





secret chat as shown in Figure 3 where the user can send end-to-end encrypted messages [3] that do not get stored on servers and the users are able to set a self-destruction time on each individual message for extra privacy where it does not supported by WhatsApp. The padlock symbol indicates the private chat. One tick in the message means that the message is delivered to the Telegram cloud and the recipient has been notified, while double checks mean that the message has been read by the recipients [13]. Telegram also allows the users to send photo, video, audio, location, and contact. The additional feature in Telegram for messaging is that it can send document such as doc, zip, and mp3 files while WhatsApp cannot.

On the other hand, WeChat has richer emoticons and stickers as compared to WhatsApp and Telegram. By default, it comes with a default set of animated stickers. The user can get more stickers by downloading them for free and some of them need to be paid. WeChat allows a chat and a group chat. It enables users to send images, videos, location, and name card. Other feature of WeChat is walkie-talkie feature that allows users to send quick voice messages to another user. Another distinct feature in the latest version of WeChat 5.0 is translation service that can translate the text messages from one language to another as shown in Figure 4. This unique feature is only available in WeChat and none of the other mobile messaging apps provide such in-app translation [16]. For translation, WeChat supports up to 20 international languages: English, Hindi, Arabic, Hebrew, Indonesian, Italian, Japanese, Korean, Malaysia, Polish, Russian, Spanish, Thai, Turkish, Vietnamese, French, Mandarin, Portuguese, Urdu, and German [16]. Moreover, WeChat provides a private group feature to set a password for groups where the participants must enter a four-digit code before starting a conversation in a group as shown in Figure 5.



Figure 3: Telegram chat overview for secret chat

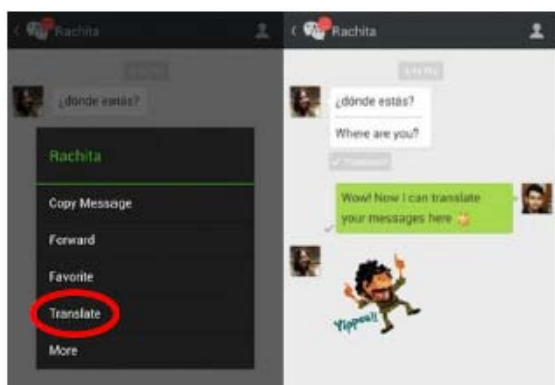


Figure 4: Translation feature in WeChat



Figure 5: Private group feature in WeChat

**D. Price**

WhatsApp is free to download and use for the first year. After one year trial, the users have to pay the subscription fees for \$0.99 USD or RM 3.50 per year [19]. Figure 6 shows that the users may purchase the extension for 1 year (RM 3.50), 3 years (RM 8.75), and 5 years (RM 12.16), and the payment can be made through Google Wallet by using debit or credit card. On top of that, the users can pay for their friends in WhatsApp contact.



Figure 6: Payment for subscription fees in WhatsApp

On the other hand, Telegram is an open source app where it has no subscription fees unlike WhatsApp[15]. WeChat is similar to Telegram as it is also free. However, the payment is only applicable for those who want to buy paid stickers.

**E. Add Friends**

In WhatsApp, the friend’s phone number must be in the user phone’s contacts in order for them to initiate a chat. Both parties must get the WhatsApp installed beforehand. Otherwise, the other party may not find their friend in WhatsApp list even though the phone number is already in the phone’s contacts. The users might invite their friends who do not have WhatsApp installed yet.

Telegram is similar to WhatsApp where the friend’s phone number must be in the user phone’s contacts in order for them to start a chat and it is required for both parties to install Telegram. The users might invite their friends who do not

have Telegram from other apps like WhatsApp. On the other hand, WeChat provide few ways to add friends. The users might add friends through their phone numbers, find people nearby by *look around* feature, *shake* feature that enables the users to shake their phones and WeChat will provide a random list of people around them immediately. The users can also scan QR code of the friends if there are any, and also through WeChat ID.

**F. Ease of Changing to New Devices**

WhatsApp allows the users to change phone numbers on their accounts. Hence, it is easy to change to a new device since the users need to ensure that particular number of SIM card is on the phone that the users wish to register WhatsApp on since the verification during registration process will be done automatically and no username or password required. Meanwhile, Telegram requires the users to deactivate old account and create a new one for the new number if the users wish to change for a new device. However, in order to login to WeChat account, it requires the users to enter a password for the number of the device once the users have logged out.

