mobile technology environment requires the library to be in line within this digital environment. Thus, in May of 2018 the synchronous communication platform is implemented with a single service point model where professional librarians from the central library as well as all branches and special libraries are scheduled to answer questions at the front line service point- Live Chat. The traditional reference service at the reference desk are still maintained at the Central library where the senior support staff are stationed on a rotational basis to answer the questions and users are directed to the librarian on line through the Live Chat for any questions requiring a more extensive professional skill to answer.

The objectives of the implementation were to:

- Meet user expectations and being able to ask a librarian enquiries without coming to the library.
- Serve the communities and deliver the information about search engines, databases, digital collection and information about the library without charging any fees.
- Support the lifelong learning trend and respond to the need of users in a prompt manner

LITERATURE REVIEW

A study has been conducted by Mu et al. (2011) to examine the strategies used by libraries to increase the usage of virtual reference by 100 academic libraries. The research found that the key success of Virtual Reference is to go beyond the Virtual Reference Services, which is that the user needs to understand that a real librarian is sitting behind the screen. The picture of the librarian at the chat window, larger texts, user friendly interface and prominently visible link will increase user awareness of the librarian component of Virtual Reference as well as the branding of the virtual reference itself.

The quality of reference service is dependent on the reference interview. Librarians must be knowledgeable about the topic discussed with users and can respond and communicate with users in the most appropriate manners. (Mu et al., 2011)

According to Radford, Connaway, Confer, Sabolcsi-Boros, and Kwon (2011), query clarification in virtual environment can be used to improve the accuracy and satisfaction. It is the aspect of the human intelligence where professional librarians provide reference service through the digital environment.

Connaway and Faniel (2015) in their studies found that people who asking questions through live chat are actually in the library. There are multiple reasons including they do not want to lose their seat , not wanting to move, they do not want to leave their personal belongings, not feeling comfortable asking the question face to face and the virtual reference being more convenient and faster than having it face to face.

LIVECHAT SERVICE IN UM LIBRARY

A few steps had been taken before the implementation of the real time chat. They were i) benchmarking and product survey and ii) Pilot Testing

Benchmarking and product survey

A benchmarking initiative had been done to look into other local academic libraries to find out the methods they have used for VRS. We have found that most of the libraries are using free software/ platform such as WhatsApp, tawk.to and Facebook chat. UniMap Library subscribed to the commercial chat platform- LibAnswer by Springhare. Refer to Table 1.

Following that, we had also conducted a market survey to identify available live chat software that are suitable to our needs in terms of a user friendly interface, which non IT based librarians can easily use and at a reasonable cost. We also tested the live chat software Tawk.to during the pilot testing but received a negative response from the librarians using it in terms of navigation and usability. We tried another live chat software- LiveChat as a trial software during the pilot testing period and received positive feedback from the librarian on its usage and also positive feedback from the user based on the details of the data we gathered from pilot testing.

Table 1: Medium of VRS by libraries in Malaysia

Institute	Platform	Librarian responsible	Since when implement	Who decide to implement
Perpustakaan Universiti Kebangsaan Malaysia (UKM)	WhatsApp Desktop, WhatsApp Web	<i>Unit Pendidikan Pelanggan</i> Librarians & Assistant Librarian on duty at the reference desk	WhatsApp Desktop – 2015-2017 WhatsApp Web- 2018 - current	Reference service management meeting
Perpustakaan Universiti Putra Malaysia (UPM)	Facebook – not officially using FB chat	-	-	-
Perpustakaan Universiti Sains Malaysia (USM)	tawk.to	Reference department	2018	Reference Department
Perpustakaan Universiti Islam Antarabangsa Malaysia (UIA)	-	-	-	-
Perpustakaan Sultanah Bahiyah Universiti Utara Malaysia (UUM)	-	-	-	-
Perpustakaan Universiti Perguruan Sultan Idris (UPSI)	Tidio- plug-in at wordpress	<i>Unit Perpustakaan Digital</i>	2018	<i>Unit Rujukan dan Perundingan</i>
Perpustakaan Universiti Malaysia Kelantan (UMK)	WhatsApp, email	Librarians on duty at reference desk	2018	Information Service Department
Perpustakaan Universiti Malaysia Perlis (UniMAP)	LibAnswer Springshare	Office hour- Reference Librarian, all staff at the reference unit and librarians on duty	2013	Chief Librarian
Perpustakaan Universiti Teknologi Mara (UiTM)	Facebook chat, Live chat, email	Librarian/ Librarian on duty at reference desk, library assistant	2008	Chief librarian
Perpustakaan Universiti Tenaga Nasional (UNITEN)	Facebook / tawk.to / Email	Reference & Information service department	2009	Chief Librarian
Perpustakaan Universiti Sains	-	-	-	-

Islam Malaysia (USIM)				
Perpustakaan Jeneral Tun Ibrahim (UPNM)	Facebook-not officially implemented live chat service	-	-	-
Perpustakaan Universiti Sultan Zainal Abidin (UNISZA)	Facebook	-	-	-
Perpustakaan Universiti Malaysia Pahang (UMP)	WhatsApp using mobile phone	Reference librarian at main campus	2018	Reference unit

Pilot Testing

The pilot testing had been carried out starting from 6 December 2017 until 3 January 2018 from 8.30 am to 5.00 pm on weekdays only.

a) Platform

The trial mediated software to support the service was LiveChat (<https://www.livechatinc.com>)

The transcript of the software was embedded at the library website (<https://umlib.um.edu.my>).

b) Who involve?

