Messaging Application for Tenant, Landlord and Agent in Ireland

Dissertation submitted in part fulfilment of the requirements

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**Declaration**

I, Jigar Deepak Patel, declare that this research is my original work and that it has never been presented to any institution or university for the award of Degree or Diploma. In addition, I have referenced correctly all literature and sources used in this work and this this work is fully compliant with the Dublin Business School’s academic honesty policy.

Signed: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Acknowledgement**

**Abstract**

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**Chapter 1**

1. **Introduction:**

In recent years, Ireland has encountered a great increase in the number of International students and it is one of the hottest destination to study abroad. As there are many famous universities and colleges like Dublin Business School, Trinity College Dublin, University College Dublin etc. and famous multinational companies like Google, Facebook, Apple, Dell, IBM and many other companies which attract students and professionals to come to Ireland for their career. There are a lot of other reasons like, English as a local speaking language, similar lifestyle like UK, work visas after graduation for example 2 years of work visas for Indian students, and no tension about Brexit (Istead, 2017). According to O'Brien (2017), there is a significant increase in the application of international students to Irish universities and most of them are non-EU. Universities has encountered increase in the number of applications in which University College Cork (UCC) had 40% and University College Dublin (UCD) had 26% of increase and non-EU students are mostly from the countries like India, China, United States of America and Canada (O'Brien, 2017). Since the number of students have increased, there will be a problem for them to search accommodation into their budget and time.

Currently, Ireland is facing housing crisis which is directly affected to the people looking to rent an apartment. The average time taken to find a proper accommodation in Ireland is usually between one to two months, but some may find it earlier. According to Lyons (2017), the rental market conditions showed by Daft.ie rental report in September 2017, was in bad state. The rent in other parts of the country has approximately risen by 45%, but at the same time, there was approximately 70% increase in rents in Dublin (Lyons, 2017). The reason to increase the rent at a faster rate is because of the lack of property supply, and in this situation, landlords will be in a great profit if they rent out their apartment. In the month of August 2017, property available to rent throughout Ireland were less than 3000 and was 20% down as compared to the previous year which happened for the first time in Ireland history. There were 4800 properties available to rent nationwide and almost half of the property was in Dublin at a time in early 2007 (Lyons, 2017). In 2017, there were roughly 1000 properties available to rent and that is because, the rent has increase by 50%. As this rental crisis was never known before, this will directly have linkage to the homelessness crisis which will eventually affect the students. In such crisis, if the tenants get an eviction notice from the agent or landlord, it is very difficult for tenants to search and shift into new apartment.

After a lot of difficulties in viewing of unaffordable and unacceptable apartments due to the housing crisis, the renter has found one apartment finally to move in. Even after finding the correct apartment, there are lot of issues in that apartment that you won’t be able to see through your naked eyes. To get those issues solved, the tenants should first contact his/her house agent and explain the problems, and then the agent will contact the owner of the house to seek permission whether to make any changes or repairs in the house. So basically, there is a communication gap between house tenants, agent and landlord. To overcome this communication gap between the house tenants, agent and landlord, this application can be used as a medium to report house related issues and convey the message to the correct person. This will help to save a lot of time and get the work done much quicker.

1. **Research Question:**

**How can we reduce the communication gap and housing problems faced by renters in Ireland using mobile messaging application?**

Through this research, my primary aim is to reduce the communication gap between the landlord, agent and tenants which leads to disputes between them and eventually eviction notice to tenants. The artefact implementation of this research will help all the renters regardless if they are international students or local renters to report house related problems like, if the window or window curtain rod is broken, plug point not working properly, heating system failure etc. to the owner of the house or agent directly using the user specific messaging mobile application. This mobile chat application will also be a medium for landlord, tenants and agents to solve the disputes between them. All the information regarding the Rights and Obligation for landlord and tenant, and dispute resolution information website links is added under HELP section, which will prevent all the users to go outside of the mobile application to hunt for information. There will also be an option for house agent or landlord to rate the tenants of the house according to their behavior.

