

Analyzing the use of Facebook among university libraries in Hong Kong

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Abstract

In recent years, many academic libraries have started adopting social media by, for example, establishing their own Facebook pages. Our research investigates the current Facebook usage among seven university libraries in Hong Kong. Using a mixed-method research approach, we examined the characteristics of academic libraries Facebook usage and its effectiveness to engage with their patrons, based on online observations and Web content analysis from the publicly available data of the Facebook pages.

Our results indicated that most libraries in Hong Kong adopted Facebook as a marketing tool, yet the user engagement level in these pages is low. In addition, we also discovered that communication-related posts and video-type posts can attract the most attention of patrons. Based on these outcomes, we provided some recommendations on the application of Facebook for academic libraries.

Keywords: social media; library promotion; academic libraries; mixed methodology

Introduction

Earlier articles have introduced the applications of social media for both social and educational purposes (Ajjan & Hartshorne, 2008; Mazman & Usluel, 2010). In the academic library context, Facebook has provided libraries with cost-effective and efficient ways to disseminate news, to promote services, and to communicate with their patrons (Chu & Du, 2012; Witte, 2014). While earlier studies have explored the perception (Chu & Du, 2012; Witte, 2014) and the application of Facebook in academic libraries (Garcia-Milian, Norton, & Tennant, 2012; Garoufallou & Vassilakaki, 2015), the effectiveness of such applications were not fully examined (Palmer, 2014; Peñafior, 2017). Particularly, few studies have investigated the context of Hong Kong (Chan, 2012; Kong, Chiu, & Ho, 2016). Not filling such gap may leave the practitioners of academic libraries using social media in swift, and thus hinder the potential and benefits of using Facebook and other social media for assisting and promoting the services of university libraries.

To fill this gap, we investigate the current Facebook usage among university libraries in Hong Kong, where Facebook is the most commonly used social media (Kong et al., 2016). By analyzing their Facebook pages and posts, we aim to examine the characteristics of their Facebook usage and to evaluate its effectiveness to engage with their patrons. We also analyze the influence of Facebook content and media type on user engagement in order to provide recommendations for improving the response rate. Insights gained from this study would be useful for librarians to gain deeper understandings for future Facebook management and adoption. Accordingly, our research questions are set out as follows:

RQ1) What are the characteristics of Facebook page usage among university libraries in Hong Kong?

RQ2) How effective is the university libraries' use of Facebook to interact with their patrons, in terms of engagement rate?

RQ3) From the perspective of university library users, which Facebook post categories and media types attract their attention mostly?

The rest of the paper is structured as follows. We first review the literature about using Facebook in academic libraries, followed by presenting our research methods. Next, we present and discuss our results. We also offer some recommendations on future applications of Facebook in academic libraries before we conclude our paper.

Review on Facebook and its applications in academic libraries context

Facebook is a multi-feature social networking platform that allows registered users to communicate with family, friends, and colleagues (Au & He, 2014). Initially developed as a Harvard-only social network site in 2004 (Ellison, 2007), it has been extended gradually to all Internet users after its

initial successes (Cassidy, 2006), and has become one of the largest social networking sites in the world with over 2 billion active users (Nowak & Spiller, 2017). Mazman and Usluel (2010) have highlighted a number of purposes of using Facebook, such as social connections, work-related activities, and educational activities. Table 1 shows a selected list of earlier arguments about the application of Facebook or social media in the educational context.

Table 1. Selected literature about the application of social media tools in academic context

References	Argument
Graham, Faix, and Hartman (2009)	In the university library context, adopting Facebook can improve the visibility of the library, engage the students and connect the library with other library professionals. Example of activities that university librarians do in Facebook page includes making announcement, promoting events and answering users' questions.
Sachs, Eckel, and Langan (2011)	A survey conducted in Western Michigan University indicated that Facebook as a useful tool to learn about the resources and services provided by the libraries. To effectively use the Facebook page, universities librarians should balance between delivering vital information and preserving patron privacy.
Chu and Du (2012)	Wide adoptions were found in academic libraries in Asia, North America, and Europe, because of its usefulness in providing the services. Among different social media tools, Facebook and Twitter were the most commonly adopted.
Lam (2012)	Online platforms are playing an important role in higher education. For example, Facebook can change the interaction, communications and interrelations of students, and thus can be a very useful tool to motivate students' learning.
Au and He (2014)	Most students were positive using Facebook in learning. They would interact with one another on Facebook, work on academic-related questions and collaborate for their group projects.
McCallum (2015)	Many librarians acknowledged the importance of social media and most libraries have been managing at least one social media tool. However, a deeper investigation is needed for understanding how to apply social media to enhance the services.
Niu (2017)	Niu (2017) reviewed 57 international studies and concluded that Facebook could be an effective tool for academic communication and self-learning, and had great potential for being incorporated into formal teaching and learning.