Librarians who were on duty at the Reference Desk were responsible handling the LiveChat enquiries with users during the period of the pilot testing (6 December 2017 until 3 January 2018 from 8.30 am to 5.30 pm on weekdays only) aside from providing the face to face reference service. There were 6 librarians scheduled to be on duty at the Reference Desk for each day during weekdays. A training had been conducted for all the librarians involved in this pilot testing in terms of the navigation of the used platform. The Library Information System Division were responsible in providing the training to them.

Pilot testing results

Pilot testing had been carried out to identify various user needs in terms of i) Understanding current users by gathering various information from users; ii) What library resources and services they used? and iii) How much information are they looking for?

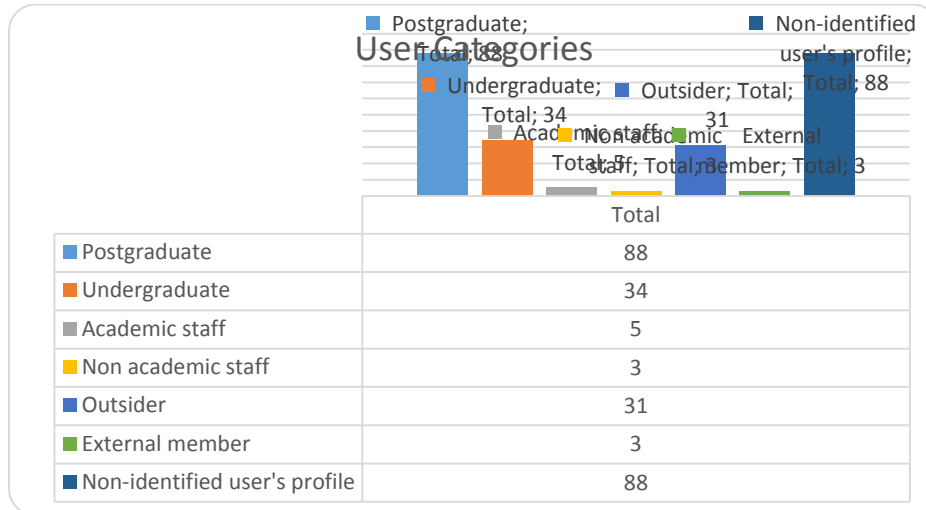
A total of 348 chat transcripts were analyzed to get the findings as follows:

i) Understanding current users by gathering various information from users

From the chat transcript, there were 298 users who had used the service. Out of that total, 46 users were excluded due to the chat transcripts were used for training

purposes. Therefore, the total numbers of counted users were 252. Refer to the bar chart below for the details of users categories:

Graph 1: User Categories



The result shows that Postgraduate and non-identified user’s profile scores the highest number of users with the total of 88 for both categories, followed by Undergraduate with the total number of 34 users and outsiders with the total number of 31 users. Out of the total number of users, there are 5 users who were of the academic staff category and the lowest number of users were from the External Member and Non-academic staff category with total of 3 users for each categories.

From the results, we noticed that the current users who were using the Live chat services were of the UM community including postgraduates, undergraduates, academic staff, non-academic staff and also non-identified user’s profiles. Non-identified users profiles might also be from within the UM community members, however we cannot identify exactly their categories through the chat transcripts. By referring to the chat transcripts and pre-survey chat, we classified that they are from the UM community members by their emails or the nature of their questions.

The total number of outsiders also can be interpreted by the fact that the live chat service were also used by non-UM community members which means that our library resources and the library website are also referred and browsed by other external users. Table 2 below shows the location of the users based on the IP addresses.

Table 2: Location of users accessing Live Chat service

Countries	Count of Countries
Istanbul, Istanbul, Turkey	1
Kuala Lumpur, Kuala Lumpur, Malaysia	151
Kuala Terengganu, Terengganu, Malaysia	1