1. **Practical benefits of the research and mobile chat application:**

* As this mobile chat application will help to reduce the communication gap between landlord, tenant and agent and help them to resolve any dispute.
* The house agent and owner can manage more than one house by creating separate groups and adding tenants in the respective house groups in one single mobile application.
* Tenant can only be added by the house agent in the respective group, as tenants can only stay in one house.
* As a tenant point of view, reporting house related problems by clicking picture is added on the chat application.
* Agent can upload legal documents of the house on the group with tenants and landlord included.
* Agent or owner can schedule meeting with the tenants through group chat.
* An agent can rate a tenant on the application according to his behavior or any issue. This will help eliminate the need of the reference letter from the previous agent or landlord and only agent can search the username of a tenant to check the rating.
* The websites links of Citizens Information is added in the application.

1. **Dissertation Roadmap:**

The Dissertation is divided into different chapters. First chapter illustrates an introduction and background of the dissertation and details the problem. Chapter two is about the literature review given below.

1. **Scope of the research:**

* This research is focused in designing and implementing a mobile chat application for Android operating system and focusing on specific users such as landlord, tenants and agent.
* The mobile application must be able to send, receive messages and, search and rate a specific user i.e. a tenant.
* This research will also provide information related to tenant and landlord law, effects of housing crisis on renters, and information regarding Threshold and Residential Tenancies Board (RTB).

1. **Limitation of the research:**

* The development of the mobile application is very vast and have several dimensions, it is very difficult to cover all the aspects of mobile development in a single research.
* Currently, there are many mobile Operating Systems (OS) like iOS, Android, Windows etc. available, so implementing the chat application for every OS is difficult.
* Posting a feedback for a user by another user is difficult and storing the feedback data in backend is also challenging. This feature will require more time to implement and will be available in version 2 of the application.
* As this research is regarding the chat app for landlord, agent and tenant. The main goal is to send and receive messages from specific users. Hence, End-to-End Encryption (E2EE) for the messages has been neglected and is beyond the scope of this research.
* For O-Authentication, I wanted to use SMS API, but the SMS packs or bundles from service providers are paid and hence couldn’t implement.

1. **Major contributions of this research:**

This research highlights the relationship between an agent, tenants and landlord. It discusses the effects of housing crisis, disputes and the need to resolve the communication gap between landlord, tenant and agents. It also discusses that, through the implementation of a mobile chat application, communication gap will decrease and hence there will be no cases filed to Residential Tenancies Board. It explains the practical benefits of the mobile chat application and there will be all the needed information for landlord and tenant in this research as well as mobile application. This research will ultimately contribute and improve the relationship between landlord, agent and tenants.

**Chapter 2**

**Literature Review:**

1. **Discussion regarding the Residential Tenancies Act of Landlord and Tenant Law:**

As this research is regarding the tenancy application, landlord and tenants should be aware of the basic laws and, amendments done to the previous Acts by the Residential Tenancies Board (RTB).

Currently, there is Residential Tenancies (Amendment) Act 2015 which has passed and signed into law on 4th December 2015 by the President (Baneham, 2015). Following are the amendments done to the previous Acts and stated in Act 2015 which are related to landlord and tenants.

1. **Rent Increase:**

Baneham (2015), a Barrister at Law has discussed and prepared all the changes made to the previous Acts 2004 to 2009. In the case of rent increase, landlord must inform the tenants 90 days’ prior regarding rent increase in a prescribed form. The prescribed form will include justification to increase rent and compare three advertisements of rent in same area four weeks prior to the notice given (Baneham, 2015).

1. **Termination of Tenancy:**

The base for tenancy termination is now very strict and stronger as compared to the Acts 2009 and 2004. The landlord needs to provide a termination or eviction letter in the case of tenant breach i.e. tenants in fault. Also, termination on the grounds of sale or occupying the apartment by landlord itself or any of his/her family member, landlord need to provide notice to tenants one month prior. And in the case of refurbishment of the apartment, landlord should re-offer tenancy to the tenants to stay in that apartment after the work is done in six months period (Baneham, 2015).

1. **Dispute Resolution:**

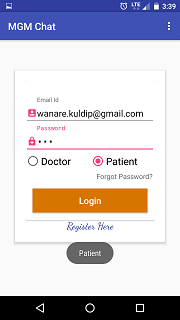
Residential Tenancies Act 2015 states additional categories for the issues that are related to dispute resolution. Additional category will include the failure of the landlord to return deposit amount to the tenants after their tenancy period. And failure of both the parties i.e. landlord and tenants to follow laws assigned to them (Baneham, 2015). The act also changes the cooling-off period of 21 days for resolution of the disputes to 10 days including weekends and bank holidays (Board, 2018).