In short, educators, librarians, and patrons have become increasingly positive about using Facebook for promoting the events, resources, and services of libraries (Chan, 2012; Xie & Stevenson, 2014), as well as communicating with users (Aharony, 2012; Giri, Kar, & Sen, 2014) and among internal staff (Chu & Du, 2012; Graham et al., 2009). From the students' perspective, Facebook is considered as a

useful tool for motivating and supporting their academic works (Au & He, 2014; McCallum, 2015; Niu, 2017). Particularly, students' behavior norms of using social media as learning tools are vital, as it may impact the outcome of the tools application (Marangunić & Granić, 2015).

Measuring interactions between libraries and patrons on social media

Facebook engagement has been measured in different disciplines. Primarily, the metrics of interaction is measured in terms of likes, comments, and shares. For example, the "like" behavior of the social media users could represent the genuine sense of appreciation (Lowe-Calverley & Grieve, 2018), while "comments" are considered the active method to engage with users (Giri et al., 2014). Bonsón and Ratkai (2013) in an earlier study have implemented a metrics framework to measure Facebook user engagement (See Table 2). Based on this proposal, three metrics were used to quantify the interaction, "Popularity" is measured by the number of likes, "Commitment" refers to the number of comments, and "Virality" is measured by the number of shares. The number of posts and size of the audience were also considered into the calculation. This proposal is widely accepted as the related variables could be obtained through the publicly available data, and thus constitutes a measurement basis for our study (Kong et al., 2016).

Table 2. Facebook metrics for the engagement (Bonsón & Ratkai, 2013)

Popularity	P1	Number of posts liked/total posts	Percentage of posts that have been liked
	P2	Total likes/total number of posts	Average number of likes per post
	P3	$(P2/\text{number of fans}) \times 1000$	Average number of likes per post per 1000 fans
Commitment	C1	Number of posts commented/total posts	Percentage of posts that have been commented
	C2	Total comments/total posts	Average number of comments per post
	C3	$(C2/\text{number of fans}) \times 1000$	Average number of comments per post per 1000 fans
Virality	V1	Number of posts shared/total posts	Percentage of posts that have been shared
	V2	Total shares/total posts	Average number of shares per post
	V3	$(V2/\text{number of fans}) \times 1000$	Average number of shares per post per 1000 fans
Engagement	E	$P3 + C3 + V3$	Stakeholder engagement index

Further, some studies have examined the interaction between libraries and patrons via quantitative and qualitative approaches. Table 3 shows a selected list of earlier articles with a description of how they have measured the interaction rate.

Table 3. Selected literature about calculating interaction rates of Facebook pages in academic libraries context

References	Calculation description
Ayu and Abrizah (2011)	In a study on 25 academic libraries in Malaysia, they measured the post interactions of the Facebook pages in terms of numbers of likes on the pages and posts, as well as the number of comments.
Gerolimos (2011)	By examining user comments on the Facebook pages of 20 American academic libraries, the paper calculated the number of likes and comments on these pages and found that the number of likes was far more than the number of comments.
Palmer (2014)	Selecting a few Australian universities to study, the author calculated the number of shares, comments, and likes on the social media as the engagement rate, and applied data visualization and metrics for showing the information.
Peñaflor (2017)	The author took an approach of calculating the “popularity” (i.e. number of followers of the page) for determining the engagement rate (i.e., how many comments, likes, and shares in each post among fans).
Al-Daihani and Abrahams (2018)	Selecting the academic libraries from 100 highly-ranked universities over the world, this research defined engagement on social media as the multiplication of likes and comments.
Joo, Choi, and Baek (2018)	Collected Facebook posts from 151 public libraries in the USA, they measured user engagement in terms of the number of likes, comments, and shares for each type of Facebook post. User engagement was further standardized by the size of the library and the number of Facebook followers.

In short, the engagement figures help determine users’ preference on the types of applications and posting methods in the Facebook profiles. Based on the engagement figures, practitioners may come up with some potential implications for improving social media applications of the libraries. For example, Garcia-Milian et al. (2012) discovered a positive correlation between the total number of fans and the number of posts in a Facebook page, and suggested that posting of videos helped attract more followers. However, that study did not test the correlation between the number of fans and the engagement. Giri et al. (2014) pointed out that the number of "likes" in the posts is more important than the total number of fans when measuring the effectiveness of the post. Witte (2014) found that sharing external contents would bring a higher engagement rate and save librarians’ time on Facebook page management. Both Al-Daihani and Abrahams (2018) and Joo et al. (2018) discovered that personal terms such as “congratulation,” “thanks,” and other inspirational messages could receive higher engagement. Al-Daihani and Abrahams (2018) also found that wording associated with institutional identity could gain more patrons’ attention.

As there is scant research on the adoption of social media in the Asian context, we aim to study the correlation between the engagement, content types, and posting methods more deeply, and to compare the results with that of similar studies conducted in other cultural contexts.