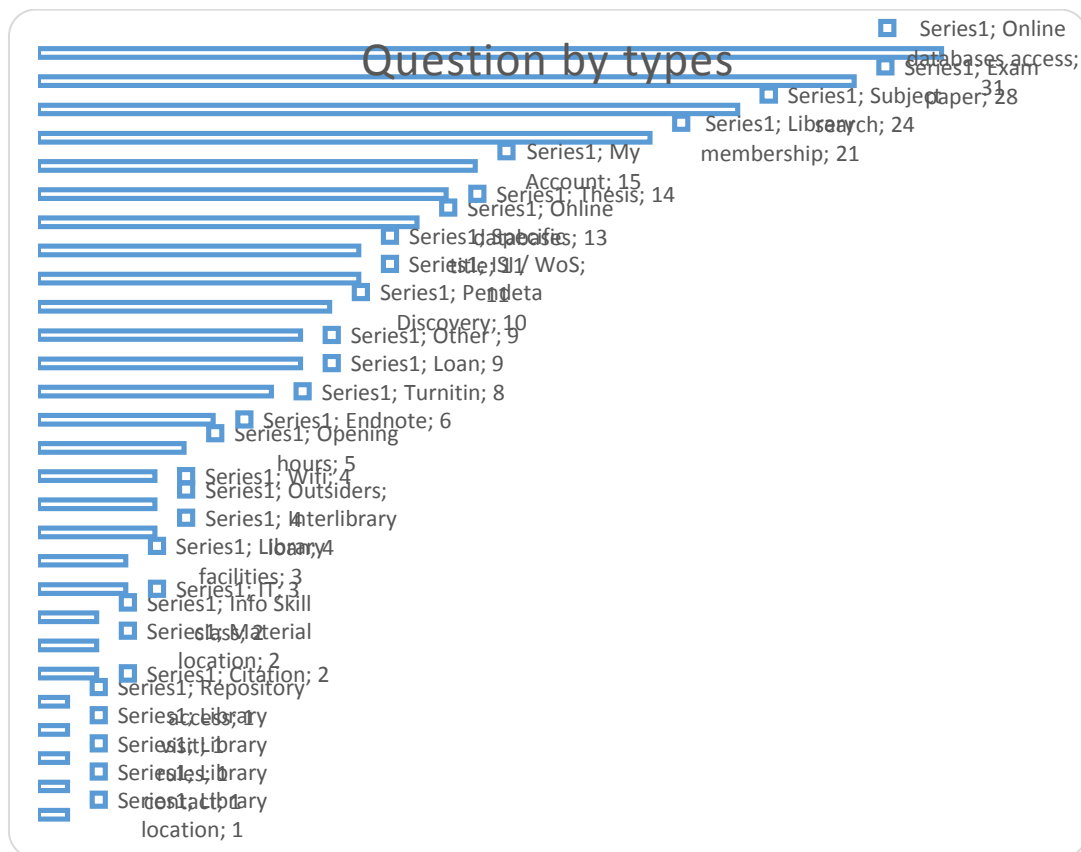
Kuantan, Pahang, Malaysia	1
Melaka, Melaka, Malaysia	2
Penang, Pulau Pinang, Malaysia	2
Selangor, Malaysia	1
Shah Alam, Selangor, Malaysia	5
Singapore, Singapore	1
Tejgaon, Dhaka, Bangladesh	1
Ampang, Pahang, Malaysia	1
Asia/pacific Region	2
Bangi, Selangor, Malaysia	2
Batang Kali, Selangor, Malaysia	1
Batu Caves, Selangor, Malaysia	4
Changlun, Kedah, Malaysia	1
Cheras, Selangor, Malaysia	2
Dhaka, Dhaka, Bangladesh	1
Frankfurt, Hessen, Germany	1
Ipoh, Perak, Malaysia	1
Isieke, Anambra, Nigeria	1
Jakarta, Jakarta Raya, Indonesia	1
Johor Bahru, Johor, Malaysia	1
Kajang, Selangor, Malaysia	5
Kedah, Malaysia	2
Kepong, Selangor, Malaysia	1
Klang, Selangor, Malaysia	2
Kota Kinabalu, Sabah, Malaysia	2
Kuala Lumpur, Kuala Lumpur, Malaysia	2
Kyoto, Kyoto, Japan	1
Lakemba, New South Wales, Australia	1
Melaka, Melaka, Malaysia	3
Penang, Pulau Pinang, Malaysia	1
Petaling Jaya, Selangor, Malaysia	28
Pusing, Perak, Malaysia	1
Putrajaya, Putrajaya, Malaysia	1
Selangor, Malaysia	4
Seremban, Negeri Sembilan, Malaysia	2
Shah Alam, Selangor, Malaysia	1
Sri Lanka	1
Subang Jaya, Selangor, Malaysia	6
Sungai Buloh, Selangor, Malaysia	1
Wolfenbüttel, Niedersachsen, Germany	1
Yogyakarta, Yogyakarta, Indonesia	1
Grand Total	252

Based on the list of countries, 96% of the users were from within Malaysia and 4 % were from the overseas.

- ii) Library resources and services used by users and information needs by users

We had analyzed the types of questions being asked by the users in order to identify the library resources and services used by them and also to identify the category of information that they are looking for. There were 244 of questions being asked by the 252 users within 348 chat transcripts during pilot testing. Refer to the definition of chat transcript and question types at the Methodology section. Refer to Graph 2 for the details of question types.

Graph 2: Question Types



The graph shows that majority of the users were asking question about online databases access with a total of 31 questions followed by Exam Papers with a total 28 questions and subject search with a total 24 questions. Questions about the library membership also scored among the highest with total 21 questions, followed by questions about the My Account with a total 15 questions, Thesis with a total of 14 questions and Online databases content with a total of 13 questions. Questions related to journal ranking- ISI /WOS and questions related to specific titles scored a total of 11 questions each. Questions related to the usage of Library OPAC- Pendeta Discovery scored 10 questions. 9 questions asked each for two types of questions which were related to Loans and Others. A total of 8 questions related to the plagiarism software- Turnitin, 6 questions related to the citation software- Endnote and 5 questions related to the library opening hours. Questions related to Wi-Fi access and the interlibrary loan service scored the same total enquiries which is 4 questions for each type. Questions about the Library facilities and IT related questions scored a total of 3 questions each, followed by

questions related to Citation and Information Skills Session with total 2 questions each. The lowest type of questions being asked were questions related to repository access, Library visits, Library rules, Library contact and the Library location which only scored 1 questions asked each.