The Planning and Development (Housing) and Residential Tenancies Act 2016 was passed and signed on 23rd of December 2016 by the President in which minor amendments are made to the Residential Tenancies Act 2004 which is related to both, landlord and tenants (Board, 2018). A landlord cannot terminate the lease contract or send eviction notice to vacant the apartment without any reason. If this happens, a tenant can lodge a complaint to RTB (Board, 2018). In the case of Anti-social behaviour by tenants, a landlord is liable to the distress caused to third-person (neighbour) (RTB, 2018). In Act 2016, which was changed on 9th May 2016, third-party i.e. affected person can now file a case against landlord and take the case to RTB. Other Act passed in 2016 related to landlord and tenant is Dispute Resolution. Telephone Mediation is a category in dispute resolution, which is now free (RTB, 2018).

1. **Doctor and Patient chat application in Android Operating System:**

In Sonwane, et al. (2017, pp. 170-174) shows that how doctor patient communication is done using the android chat application. In this research, the chat application is basically used for sharing data such as x-rays, ECG, blood reports, prescription etc. by the doctor with his/her patients. The implementation of this research shows that, the patient has to send request to the respective doctor, and then only communication is possible between them (Sonwane, et al., 2017), which is similar to this research.

In this research, specific users such as, tenants, landlord and agents will also be using a chat application to communicate between them. Like doctor patient application, in this research implementation, agent will be the primary user who can add landlord and tenants in a home chat group. Only if agent adds the tenant and landlord, then communication can happen over application. If there is no agent in between, the landlord can signup as agent and login in which he can manage all his/her houses. Sonwane, et al.(2017, pp. 170-174) uses technologies such as Firebase for backend and MySQL database to store information of the user. By this research, I found Firebase is used for all the back-end support for chat application which is simple and SDKs are already provided by Firebase. Also, user authentication i.e. OAUTH 2.0 is provided by firebase which will be automatically added when selecting an option. By this, the user can user Gmail or Facebook credentials to login to the app. Whereas in this research, all the users need additional information at first to sign-up, that’s why OAUTH cannot be used for sign-up in this application.

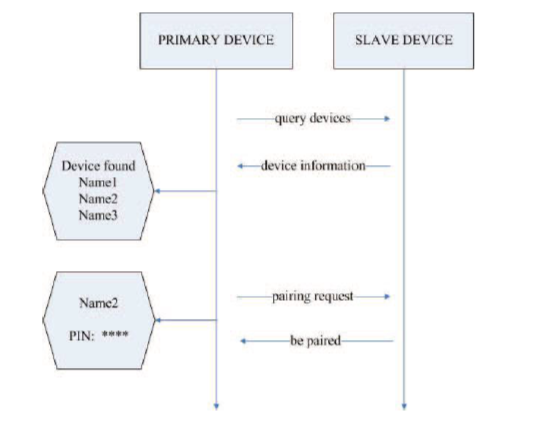


**Figure 1: Doctor-Patient Chat Login (Sonwane, et al., 2017)**

Figure 1 shows the login screenshot of the doctor patient application in which, the user must select either doctor or patient user type (Sonwane, et al., 2017). But there will be no extra information collected from the user at the time of login such as disease type and doctor’s specialty category etc. which will be need by the doctor at a later stage, as mentioned in limitations (Sonwane, et al., 2017). Comparing the research implementation of Sonwane, et al.(2017) to implementation requirements in this research, doctor-patient requires limited information while signup of the users, which is a drawback in future. Whereas, Renter Solution (name of my app) requires more details of the tenants, landlord and agents such as PSR (Property Services Regulatory) number of the agent, current address of the tenant and mobile number which is very important and hence won’t need any additional information in future. Also, there is a rating feature in the application where, an agent can rate tenants out of 5.

1. **Bluetooth based Android chatting application:**

The authors Mahajan, et al. (2014, pp. 712-717) shows that how a Bluetooth on an Android based smartphone can be used for chatting with another Android based smartphone. The author also explains that, most of communication happening is through China Unicom gateway which was paid service. To overcome this, author implements and used Bluetooth technology of an Android device to communicate with other smartphones having Bluetooth using the local area network, which help devices to communicate with each other without paying any cost (Mahajan, et al., 2014). The methodology used to implement is the Bluetooth module, where in the case of two devices connected via Bluetooth, one device will be Server and another device will be client or slave. Where there are more than two devices connected to each other, only one device will be server and rest will be clients and can only be added by server device or primary device (Mahajan, et al., 2014, pp. 712-717). The design of the chatting application is a Client-Server architecture. Bluetooth API is used where it provides RFCOMM (Radio Frequency Communication) channel to transmit data between the devices connected. Each Android device will have a unique MAC (Memory Access Control) address, and using this MAC address, the server-side device will be able to discover and pair the client-side Android device (Mahajan, et al., 2014, pp. 712-717).