Research Method

In response to our research questions and phenomena under study, we opted to use a mixed-method research approach for triangulation and building a more completed image (Gable, 1994). Qualitative research can capture the language and imagery that people use to describe a service and understand influence behavior (Greenfield & Greener, 2016), while quantitative research delivers the strengths of tracing trends and relationship as well as formalizing comparisons (Punch, 2014). Our adoption of research methods in response to each research question is summarized in Table 4.

Table 4. Summary of research methodology employed

Research Question	Research method	Sampling selection	Data collection	Data Analysis
1) What are the characteristics of Facebook use among university libraries in Hong Kong?	Qualitative analysis	<ul style="list-style-type: none"> Library Facebook pages of 7 government-funded university libraries in Hong Kong Posts and comments over the period 1 Jan 2016 to 31 Dec 2017 	<ul style="list-style-type: none"> Online observation Netvizz 	Web content analysis
2) How effective is the library use of Facebook to interact with their patrons, in terms of engagement rate?	Quantitative analysis			Engagement rate
3) From the perspective of library users, which Facebook post categories and media types attract their attention mostly?				Kruskal-Wallis test

We investigate the Facebook pages of these university libraries using online observation and Web content analysis, which may be illustrated by five steps:

1. Identifying the official Facebook accounts of the Hong Kong university libraries;
2. Capturing the Facebook posts and engagement from both librarians and library users between January 1, 2016 and December 31, 2017;
3. Coding the Facebook posts by relevant content and media types;
4. Calculating the engagement rate of Facebook posts;

5. Analyzing the relationship among the post media type, purpose category, and engagement rate.

Netvizz is a data collection and extraction application that allows researchers to export data in standard file formats from different sections of the Facebook social networking service. Initially developed in 2009 as an attempt of studying Facebook, the application was developed into a veritable data extractor that provides outputs of different Facebook sections in standard formats (Rieder, 2013).

Data Collection

The universities that we included in our studies are as follows:

- The University of Hong Kong (HKU)
- The Chinese University of Hong Kong (CUHK)
- The Hong Kong University of Science and Technology (HKUST)
- The Hong Kong Polytechnic University (PolyU)
- City University of Hong Kong (CityU)
- Hong Kong Baptist University (HKBU)
- Lingnan University (LU)

We excluded the library of the Education University of Hong Kong (EdUHK), because it was upgraded to a university only in May 2016. We also excluded the Open University of Hong Kong (OUHK) because of its unique and totally different student composition (e.g., a large portion of OUHK students are not full-time students and may thus have a very different library usage habit), and their branches because of their low popularity (i.e., less than 500 total fans). We believe the inclusion of these 7 academic libraries is adequate to build a more completed and generalized image of Facebook page applications of academic libraries.

The general information such as creation date, the total number of fans, and the URL of library Facebook pages were firstly collected. Then, the information such as content, number of reactions (i.e., *like*, *love*, *haha*, *wow*, *sad*, and *angry*), number of comments, number of shares, media type, and posting date of each post of the Facebook pages over the period of January 1, 2016 and December 31, 2017 were captured by using the software Netvizz. A total of 1,740 posts were harvested and converted into spreadsheet data.

Data analysis

With reference to earlier research (Chu & Du, 2012; Phillips, 2011), we manually classified the Facebook posts into 19 categories in terms of the purposes (See Table 5 for details); whereas (1) text, (2) photo, (3) video, and (4) link in terms of media type.