From the results, we found that the majority users were using the live chat service concurrently while they were searching or browsing through the digital library resources such as the online databases and looking for a certain subject topic for their research. It also correlates to the library membership if users want to access the library portal- which is considered as a one stop center for online databases access. We had also noticed that the exam papers also scored among the highest type of questions being asked by users due to the fact that the pilot testing was done during the examination period. Questions that are categorized as Others were question being asked by outsiders who need information on Malaysian resources (e.g : Malaysia law cases), UM/admission or enrollment process, looking for specific titles of research by UM academicians, open access articles from Malaysia and the contact number of specific a personnel in UM.

In conclusion, we found that the LiveChat service is becoming an important service that can support users facing a problem while they are looking for a library resources remotely. They needed instant replies from the librarian to find the information or solve their problems. Therefore, the UM library decided to continue to provide the LiveChat service to users.

The implementation of Live chat

Based on the pilot testing result, the library then decided to subscribe to the LiveChat software to implement the real time chat service. Below are the features of the Livechat Plans subscribed by the Library

a) Live chat features

The library subscribed the LiveChat. Inc software to support the service - Team Plan that support multiple domains and languages, 3 librarians per seats, unlimited chat story, unlimited automated greetings, provide reports and analytics, customizable chat window and provide file sharing features.

b) Interface and accessibility

Pop-up chat window appears at the library website, the Interaktif Portal (Library portal) and the Library Guides. Refer to Image 1 and Image 2

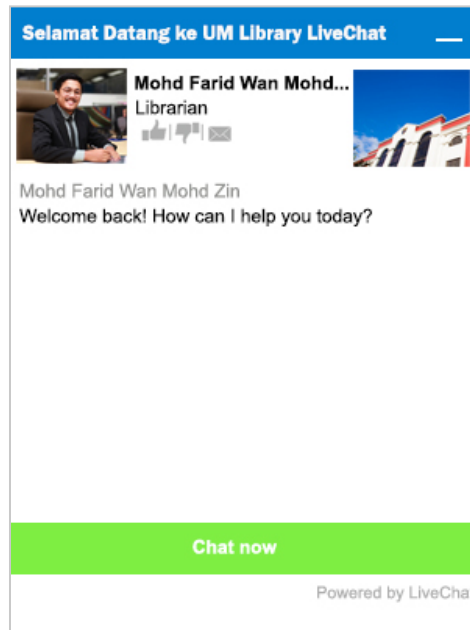


Figure 1 : LiveChat interface for user

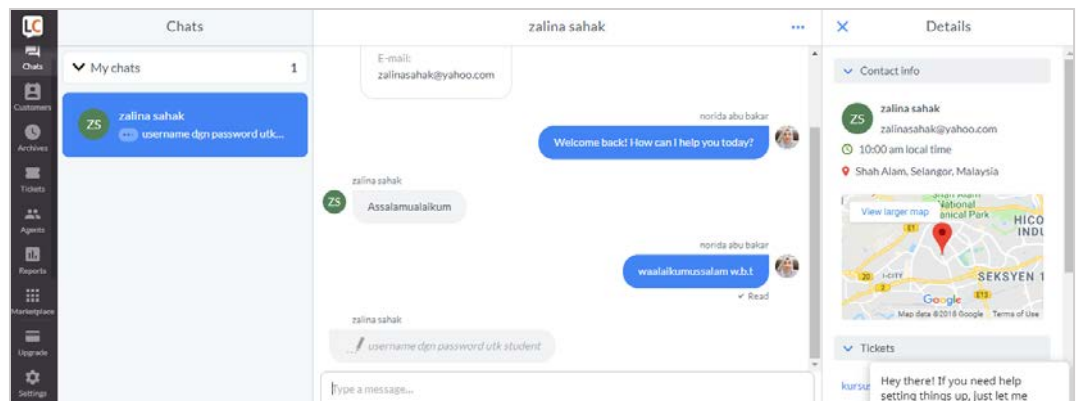


Figure 2 : Livechat interface

c) Training of librarians working in VRS

Professional librarians from Central Library, Branches and Special Libraries are being included in the task of answering questions at the front line service point- the LiveChat. They are scheduled to be on the LiveChat roster in a group of 3 personnel per session. The librarians will be available online from 8.30 am to 5.00 pm during weekdays only.

A training session had been carried out before this service was launched in May of 2018 for all professional librarians, trained by the librarians from Information System Division. The following modules were included in the training session:

- Software training
Librarians were given training on the features and function of the software. It is important so that they know how to utilize the agent

tools, user-interface and all related technical aspect as an admin as well as being agents.

- Training on chat reference transactions
Live chat session had been done during the session training among the librarians in order to expose them to the inner workings of chatting in digital environment.
- On-going training
On-going training will be conducted to the librarians scheduled in order to improve the skills and implementation reference interview in digital environment.

RESEARCH DESIGN

Besides sharing our experience in implementing the Live Chat service, the other main purposes of this paper are:

1. To analyze the chats transcripts for questions posed and the handling of different types of question by the librarians.
2. To investigate the feedback received on the Live Chat services.

Methodology

A team of librarians from the Information System Division and the Information Skills Division analyzed the chat transcripts to identify the questions handling, question types and also feedbacks from the users.

Chat transcript is a record of communication or chat between librarian and the user. One user may chat with librarian in one or more than 2 sessions with the librarian until they are satisfied, get the answer or left the chat without getting any answers. Therefore, a session of chat might include more than one chat transcripts from the same user due to loss of internet connection, user closing the chat window or the chat window automatically closed due to inactivity for 20 minutes.