**Figure 2: Pairing process of the Bluetooth (Mahajan, et al., 2014, pp. 712-717)**

The author Mahajan, et al. (2014, pp. 712-717) explains the Bluetooth pairing process before establishing the chat session. Primary device i.e. Bluetooth server-side Android phone will enable Bluetooth and will be discoverable to other devices and can see all the slave devices with enabled Bluetooth. The server-device gets all the information of the available slave devices nearby and hence sending pairing request to device which it intends to communicate. The slave device will send a PIN number to primary device which has to match, if the PIN number matches then a connection is established between two devices where one device will be a server and other will be slave. Bluetooth communication is same as TCP (Transmission Control Protocol) traffic (Mahajan, et al., 2014, pp. 712-717).

Another research conducted by Ghare, et al. (2015, pp. 10674-10679) also shows how Bluetooth can be useful to chat with other devices. The research done by Mahajan, et al. (2014, pp. 712-717) and Ghare, et al. (2015, pp. 10674-10679) are similar to each other except for one feature i.e. chat history will be stored on a server which is done by Ghare, et al. (2015, pp. 10674-10679) in their research. The methodology used in both the researches are Bluetooth API’s which provides functions such as BLE (BT Low Energy) to scan other devices, Bluetooth Adaptor for enquiring paired Bluetooth devices and RFCOMM channel for establishing connection between the devices. The authors Ghare, et al. (2015, pp. 10674-10679) shows how an extra feature of saving the chat history to the remote cloud server, which can be used by a Bluetooth chat application. The authors use Android’s Backup Service to take the backup of the application through Backup Manager of Android, which queries about the backup data to the Bluetooth chat application. The only similarities of these researches to my research is that, they use Client-Server Architecture to communicate between the users of the application.

These Bluetooth based chatting systems are useful where there is no Wi-Fi or internet available, but it has several limitations (Ghare, et al., 2015, pp. 10674-10679). The limitations are:

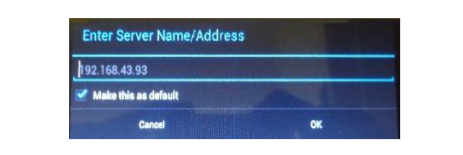
* The maximum range of the Bluetooth is not more than 100 meters. This is a major disadvantage of Bluetooth based chat application where it cannot communicate with another user if they are far.
* Bluetooth chat applications can only transfer small amount data over chat.
* The speed of chatting will be slow as compared to other non-Bluetooth chat applications.
* In Bluetooth communication, any device enabled with its Bluetooth can get connected to the server device.
* The bandwidth of the Bluetooth technology is lower than Wi-Fi and cellular connections.

As compared to the implementation of my research, Renter Solution chat application will take out the limitations of a Bluetooth based Android chat application. Renter Solution is a Client-Server based architecture where communication between landlord, tenants and agents is not based on the Android Bluetooth. It relies on the cellular connection or Wi-fi to communicate with other users. Presently, cellular connection is very advanced and uses 3G/4G technologies which has worldwide coverage of the network. Hence, it provides faster data transfer rate as compared to Bluetooth. Also, almost all the users around the world has internet connectivity on their Android smartphones which eliminates all the users to be in any range and data transfer speed over the chat will be better. According to the reports of 2018 Global Digital suite from We Are Social and Hootsuite, the number of people around the using the Internet today are 4 billion (McDonald, 2018). In Renter Solution application, only the agent has been given right to add tenants and landlord of that apartment to the group chat. This will give assurance of no other stranger can get added to the apartment group unless he/she knows the agent or landlord.