Table 5. Nineteen categories of the post contents

<i>Code</i>	<i>Purpose</i>	<i>Sample references</i>
C1	Library news dissemination	Updating the announcement about library news, policies, job posting and opening hours, excluding events and service
S1	General library operation	“Friendly Reminder on the opening hours of the Library during the Easter holiday: 14 – 15 April 2017 : Closed 16 – 17 April 2017 : 12:00 noon – 12:00 midnight”
S2	Policies	“Friendly reminder: Due to change of the new Integrated Library System, the last day to request books from the current HKALL system is June 5, 2017. Afterwards, you may use the "Inter-library Loan" (ILL) system to request for books from other libraries, before the new system go live in early July.”
S3	Recruitment	“Come work with us! We are now recruiting Student Assistants for 2017-2018 :-D [...]”
C2	Marketing	Promotion of library events (e.g. exhibitions, workshops, seminars, and ceremonies), facilities, services and collections
S4	Library events	“Live from HKBU Library - Our first ever pet therapy event!”
S5	Library digital resources	“Library News: BrowZine App for iPhone is Available Now! [...]”
S6	Library in-house collections	“Find out more featured resources for School of Hotel and Tourism Management URL: [...]”
S7	Library facilities	“Bring Design Concepts to Life – 3D Printing Service@Learning Garden Coming Soon!”
S8	Other services	“Honour with Books for Mother's Day Are you thinking of a special gift to offer your mother on Mother's Day? "Honour with Books" offers a unique way to honour a special person while making a contribution to enhance the Library Collection. In recognition of your contribution, a certification honouring your recipient will be offered. * For as little as \$500, a commemorative bookplate bearing your name and the name of the person you are honouring will be placed in a new book purchased by the Library. Donate \$1,000 to select a special book of your choice.”
S9	Library brand	“Library receives awards in Web Accessibility Recognition Scheme!”
S10	Publications	“The latest issue of "Library Matters" has been published. Please click the following link to read it online, or grasp a printed copy from the Library. [...]”
C3	Information/knowledge sharing	Sharing of tutorial guides and other external online resources and information
S11	Online resources	“A Good Read: Academic Publishing Free-for-all [...]”
S12	Other events	“Free admission to the permanent exhibitions of Hong Kong Museum of History, Hong Kong Heritage Museum, Hong Kong Museum of Art, Hong Kong Museum of Coastal Defence and Dr Sun Yat-sen Museum, starting 1 August. Check out activities/exhibitions at other Hong Kong museums: [...]”
S13	Instructional guides/tutorials	“How to find course reserve items in the Library?”
C4	Communication	Enhancing the communication with patrons and internal staff
S14	Greetings	“Happy Valentine's Day!”
S15	Supportive messages	“The official exam period begins today, and we would like to say, GOOD LUCK!”
S16	Celebration	“Congratulations to all graduates!”
S17	Humor	“Pokémon is all around the library, a Pidgey is just standing on my office desk! Also, Pokéstop and Gym are all over the campus. Play safe and have fun!” #PokémonGo #Library@HKUST”
S18	Internal staff communication	“Thank you XXX for your long service and best wishes to your retirement!”
C5	Information acquisition	Requesting feedback and suggestions from patrons to improve library facilities and services
S19	Suggestions/questionnaires	“#MobileCharging We want your opinion! Fill out this quick survey: [...]”

(All the words that involve the identities of research participants are changed as XXX)

We adopted the framework of Bonsón and Ratkai (2013) for calculating the “engagement rate” to determine the effectiveness of the interaction between librarians and patrons, and defined “engagement” as a reply that contained either a reaction, comment, or share. In a particular post, if both reaction, comment, and share were posted from the same user, both were counted. Since the amount of “engagement” was influenced by the number of posts and followers of the page, therefore, in order to isolate these effects, the “engagement rate” was calculated as the sum of reactions, comments, and shares per post per fan:

$$\text{Engagement rate} = \frac{\text{Number of (reactions + comments + shares)}}{\text{Number of Posts} * \text{Total Fans on a Given Day}} * 100$$

For the correlation analysis, Kruskal-Wallis H test (significance at 0.05 level) was used to determine the possible significant differences between the engagement ratio (i.e., number of reactions per fan) and i) content type and ii) media type.

Results

Table 6 shows the information of the university libraries pages, while Table 7 shows an overview of Facebook post categories between 2016 and 2017.

Table 6. General information of Facebook pages of Hong Kong university libraries

Name of university library	URL	Created Date	Total Fans (as of 5 Jan 2018)	No. of Posts (from 2016 to 2017)
CityU	https://www.facebook.com/cityulib/	13/1/2010	2,876	376
CUHK	https://www.facebook.com/CUHKLibraries/	19/5/2010	3,536	355
HKBU	https://www.facebook.com/hkbulibrary/	10/9/2009	7,125	469
HKU	https://www.facebook.com/hkulib/	16/2/2012	1,106	130
HKUST	https://www.facebook.com/hkust.library/	14/4/2011	4,626	215
LU	https://www.facebook.com/LuLibrary/	7/1/2010	1,561	113
PolyU	https://www.facebook.com/PaoYueKongLibrary/	3/7/2012	3,701	82

Table 7. Categorization of Facebook post in the selected Facebook pages in 2016-2017

Category	No. of Posts	Percentage
C1 - Library news dissemination	219	21%
C2 - Marketing	1071	61%
C3 - Information/knowledge sharing	366	13%
C4 - Communication	57	3%
C5 - Information acquisition	27	2%

Based on the categorization shown in Table 5, Figure 1 shows the breakdown of Facebook post categories by university libraries. The top four frequently used categories were “Library events (S4),” “Online resources (S11),” “General library operation (S1),” and “Library digital resources (S5).” Distribution of post categories varied across different libraries. “Library events (S4)” was the most frequent topic shared by the Facebook page of PolyU, LU, HKU, HKBU, and CUHK libraries, while “Online resources (S11)” was frequently posted on that Facebook page of CityU and HKUST libraries.