There will be one or more or no questions being asked from each chat transcripts and one category of question handling coded for each transcript. Therefore, the total of questions being asked is not equal to the chat transcripts and question handling. Refer to Table 3 for sample of 2 chat transcripts by the same user and one type of question being asked.

The data for this research consist of 2179 chat transcripts with 1968 questions asked by the users from May to October 2018. 81 chat transcripts were not included in the total number of the chat transcripts analyzed as those were chats that was used for practice during the demonstration/training and also excluded were some inappropriate chats. Each transcript was individually read by the team and coded to reflect question types and question handling and also feedback of users. Only one code of question handling coded for each chat transcript. The following codes were determined:

- i. Correct and complete all parts with URL, citation or file attachment
- ii. Correct and complete all parts without URL, citation or file attachment
- iii. Incomplete/ No answer but will follow-up with email
- iv. Referral only (user are referred to another unit or given phone no/email. No follow-up offered)
- v. User left chat without attended by librarian
- vi. User left chat– not response to librarian
- vii. Technical problem – chat ended
- viii. Internal chat – training session among librarian
- ix. No question

The team also needed to determine the question types and tag the chat transcripts to ensure the consistency and clarity of the question types. It is quite difficult to assign the tags because the team needed to go through all the chat transcripts and as some of the chat transcripts belonged to two or more difference categories of question types as well there were only one question for more than one chat transcripts.

There are various types of the questions used to categorize the reference questions. Based on the analysis, the team found that the following categories. Some of the categories were derived from Radford and Connaway (2013), Matteson, Salamon, and Brewster (2011) and Matteson et al. (2011):

- i. Subject-based research question
- ii. Ready reference
- iii. Procedural/policy
- iv. Information/Directional
- v. Circulation-related questions
- vi. IT- related questions
- vii. Suggestion of library collection
- viii. Complaint
- ix. Interlibrary Loan/Document Delivery Service
- x. Holdings

Table 3: Sample of chat transcripts, question type and question handling

chat transcript 1	Chat transcript 2	Type of question	Question handling
<p>PRECHAT SURVEY Name:Dr A Email:xxx@gmail.com</p> <p>Librarian : Welcome to our website. Any questions? You are at the right place!</p> <p>10:00 am User left the chat.</p>	<p>PRE-CHAT SURVEY Name:Dr A Email:xxx@gmail.com</p> <p>Librarian: Hello. How may I assist you? Hello Dr. xxx, how can I help you?</p> <p>User: Goog morning, I am Dr xxx. My library membership expired 25.4.2018 when my contract ended. I still have my UM email, xxx@um.edu.my for 12 months. I am still in Malaysia and trying to write up research that I was doing until 25.4.18. Our group presented at FMSC conference (Family Medicine Specialists conference) on 2.8.2018. It would be very, very helpful if I could continue to use UM library in these weeks when I am trying to write a manuscript for publication. Thank you for considering this.</p> <p>Librarian: Dr. xxx, in regards to accessing the online resources you can give a call to our membership office at 03-7967 7765 and enquire with them on the available options for you to access the resources. You can speak to either Mrs. Kohila or Mrs. Hanisah on your options to access the resources. You can also contact any of the Client services librarian at 03 7967 3357.</p> <p>Dr A closed the chat. 10:09 am Dr A rated this chat as good.</p>	<p>Renewals of Library membership</p>	<p>Chat transcript 1 : no question</p> <p>Chat transcript 2 : Referrals, with contact information/department and names of person in-charge</p>

This will be explained in further detail from the result of data analysis.

RESULTS

Types of question

A total of 1968 questions were identified from 2179 chat transcripts. Inappropriate and internal chat transactions were excluded. Some of the transcripts belonged to multiple question types. Refer to Table 4 and Table 5. There are many attributions for each type of the questions. The team classified and coded the attributions according to the question types.

Table 4: Question types and attributions

Question Types	Attribution
Circulation-related questions	<ul style="list-style-type: none"> ● Renewals of membership ● Overdue fines ● Loans of library materials
Information/Directional	<ul style="list-style-type: none"> ● Library location ● Library contact ● Library facilities ● Library website ● Material location ● Opening hours
Ready reference	<ul style="list-style-type: none"> ● Citation style ● How to register for Information Skill Class ● How to request for Interlibrary Loan /Document delivery service ● How to register to Turnitin
Complaint	<ul style="list-style-type: none"> ● Complaints
Holdings	<ul style="list-style-type: none"> ● Availability of the items in the library collection ● Thesis collection
Subject-based research question	<ul style="list-style-type: none"> ● Online database content ● Repository content ● Web of Science/Scopus ● Subject search
IT- related questions	<ul style="list-style-type: none"> ● Online database access ● Repository access ● Wi-Fi ● Endnote
Procedural/policy	<ul style="list-style-type: none"> ● External membership ● Library rules & regulation ● Library visit by outsiders
Suggestion collection	<ul style="list-style-type: none"> ● Suggestion collection

Table 5: Question types

Question types	Sum of total	Percentage %
IT- related questions	396	20.12
Circulation-related questions	359	18.24
Subject-based research question	323	16.41
Information/Directional	295	15
Holdings	219	11.13
Ready reference	211	10.72
Interlibrary Loan/Document Delivery Service	83	4.22
Procedural/policy	75	3.81
Suggestion collection	4	0.2
Complaint	3	0.15
Grand Total	1968	100

The result shows that IT-related questions scored the highest percentage with 20.12%. Circulation-related questions scored the second highest question type asked with a total of 359 questions followed by subject-based research questions with scored 16.41%. From the results, we can also see that Informational/Directional questions were also frequently asked by users through VRS with a total number of 295 questions followed by ready reference questions with a total of 211 questions. Interlibrary loan /Document delivery questions were also being asked by users with total number of 83 questions followed by procedure /policy with the total number of 75 questions. Besides asking questions, the users also gave their suggestions of titles for library to purchase or make a complaint through VRS with total number of 4 and 3 chat transcripts accordingly.