1. **Intranet based chatting application:**

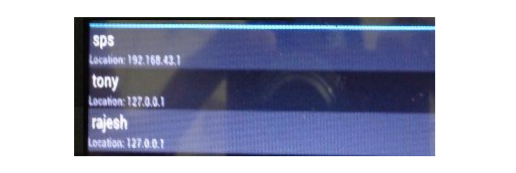
In this research, the authors Mehrotra, et al. (2014, pp. 265-272) discusses about the Peer-to-Peer (P2P) chat application used in an organization without the need of cellular network on Android smartphones and which are connected to the Intranet of an organization over Wi-Fi. The author shows that, in an organization where all the employees needs to have meeting at the end of the day or during the work hours, so they have to gather in a room or chat via email to share the work reports and discuss about the related projects (Mehrotra, et al., 2014, pp. 265-272). To avoid meeting physically or chat through emails, Mehrotra, et al. (2014, pp. 265-272) have proposed an idea of an Instant Messaging Android based application where more than one person can join the chat over internet which is connected to Wi-Fi in an organization. This Instant messaging chat application offers text-based quick transmission of messages from sender to receiver over intranet (Wi-Fi). The researcher uses BlueStacks App Player which is used to install and use Android applications on Windows PCs, Macintosh computers and Windows tablets by which all the users can use the application to chat with each other. The main aim of Mehrotra, et al. (2014, pp. 265-272) is to allow the users to communicate in an Intranet without paying any Internet data charge on Android phones. The architecture of the Instant messaging chat application is based on Peer-to-Peer (P2P) network and the developed service or application will be installed on the intranet server, through which all the users connected on the intranet can communicate with each other (Mehrotra, et al., 2014, pp. 265-272).

A similar study done by Verma, et al. (2013, pp. 1030-1032) says about the Intranet based messaging service on Android smartphones and tablets. It explains and demonstrate the implementation of their research. Following are the images of the implementation of Intranet Based Messaging service:



**Figure 3: Client interface (Verma, et al., 2013, pp. 1030-1032)**

The above image shows the client interface where the client specifies the server address, to connect with the organization server.



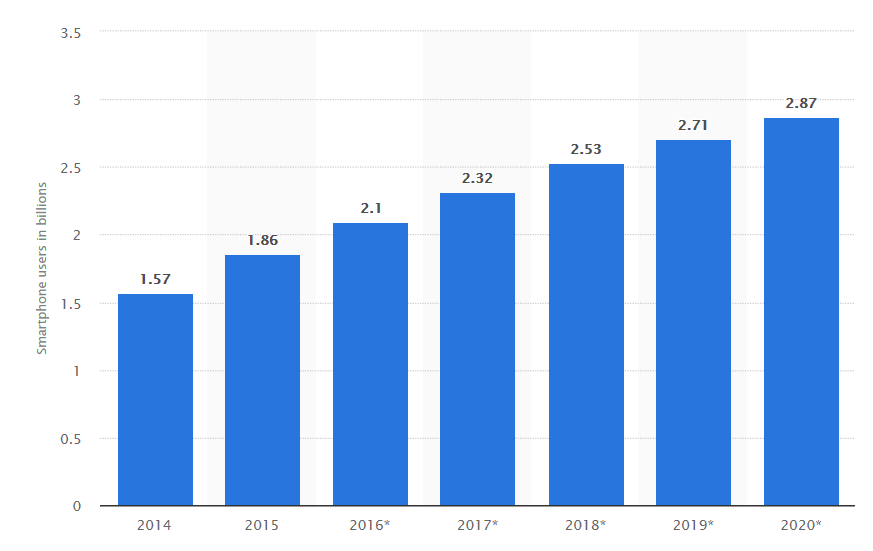
**Figure 4: List of active users on client side (Verma, et al., 2013, pp. 1030-1032)**

The above image shows when a client gets successfully connected to the server, the server broadcasts the list of active users and can communicate with other employees in the organization. All the information regarding the employees will already be stored in the organization server by the company (Verma, et al., 2013, pp. 1030-1032).

This research as compared to both the studies is not similar. The implementation of this research will be different, where the clients (users) i.e. tenants, landlord and agent will send request to the server and server will then give response to the request sent by the users. Which indicates that, Renter Solution chat application will not be bounded by the server in which all the users are connected through same Wi-Fi. The chat application of this research will work on Wi-Fi network as well as cellular network as compared with the Intranet based Messaging Service (Verma, et al., 2013, pp. 1030-1032) and Instant Messaging Service on Android smartphones (Mehrotra, et al., 2014, pp. 265-272).