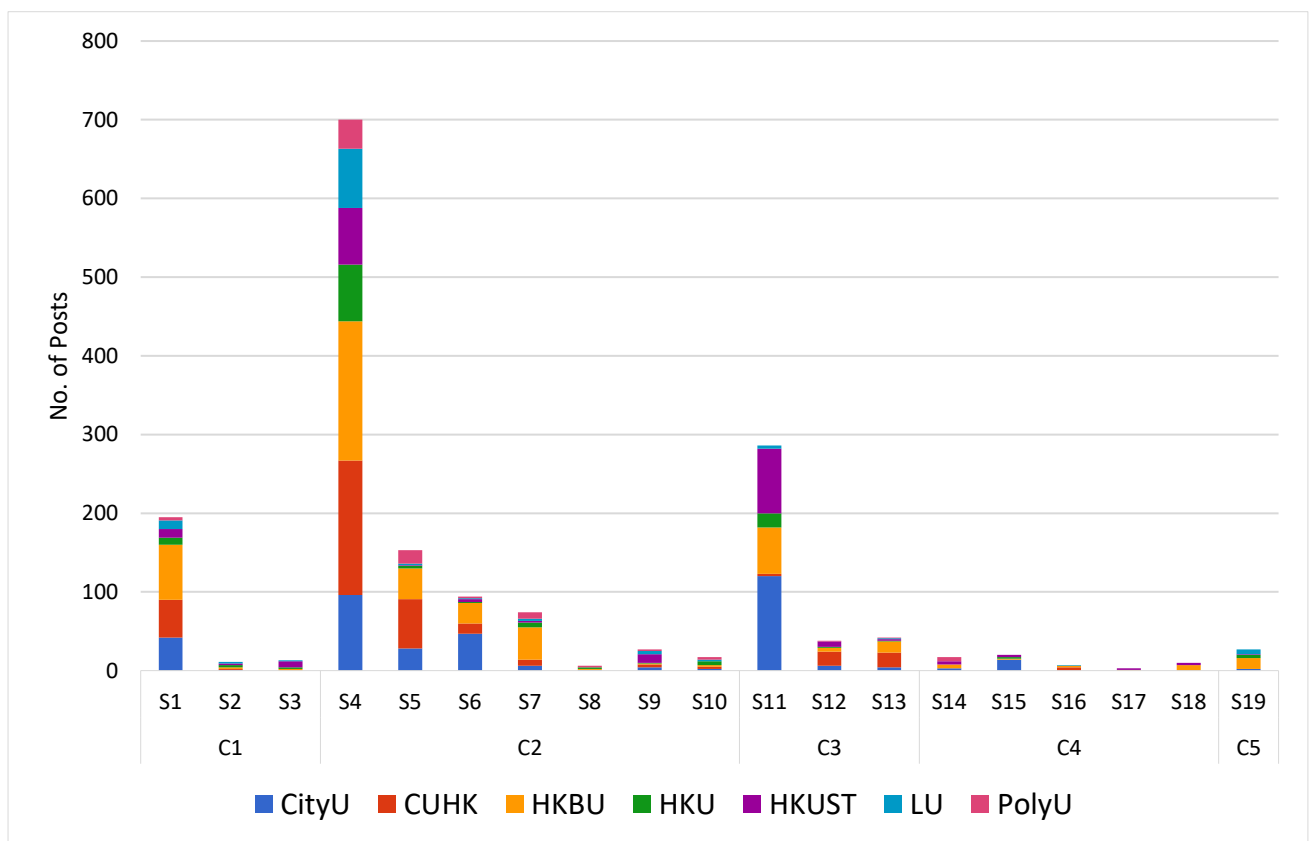


Figure 1. Breakdown of Facebook post categories between 2016 and 2017 by university libraries

The post media types adopted by these libraries between 2016 and 2017 are shown in Figure 2. The most frequent post media type was photos (62%), followed by links (30%), while video (6%) and text (2%) were less posted. All libraries except CityU and HKBU mainly used photo-based media for

posting. CityU library mainly shared posts by links, while HKBU library used both photos and links for posting.