**3. Survey**

An online survey was carried out to assess the IIUM students' preferences on mobile messaging apps including the features and security measures of those mobile messaging apps installed in their smartphones. The instrument was a 12 question mixed response survey created using Google Form. The survey was distributed through "IIUM Online", the Facebook group for IIUM students. The respondents for this survey were 52 students of IIUM: 67% of them are female while another 33% are male. The first question determined the type of operating system (OS) used for their smartphones and found out that Android is the highest with 81%, followed by iOS (13%), and Windows Phone (6%).

To know the most installed mobile messaging apps, the students were asked on which mobile messaging apps that they installed in their smartphones. The results are tabulated in Table 2. The most installed mobile messaging apps were WhatsApp (98%), followed by Telegram (46%), WeChat (35%), Viber (23%), Line (21%), Others like Tango and Badoo (8%), KakaoTalk (6%), and BBM (2%).

**Table 2:** Mobile messaging apps installed

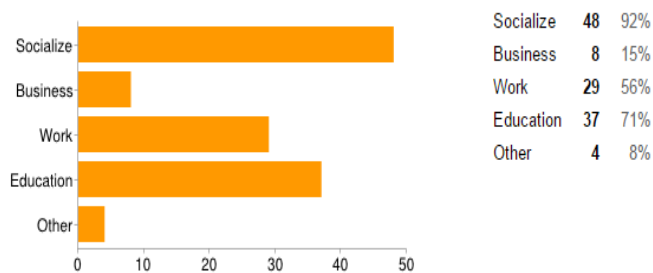
Types of app	Installed (%)
WhatsApp	98
Telegram	46
WeChat	35
Viber	23
Line	21
Others	8
KakaoTalk	6
BBM	2

Students were then asked on why they installed those mobile messaging apps and found out that 90% said that it is free, 81% said that everyone is using it, 73% said that it is easy to use, 21% for attractive features and remaining 2% for Other such as to chat.

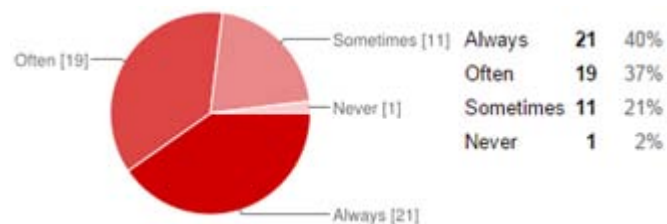
To find out the number of mobile messaging apps installed in their smartphones, students were asked on how many mobile messaging apps that they actively used. Most of them (46%) opted for one app. 40% opted for two apps, followed by 8% for three apps, and 6% for more than three apps. Students were also asked on how many number of messages they received via those apps every day and half of them (54%) said that they received more than 50 messages per day.

Due to the ambiguity of defining the features of the mobile messaging apps, students were asked on how many group they have in one mobile messaging app and the highest (38%) have 10 groups, and only one respondent (4%) has more than 40 groups. Students were asked on what group they used for. The results are presented in a bar chart in Figure 7 where 92% of them said to socialize, 71% for education, 56% for work, 15% for business, and 8% for other such as for trip group.

The pie chart in Figure 8 shows the frequency use of emoticons represented by "Always", "Often", "Sometimes", and "Never". Students were asked on how often they used emoticons in the apps. The majority of 40% of them used emoticons "Always", 37% used emoticons "Often", 21% used "Sometimes", and only one respondent (2%) "Never" used emoticons.



**Figure 7:** Categories of group



**Figure 8:** Frequency of emoticons usage

To find out the awareness of security among the students, they were asked whether they are aware that their messages are not well-secured and majority of them (69%) said "Yes" while another 31% of them said "No". They were also asked whether they have been spammed through those mobile messaging apps and majority of them (63%) said "No" and 37% said "Yes". Lastly, they were asked on how they knew about the mobile messaging apps and the answer included "Friends", "Advertisements", "Google Play", and "App Store". Most of them (85%) said they knew about it from "Friends", followed by 42% from "Google Play", 29% from "Advertisements", and 27% from "App Store".

#### 4. Discussion and Conclusion

Based on the survey from 52 students from IIUM, majority of the students use Android smart phones. This might be due to the reasons that the price is cheaper than other OS like iOS devices. Android devices are affordable for students to buy instead of iPhone that is a bit higher priced and up market. Moreover, Android devices might easily connect with one another through Bluetooth but with iPhone, they can only connect with iPhone users. The price of the smart phones need to be considered as the users need to think of what data plan package that they want to subscribe which also differ in price. By default, a student will always choose within their limited budget for the device and the mobile data plan that they can afford.