1. **Comparison to existing chat application:**
2. **Introduction**:

As the number of smartphones users around the world has increased and it is expected to rise more. Today on a smartphone, a person can do the things that can be done on a laptop or desktop. Below is the image of number of the smartphone users around the world and prediction till the year 2020:



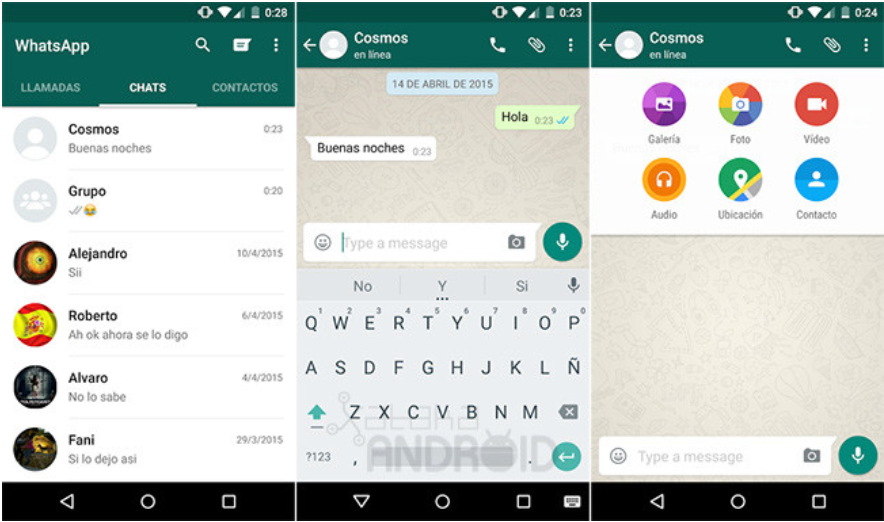
**Figure 5: Total number of smartphone users around the world 2014 to 2020 (Statista, 2016)**

As the above images shows the number of smartphone users around the world from the year 2014 to 2020. By the year 2019, the number of smartphone users is expected to grow around 2.71 billion and by 2020 it will grow around 2.87 billion (Statista, 2016).

Due to the increase of smartphones and users of smartphones, there are many applications developed for them. Since this research is regarding chat application, there are number of chat applications available in the mobile market to use. Earlier, every chat application was almost similar to each other but nowadays some chat applications in the market have started to differentiate themselves from other present chat applications.

1. **Existing chat application:**
2. **WhatsApp:**

WhatsApp messenger is one of the most popular cross-platform chatting application that is used to exchange text, voice call, video call, share location, document, audio and contact over iOS, Android, Blackberry and Windows smartphones (WhatsApp, 2018). The users of the WhatsApp are more than 1 billion in 180 countries around the world which helps family and friend to stay in touch anywhere and anytime in the world (WhatsApp, 2018). Below is the image of the chat interface of WhatsApp in Android smartphones.

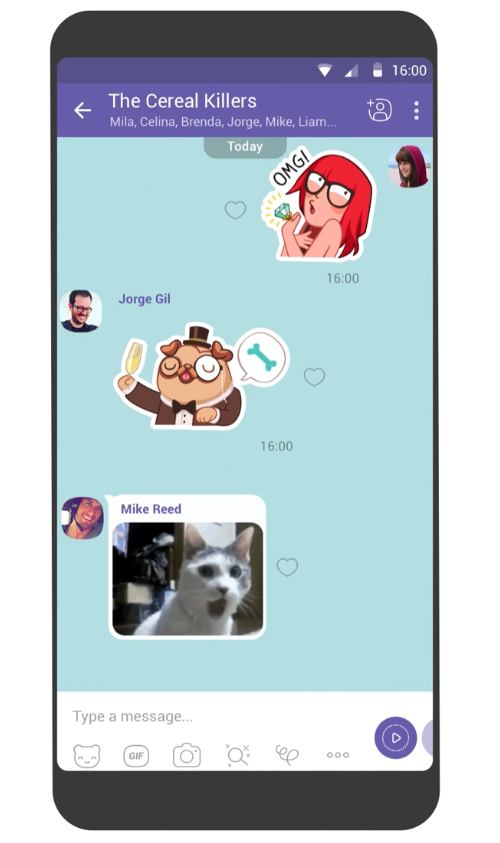


**Figure 6: Chat Interface (Phoneia, 2018)**

The chat interface of WhatsApp is very simple in design and user-friendly so that people can understand and use it easily. The protocols used by WhatsApp messenger are XMPP (Extensible Messaging and Presence Protocol) which is used for instant messaging between two or more users (Yasser, et al., 2017).