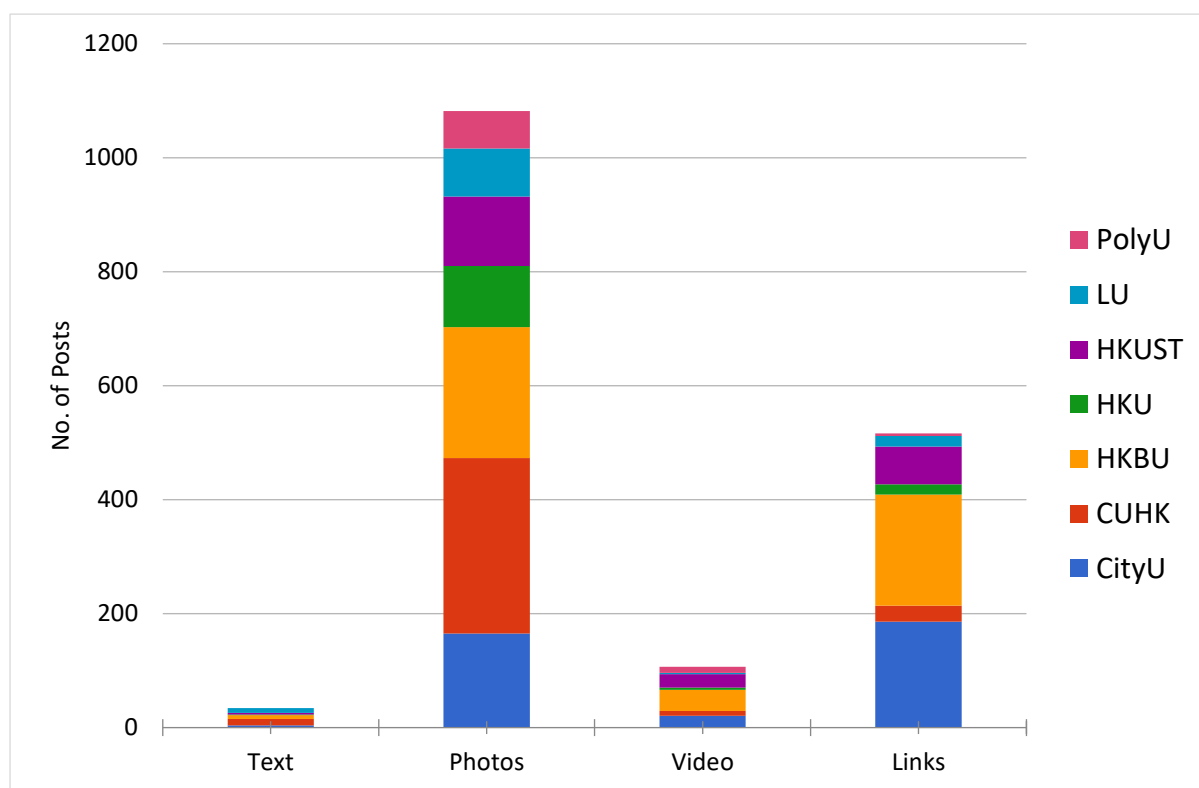


Figure 2. Post media types

Table 8. Number of reactions, comments, shares, and engagement rate by university libraries between 2016 and 2017.

Name of university library	Total No. of Reactions	Total No. of Comments	Total No. of Shares	Average Engagement Rate (%)
CityU	749	24	67	0.09
CUHK	2992	141	636	0.33
HKBU	5865	257	295	0.20
HKU	272	21	72	0.29
HKUST	1873	103	91	0.21
LU	261	4	15	0.16
PolyU	162	25	45	0.09

Table 8 illustrates the total number of reactions, comments, and engagement rate by university libraries. The number of comments and shares were much lower than those of reactions. To determine the effectiveness of Facebook use, the average engagement rate was calculated as the sum of reactions, comments, and shares per post per fan. There were differences in the

engagement rate among these libraries. CUHK library received the most engagement rate (0.33%), followed by HKU (0.29%). PolyU and CityU received the least engagement rate (0.09%).

Influence of Post Content and Type on the Engagement

Table 9. Kruskal-Wallis Test results for post categories and engagement

Post categories		N	Mean Rank	Chi-Square	df	Significance
<i>Engagement Ratio</i>				127.34	18	0.000
C1	S1	195	814.47			
	S2	11	1113.36			
	S3	13	836.58			
C2	S4	700	899.27			
	S5	153	865.57			
	S6	94	642.04			
	S7	74	1242.41			
	S8	6	919.08			
	S9	27	1153.72			
	S10	17	1013.68			
C3	S11	286	712.76			
	S12	38	966.33			
	S13	42	936.55			
C4	S14	17	937.41			
	S15	20	874.28			
	S16	7	1426.43			
	S17	3	994.17			
	S18	10	1368.1			
C5	S19	27	912.56			
Total		1740				

A Kruskal-Wallis H test was conducted to evaluate the differences among 19 post categories on the median change in engagement ratio (i.e., number of reactions per fan). The results of the Kruskal-Wallis test (Table 9) indicated a significant relationship between the post categories and the engagement ratio ($H(18) = 127.34, p < .05$). Also, the results showed that the engagement ratio was the highest for “Celebration (S16)” category, which was followed by “Internal staff communication

(S18)” and “Library facilities (S17)”. The post with the lowest engagement ratio was in the “Library in-house collections (S16)” category.

Table 10 shows the impact of media types on the engagement ratio. Similarly, the Kruskal-Wallis test revealed that there was a significant relationship between the post media types and the engagement level. ($H(3) = (115.72), p < .05$). Video-based posts received the highest number of engagement ratio, followed by photo, link, and text.