In terms of the type of mobile messaging apps that the students used, it shows that WhatsApp has the highest percentage among others as all of the students installed WhatsApp in their phones. This is consistent to the hypothesis we had. Some of the reasons are due to WhatsApp provides the simple features focusing on messaging although the users are only given one year of trial and they need to pay for the subscription fees after one year. Moreover, most of students said that they knew about their mobile messaging apps through friends rather than from advertisements, Google Play or App Store. WhatsApp has never seen in television advertisements but it is widely used around the world. As compared to the famous apps that are always in the television advertisements such as WeChat, Line, and KakaoTalk with famous artists, which are lesser used among students.

It seems like the users do not mind if they have to subscribe WhatsApp as most of the students said that they installed the apps because of it is free, everyone is using it, and it is easy to use. WhatsApp is well-known mobile messaging app that was introduced in 2009 while other apps were only started to emerge after that. Therefore, it eludes the trust for the students that WhatsApp is the most established app among others. Since everyone is using it, it made the students to feel like they must have one. All mobile messaging apps required the users to install them in order to initiate chat with one another. WhatsApp users can only chat with another user that have WhatsApp and vice versa. The simple features provided in WhatsApp might be the reason why the students said that they installed the apps because it is easy to use. There were a small percentage of the students said that they installed the apps due to its attractive features which means that simplicity is the key. Users do not prefer those apps with rich features and WhatsApp is the right one although it does not provide secret chat as in Telegram and cool stickers as in WeChat. Moreover, majority of the students used emoticons while messaging even though emoticons are not that cool as stickers but it simply shows one's emotion instead of texting.

About half of the students said that they have one mobile messaging app that is actively used. It can be concluded that WhatsApp is the most favourable mobile messaging app among IIUM students since all of the students in the survey installed WhatsApp in their phones. Most of the students have more than 5 groups in the app and the groups are used the most for socializing and educational purposes. It is a nature for the mobile users to use them to interact with their

friends and family, and that is the main purpose of why mobile messaging apps are created. Besides, students need to discuss on their academic outside of the classrooms and sometimes, they might have no time to meet up for group discussion. Alternatively, mobile messaging apps help them to communicate without having to meet face-to-face. They can discuss on their class materials and what not in the app anytime and less energy is needed as they do not have to meet up somewhere and only discuss through the apps.

In terms of security concern, most of the students are aware that their messages are not well-secured. According to Thijs Alkemade, an open-source developer and student at Utrecht University in the Netherlands [20], he explored the flaw in the app's encryption that would make it possible to read plain text sent through WhatsApp. The vulnerability has been found in most Android devices and Nokia Series. However, there is a possibility that the vulnerability could be found in iOS devices as well [20]. WhatsApp messages are most likely have been compromised if the users are using unsecure wireless networks. Therefore, it is advisable to avoid sharing personal information like home address or unsafe photos through any mobile messaging app even though security is provided. All in all, users have to limit their personal information sharing while using any mobile messaging app in order to avoid from such security issues.

Another security concern regarding spam, majority of students said that they have not been spammed through the mobile messaging apps. This result shows that mobile messaging apps are different than SMS since SMS spam (also called as mobile spamming, text spam, and m-spam) [11] occur through SMS itself. The SMS spam occurs when unwanted advertisements are sent through text messaging. The spammers might easily get the users' phone numbers and start sending spam through SMS. Meanwhile in mobile messaging apps, the users can only start to chat if both parties get the app installed and have each other phone numbers in phone's contact list. Perhaps, it will be more difficult for the spammers to send the unwanted messages but it has high possibility to happen in WhatsApp since mostly everyone has WhatsApp installed in their phones.

In a nutshell, it is clearly proved that WhatsApp is the most favourable mobile messaging app among IIUM students due to its simple features that make it easy to use due to the fact that everyone is using it. The most important thing for the user is that the functionality to quickly send messages to their friends and family no matter where they are without bothering too much with cool features such as stickers that provided by the other apps. Telegram is also one of the mostly used by IIUM students since it is in top two installed mobile messaging app based the survey. The similar chat overview and features to WhatsApp might be the reasons as to why Telegram is in top two installed. Additional features of Telegram such as secret chat and it is completely free service would make Telegram more preferable in future. However, WeChat provide cute stickers and it is suitable for youngsters who love to send cool stickers even though some of them need to be purchased. As a student, mobile messaging apps are indeed needed in daily lives in order to communicate with each other for free or at lower cost than SMS, as long as they have an internet connection.

There are some limitations for this study due to the small number of respondents who were only from one university. Therefore, to get more accurate results, the study should have involved more respondents from other universities in future. Besides that, the research instrument for this study is limited to survey. In further study, the study should have a triangulation for better findings which include survey, interview, and observation.

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