From the results, we found that IT-related questions which including questions related to online databases access, repository access, Endnote and Wi-Fi access scored the highest percentage due to users using or accessing the library digital resources remotely. They need instants answers or immediate action from the librarian through LiveChat service to help or solve their problems related to technical issues such as their access blocked by IP address, IP address not recognized by the site and technical issues when using the citation management software- Endnote.

We also noticed that the total number of questions related to Circulation-related questions scored the second highest as it is related to the accessibility of the online resources due to library membership issues and also related to loans of library materials where users can renew books online. The need was for instant answers or help from the librarian when they face the problems in renewing the loans at that particular time.

Subject-based research questions was also related to those who can access the online resources but could not find the information they were looking for or do not know how to locate the resources. This is where they used the LiveChat service to seek help from the librarian.

Ready reference questions includes questions on citation style and questions on “how to” register for Information Skills session, request Interlibrary Loan/ document delivery service and using the Turnitin platform. Answers for all those questions are indicated as ready reference and are already set as canned response within the LiveChat as a tool for librarians to provide the answers in a quick and accurate manner.

The analysis also reveals that Information/Directional questions and library holdings were also among the highest type of questions being asked, where users needed instant answers from the librarian on issues such as the availability of the books or thesis within the library, location of the library, location of the books, library opening hours and library contacts. Those information can be provided by the librarian instantly through the LiveChat service before they come to the library.

Procedural/ policy questions were being asked mostly by outsiders, in relation to external membership issues, library rules & regulations as well as on library visits request procedures. No analysis were done on the questions types according to the users’ categories.

Aside from receiving questions from users, the service also received suggestions on the library collection and also complaints. Even though the number is not that high as compared to other question types, it is an important data collection for the library to capture in helping to improve the Library’s service, facilities and collection development.

The Accuracy of questions handling by librarians

Aside from the analyzing the type of questions being asked by the users, we also analyzed the accuracy of the questions handling by the librarians. There are 2 categories of question handling indicated, which are:

- i. Librarians provide correct answers to users with or without any citation, file attachment or URL. Refer to Table 6 for explanatory
- ii. No answers provided by the librarians in terms of deferred, referred, incorrect or lost connection. Refer to Table 7 for explanatory

Table 6: Descriptions with transcript example of questions answered correct and complete with or without any citation, file attachment or URL

Question handling	Explanatory notes	Sample of chat transcript
Correct and complete without URL, citation or file attachment	Librarians provide the answers to the users during the chat but not providing any URL , citation or file attachment as guide because the questions is Information/directional question	<ul style="list-style-type: none"> • Librarian : Welcome back! How can I help you today? • User : Hi. May I ask, are the theses not available in the repository only available in hard copies at the library? Thank you in advance. • Librarian Hi xxx

		<ul style="list-style-type: none"> • May I have the title of the thesis xxx? • User : Yes. It's "Religiosity and other factors affecting attitudes toward homosexuality" by Tan Lee Khing (2013) • Librarian : xxx, this thesis only available in hard copies:) • User : Okay. Thank you so much. :) I'll come down to the library tomorrow. xxx rated this chat as good. • xxx left the following comment: Very helpful! • Librarian : Welcome xxx • 2:41 pm xxx closed the chat.
<p>Correct and complete with URL, citation or file attachment</p>	<p>Librarians provide the answers to the users during the chat and provide file attachment as a guidance or provide URL to provide more details of information to users such as library guides, link to information available at the library website</p>	<ul style="list-style-type: none"> • Librarian : Welcome to our website. Any questions? You are at the right place! • User: Hi xxx, I'm a librarian at University of Reading Malaysia • I would like to ask about ILL • Librarian : https://umlib.um.edu.my/scontents.asp?tid=23&cid=149&p=1&vs=en • You can refer to this page • 3:08 pm xxx left the chat.

Table 7: Descriptions with transcript example of questions deferred, referred, incorrect or lost connection

Question handling	Explanatory notes	Sample of chat transcript
<p>Incomplete / No answer. Librarian will follow-up with email or face to face/phone call promised</p>	<p>Librarians cannot answer the question instantly and need to clarify or identify the answers with respective department or expertise.</p> <ul style="list-style-type: none"> ● Promised to follow-up with email ● Face to face with user 	<ul style="list-style-type: none"> ● User : Hello I wish to get access to the UM Past Exam Papers. What is supposed to be the username and password Librarian : Go to interaktif portal and log in your X barcode no ● User : I am already here under Links, when I click UM Past Exam Papers, it asks me for a username and password Librarian : I just tried and it does not ask any password ● User : really... one minute File: Doc1.pdf ● See the attachment. It prompts me for a password and a username File: Doc2.pdf Happens when I click UM Past Exam Papers Librarian : I need to clarify this to technical division? can i have your email please ● I'll contact you later User : Yes of course: Dr xxx Librarian : xxx@um.edu.my L: ok got it..i'll get back to you later
<p>Referrals, with contact information/department and names of person in charge</p>	<p>Refer user to other department, with names and contact number. No following up.</p>	<p>User : why my membership has expired on 11/10/18 Librarian : For membership related questions:Please call the membership counter at 03-7967 7765</p>