Table 10. Kruskal-Wallis Test results for post media types and engagement ratio

Post Media Type	N	Mean Rank	Chi-Square	df	Significance
<i>Engagement Ratio</i>			115.72	3	0.000
Text	34	474.24			
Photo	1083	950.8			
Video	107	1002.58			
Link	516	700.69			
Total	1740				

Discussion

RQ1) What are the characteristics of Facebook page usage among university libraries in Hong Kong?

Our findings were aligned with previous findings (Aharony, 2012; Garoufallou & Vassilakaki, 2014), which suggested Facebook as a marketing tool (61%) of academic libraries. Particularly, the category “library events (S4)” was the most frequent content published by librarians, which was consistent with the previous studies about using social media for event promotion, due to its ability of rapidly distributing various information (Chu & Du, 2012).

Regarding the media types of the posts, both photo-based and external links were frequently posted by some libraries. For example, about half of the library posts of HKBU and CityU comprised links. Sharing contents seemed to be helpful to maintain high posting frequency while to save production time (Witte, 2014).

RQ2) How effective is the library use of Facebook to interact with their patrons, in terms of engagement rate?

It was found that the overall number of comments were lower than that of reactions and shares, probably because it was easier to click the reaction or share button than to write comments. The overall engagement rates of all libraries were low, with less than 0.33%, which suggested the low effectiveness of the current Facebook marketing strategy. The effort invested in managing the

Facebook pages and promoting library events and measures received limited attention. For example, the HKBU library had the highest number of followers and posts but gained only 0.20% engagement rate. It indicates that most followers are indeed inactive having limited interaction with the page. Besides, CityU library updated the post frequently but only showed second lowest engagement rate (0.09%), which aligned with the previous finding that higher frequency posting did not necessarily correlate to high engagement rate (Peñaflor, 2017). Mechanisms or guidelines for monitoring the performance of each post are therefore needed. For example, the alert mechanism proposed by Chan et al. (2015) can be employed for automating such actions. Further, by identifying the most and least attractive content or media type, librarians could improve the knowledge about how to deepen the overall patron engagement.

RQ 3) From the perspective of library users, which Facebook post categories and media type attract their attention mostly?

In terms of post contents, it was found that “Celebration (S16)” under the “Communication (C4)” category attracted the most attention from library patrons, which aligned with the findings of Al-Daihani and Abrahams (2018) and Joo et al. (2018) about high engagement rate for congratulations and gratitude messages. However, it seems that Hong Kong librarians did not utilize the full advantage of Facebook pages, and had only considered to use a small proportion of posts as communication purpose (3%). Libraries should emphasize social media as communication tools (Enis, 2017) with patrons, and thus to establish close relationship with them regardless of their options and access to different library services and resources (Parvin, 2017). Facebook provides great opportunities for libraries to interact with their users deeply. To encourage more responses and to cultivate a friendly image with patrons, librarians are suggested to avoid overly formal language, and post more human-side or emotionally positive messages, such as encouragement messages during and closely-before the examination period and congratulation messages when the graduation ceremony is nearby.

Regarding the marketing related posts, it should be noted that “Library in-house collections (S6)” within the “Marketing (C2)” category received the least attention from patrons, while “Library facilities (S7)” within the same group attracted much more attention from users. As suggested by Giri et al. (2014), there may be a gap between the demand and supply of learning resources and required facilities in the library, which may imply a change of need or perception of young adults on university library. Patrons may perceive libraries as a place for learning, and are more interested in how innovative technologies or facilities can support the learning environment. Some of the examples of the most attractive posts were:

“ 【 Behind the Scene 】 Some users asked how our RFID enabled automated book sorter runs behind the return slots. We have visited this SECRET PLACE under the lead of User Services colleagues. Over the past two years,

colleagues of User Services and branch libraries were working hard on the RFID tagging of about 1.7 million circulating books in the CUHK Library. Many thanks for their hard work. A mini-video is filmed. Let's watch!"

"Asia's first short story dispenser in action! Come and try it for yourself at the Main Library :-)"

"Hot tip! Our new chairs in the Academic Commons have a space for you to store your bag :-)"

"Summer is the time for the Library to make improvements to offer you an even better service. Today we set up our new charging station - no need to worry if you forget to bring your charging cable, we've got you covered!"

These findings may imply the need for transforming the library services by enhancing library facilities and digital technologies on top of physical collections (Lo et al., 2017). Therefore, librarians should be aware of the trends of emerging technologies and how these technologies may be applied to improve the learning environment and patrons' experience. Further, such new technologies adoption could be effectively marketed through social media to attract the patrons.

In addition, the library brand (S9) under the marketing category also received high engagement. It supports the finding of Al-Daihani and Abrahams (2018), who stated that social media could be useful for branding library. Apart from mentioning the institutional name in the posts, identifiable cover photos or profile pictures of the library are also a great way to enhance the library identity. Librarians are also encouraged to re-strategize the use of social media in assisting users. Facebook is not only an electronic notice board, but also an enabler of more diversified marketing approaches.

In terms of media type, our results are not aligned with previous literature (Witte, 2014) and suggested that the sharing links and text-type posts were not as effective as photo-type posts or video-type posts to attract attention from patrons in Hong Kong. This may also explain the low engagement rate displayed by CityU library, as most of its posts were online resources shared via links. While sharing external resources links could save production time, librarians should strike a balance between content quality and posting efficiency. The libraries may share more in-depth posts that are relevant to both the library and the patrons. In addition, only a few posts comprised video, yet, our analysis showed video-based post could gain the greatest attraction. Given videos of no longer than five minutes account for 55% of total video consumption time on smartphones (Enis, 2017), librarians may provide creative short video clips for enriching the contents of library services and resources to attract younger students who have grown up with social media and other digital technologies (Collins & Quan-Haase, 2014).

Other recommendations on Facebook application for academic libraries

In general, academic libraries may consider adopting up-to-date or advanced features supported by Facebook. We hereby make a few possible recommendations.

Firstly, Facebook offers alternative channels for communication. For example, Patrons may comment on public posts or privately message the page administrator. The former is useful for open discussion and feedback, while the latter is helpful for answering specific enquiries. To address some simple enquiries from the users, Facebook pages may consider including automatic chatbots, which has been used by some other companies (e.g., Qantas and Jetstar) to answer some routine enquiries (Dal Porto, 2017) such as opening hour and service locations. Such automatic chatbots can greatly improve service efficiency.

Secondly, the libraries may consider using Facebook live functions to create real-time video posts when there are events such as library tours and workshops. It is not a technically-complex function, but it has been suggested that people would spend three times longer to watch the video when it is broadcasted (Lavrusik & Capra, 2016). In the academic library context, it can engage patrons who could not attend the events in person (Koerber, 2017).

Thirdly, the librarians may utilize the hashtag functions (Lindley, 2013) with the common language of the university members, so that patrons can search for the relevant conversation. It also helps increase the exposure to the local community and offers convenient connectivity to other libraries professionals over the world. Thus, the libraries may consider sharing more useful information or hot topics by adding hashtags in their posts.

Last but not the least, given the time of posting may affect the user engagement (Giri et al., 2014), administrators may prepare the posts earlier and scheduled it to be published on specific days, so that they can control the time and frequency of the posts for getting the highest attention from patrons. In addition, it improves the posting consistency, as administrators would not miss checking the posts. For example, greetings messages could be scheduled during long holidays, while encouragement messages could be scheduled during the examination periods.

Conclusion

Our mixed-method research examined the characteristics of library Facebook use, evaluated its effectiveness to engage with their patrons, and analyzed the influence of Facebook content and media type on the user engagement from multiple perspectives. Based on our findings, we provided some recommendations to improve the response rate.

Our web-content analysis results indicated that most libraries adopted Facebook as a marketing tool. Library event was the most frequent category posted among libraries. In terms of media types, most of the post comprised of photos, followed by sharing links.

This study adopted some contemporary metrics to evaluate the effectiveness of library Facebook use. The engagement rate can serve as a useful indicator to provide valuable insights for librarians to understand their performance. This study found that engagement was low among all university libraries studied, and was significantly influenced by the post categories as well as the media format, while communication-related posts and video-type posts attracted the most attention of patrons.

The libraries should periodically monitor the page performance based on the indicators and adopted more diversified approaches as well as advanced features to attract the younger generation who have grown up with digital technology.

There are some limitations in this study. Since it is not possible to check whether the person who posted or replied on the library Facebook is a real library user (e.g., staff member or student), it is assumed that all the posts and feedbacks are created by library users. Besides, the calculation of engagement rate was based on the publicly available data on the library Facebook pages, as historical like numbers for the pages cannot be captured by Netvizz, the number of total fans gathered on December 31, 2016 and December 31, 2017 were used. Administrators may obtain a more accurate and comprehensive analysis through Facebook Page Insight. Besides, this study has not examined how users' responses (positive or negative) on Facebook posts. Therefore, the engagement rate can only be viewed as a statistical reference.

Although this study only focused on the use of Facebook, the proposed metrics are applicable for other social media tools to evaluate its effectiveness considering the common features between Facebook and other social media. In addition, correlation analysis can be used to provide guidance for social media practice and achieve a higher response rate. As continuing study, we plan to examine academic libraries in other countries for comparison, as well as the application of other social media such as Twitter and Instagram, so that the boundary conditions of our findings may be validated. We are also interested in other applications of social media in teaching and learning (Ma et al., 2016; Zhang et al., 2017), and the effect of mobile platforms on education computing usage (Ko et al., 2015; Lau et al., 2017).

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