		<p>Give them your X number If you can't get through, you can email to : sitijuryiah@um.edu.my</p> <p>User : Ok, Thanks</p>
Technical problems	Internet connection lost by users or librarian	<p>User : hi</p> <p>Librarian : Hello</p> <p>User : i cannot see your reply</p> <p>Librarian : Can you see me typing</p> <ul style="list-style-type: none"> • Hello • U left the chat.
User left chat- not attended by librarian	<p>User left chat- not attended by librarian. This situation occurred due to</p> <ul style="list-style-type: none"> • User queuing more than 20 minutes - the chat window automatically closed after 20 minutes of inactive chat) • Librarian are not focused on the live chat- multi-tasking 	<p>Librarian: Welcome back! How can I help you today?</p> <p>User: How to renew online the books that I have borrowed?</p> <p><i>U left the chat.</i></p>
User did not respond to librarian and left the chat	Reference interview had been done by the librarian and needed some clarification/ information from user but the user did not respond and left the chat session	<p>L: Welcome back! How can I help you today?</p> <p>U: Do you have any recommendations on where to find journal articles on perception of pre-service teachers towards teaching practicum?</p> <ul style="list-style-type: none"> • L : You can try use Ebscho Discovery Services from database • Have you tried before? <p><i>U left the chat.</i></p>
Incorrect answers given by librarian	Incorrect answers given to users due to the following reasons:	Librarian: Welcome back! How can I help you today?

	<ul style="list-style-type: none"> • Librarian did not make a simple interview to understand users question • Librarian did not complete the conversation and logout due to end of duty hours • Close conversation without offering an alternative to questions that cannot be answered instantly or will follow-up with users later. • Librarian lack of knowledge about library membership procedure, borrowing procedure, library holdings and IT-related questions 	<p>User: Good afternoon. I am a new Phd student. I got into Scopus and Wos but i can't read the whole article. They asked me to log in... Which email should I use to log in? they ask for username and password</p> <p>Librarian: use your XXX library barcode at the back of your matrix card and the password is 1234</p> <p>User: thats it?</p>
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Below are the result of data analysis for question handling by Librarians for both categories. The analysis were based on 2179 chat transcripts. Only one code of question handling coded for each chat transcript even though it might have had more than one question or no question being asked. Refer to Table 8 for details:

Table 8: Question handling by Librarians

Question Handling	Total	Percentage %
Correct and complete without URL, citation or file attachment	727	33.36
User left chat- not attended by librarian	378	17.35
Correct and complete with URL, citation or file attachment	335	15.37
No question. Customer was "just looking" or testing new service or close the chat window	285	13.08
Referrals, with contact information/department and names of person in charge	264	12.12
User not response to librarian and left chat	90	4.13
Incomplete / No answer. Librarian will follow-up with email or face to face/phone call promised	49	2.25
Technical problems	26	1.19
Incorrect answers given by librarian	25	1.15
Total	2179	100

The result shows that majority of the questions answered correctly and complete by the librarians without URL, citation or file attachment was at 33.36% which is 727 from the total of chat transcripts received followed by User left-chat not attended by librarian

with a total number of 378 chat transcripts. 335 of chat transcripts were provided with correct answers to users with URL, citation or file attachment by the librarians. Aside from providing answers for questions asked, there were also no question asked category which scored 13.08% followed by users were suggested to refer other departments or person in-charge to get the answers from 264 chat transcripts. A total of 90 chat transcripts coded with User’s did not response to librarian and had left the chat. Any librarian handled chat transcripts that had been coded with incomplete/no answer and promised to follow-up with the user achieved a total number of 49 chat transcripts. 1.19% of the chats were lost due to technical issues and the lowest percentage of chat transcripts coded with incorrect answers provided by librarians was at 1.15 %.

Based on the data analysis, we have found that the majority of the answers provided were without URL, citation or file attachment due to the relation of the majority question types being asked by user which is more to IT related questions and Circulation-related questions. Most of those categories of questions did not require detailed explanations as answers. Librarians who had provided users with file attachment, URL to other sites or citations are specifically addressing questions that required detailed instructions or descriptions which cannot be explained from the chat. Refer to Table 5 and Table 6.

However, there were chat transcripts where the questions being asked were not answered by the librarian and were either deferred, referred, incorrect or loss due to issues with the internet connection. A list of causes on why the issues above happened were derived from the analysis. Refer to Table 7 for explanatory.

Users Feedback

A post-chat survey had been carried out for each chat transcript to identity the user’s satisfaction. 90% of the users rated their chat sessions as “Good” while 10% of them rated “Bad”. Refer to Table 9 for the categories of the positive feedbacks and Table 10 for the categories of the negative feedbacks.

Table 9: Positive feedback from users

Feedback categories	Total	Sample of feedback
Librarian response	97	<ul style="list-style-type: none"> • Responsive • good person :) • very helpful • Thumbs up! Good job. • Problem have been solved effectively! Good! • GOOD INFORMATION • Very helpful. Great service • Most helpful and excellent. I got the info on the very

		first reply.
Service	59	<ul style="list-style-type: none"> • I have now logged in and progress well. Thanks • good services • Thank you! • Excellent • I got my response very quickly. Very nice service. • really its great service... • Student service by UM staff is always excellent • thanks for the hospitality
Library resources	2	<ul style="list-style-type: none"> • this URL NOT download the whole thesis, it just articles • <i>Saya berharap dimasa akan datang, peluang penggunaan akan di perluaskan tidak kira jika caj di kenakan, Sekian terima kasih</i> •
Complaint/suggestion	2	<ul style="list-style-type: none"> • Any possibility that we have lesser aircon on in post grad room at level 4? Currently having 3 aircons running in one room. It is freezing cold and very difficult to carry out our work. Since xxx advised us to bring sweater, we all did but it is still affecting us as it is not just cold, but freezing. Please attend to this as we spend long hours on our research here in UM library. Thanks in advance.
Grand Total	160	

Based on the results, most of the users gave positive feedbacks towards the Librarian's response with a total number of 97 comments, followed by the LiveChat service itself which are 59 comments received from users. Furthermore, 2 feedbacks received for each of the following categories, Library resources and Complaint/suggestion.

The analysis results shows that the librarians provided effective service to the users with their librarianship skills and knowledge. It also demonstrated that the LiveChat service is an effective way to approach the users.

Table 10: Negative feedback from users

Feedback categories	Total	Sample of feedback
No response	13	<ul style="list-style-type: none"> • no reply from librarian • no response. • did not get a response • NO ANSWER • no response
Unsolved problem	11	<ul style="list-style-type: none"> • I have not gotten the info I needed • I need to ask • i didn't receive a reply • there is no solution to my problem

		<ul style="list-style-type: none"> Did not answer the question properly. She should conduct simple interview advice.
Late response	3	<ul style="list-style-type: none"> No immediate feedback Fail to get immediate response slow
Technical problem	3	<ul style="list-style-type: none"> difficult to connect the chat ended so fast
No alternative solution	2	Very vague answer, I still have no idea how long it may take or when they will let me been requested and how long it might take. no solution
Library resources	1	Wasn't helpful. Library doesn't have a list of ERA journals and its part of UM publication guidelines
Total	33	

Based on the results, most of users only gave negative feedbacks towards the Librarians due to them not giving a response to the chats with a total number 13 comments, followed by unsolved problems which received 11. Late responses and technical problems received 3 comment each, No alternative solution provided received 2 comments and Library Resources received one.

User left chat- not attended by librarian and late responses occurred due to user having to queue for more than 20 minutes, that the chat window automatically closed after 20 minutes of inactivity or that the Librarian on duty are not focused on the chat and was required to multi-task with other activities during their sessions.

Unsolved questions usually referred to procedure and policy queries that had to be forwarded to the responsible division and questions that are not related to the Library services and resources.

CONCLUSION

Virtual Reference Service (VRS) gave a positive impact to the reference service at the University of Malaya Library. This new service helps the library to approach users all over world and help users to get immediate response from the librarians. This platform also benefits users who have hearing and speech impairments as they can communicate with librarian comfortably using VRS.

Based on the findings, there are several recommendations by the team to help increase the accuracy of questions handling. Group of expertise should be formed so that in-depth questions can be forwarded to them and also to evaluate the chat transactions and also Provide a simple guideline as a tool kit for librarians to solve frequently ask questions.

Conduct a reference interview training for librarians in terms of clarifying the question, closing and follow-up the questions is also needed to improve the librarians' efficiency

and capability in handling reference service. According to Haddow (2012), reference librarians today need to keep up-to-date with information technologies and associated user expectations. Communication skills and personality qualities are also the most important attributes for reference librarians.

Limitation of study

The virtual reference service by the University Malaysia Library has been implemented since 2018 and is being studied from several aspects. However, the analysis of the service excluded some of the elements. In this study, we do not analyze the user category such as 'UM student', 'staff' or 'visitor'. We wanted the users to feel comfortable in having conversations with the librarians regardless their background, therefore this paper have omitted that demographic in the user details. Some of the users stated this reference service as a good platform to approach the librarians especially for the new students who are still not familiar with the library services and facilities.

The users can also leave a message when the librarians are not available, for example after working hours and the weekend. These chat transcripts are considered as "tickets". The librarians will check the "tickets" and they will answer the questions or forward them to the designated division. The offline chat transcripts that we have received during that particular time are not included in this analysis. There are some questions or enquiries that could not be resolved during the chatting session, so the librarian will take initiative to do follow up with the students regarding that matters through e-mails. Analysis of the e-mails between the user and the librarian is not available due to the communication happening outside the LiveChat platform.

Another limitation of the study is that some of the chat transcripts contained more than one question. In a chatting session, some of the user asked several questions regarding the library services to the librarian. However, we have classified each of that chat transcripts only as one category of question handling, as in based on which category took most time during the conversation session. Although there are 2179 chat transcripts, we only recorded the 1968 questions after filtering and analyzing the contents were done.

Future Research

Further studies recommended following this paper includes effectiveness of the platform used, effectiveness and efficiency of the librarian's virtual reference skills and the librarian's behavioral performance on user satisfaction in live chat service.

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