1. **Viber:**

Viber is a mobile chat application which provides endless options for expressing user’s mood through messaging and has variety of calling and messaging features (Viber, 2018). Viber supports video and audio recording, group chats, expressive stickers and, audio and video calls which can be used on iOS, Android, Windows phone and Windows10, Mac and Linux based devices (Viber, 2018). Below is the image of the chat interface of the Viber application:



**Figure 7: Viber chat interface (Viber, 2018)**

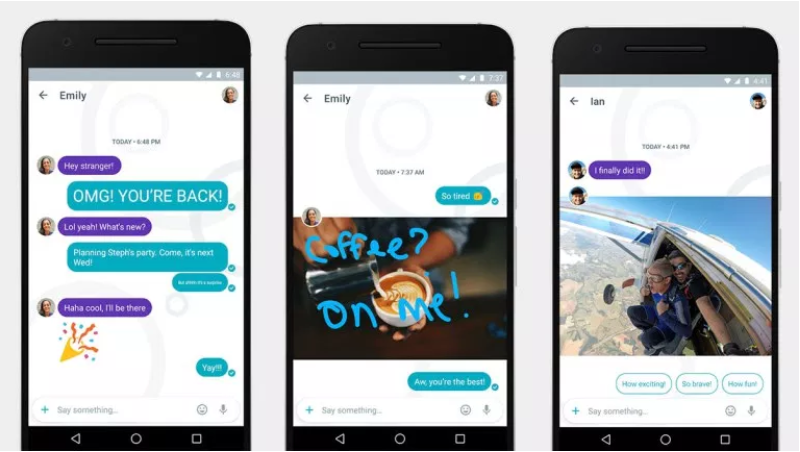
The chat interface of Viber is unique and provides lot of options to express your mood. Various features of Viber are:

* The messages sent on Viber are End-to-End Encrypted which provides privacy to the application. You can hide a chat and access through PIN number, self-destruction messages and controls for when other see the status and delivery status of messages (Viber, 2018).
* Viber out is a feature that allows the user to call a non-Viber mobile or landline number from your contacts at very low rate. For that feature, the user must purchase Credit or Call plan (Viber, 2018).

The above feature makes Viber chat application stand out differently from other application in the market. The protocol used by Viber is VoIP (Voice over Internet Protocol) technology which allows the application to make high quality voice call by using broadband internet connection (Yasser, et al., 2017).

1. **Google Allo:**

Google Allo is also one of the most famous and popular chat messaging application in the market. Google Allo is available for iOS, Android devices and Web which can be used in any desktop or laptop. This application is developed by Google company and provides amazing features (Allo, 2018). Allo application has audio and video calls, audio and video recording, photo messaging and group chats (Allo, 2018) like existing chat applications. Below is the chat interface of Google Allo application:



**Figure 8: Chat Interface of Google Allo (Miller, 2016)**

The user interface of this application is friendly and easy to use. Features that makes this application different from others are as follows:

* The user can respond without typing the message. Google Allo learns from the conversation and the way user texts (Allo, 2018).
* Allo has Google Assistant which helps the user whenever they need it. It helps you to stay in the conversation and search for things that the user wants to search (Allo, 2018).
* It has incognito mode in which all the messages are End-to-End encrypted and has self-destructive feature (Allo, 2018).

1. **Comparison to Renter Solution application:**

As there are many chat applications in the market, above are applications which are top 3 in the messaging business. The Renter Solution chat application is an implementation of this research study which is designed to be used by specific users such as tenants, landlord and agent only. This application will help all the users to communicate between each other and solve disputes. As the above mentioned can also be used for communication between the users of Renter Solution application, but there are certain features that make the Renter Solution application different from the top 3 chat application of 2018 as mentioned above. The implementation and interface related details are explained in Chapter 4 in this research.

The Renter Solution application does not include all the features of the mentioned chat applications, but it has features that are important related to this study.

* Renter solution application will only focus on specific users such as tenants, landlord and agent because main motive to develop the application is to reduce the communication gap between them.
* The other feature of the application will be that, it provides all the information that is related to the house, landlord, agent, and tenants.
* In the Help section, websites links are provided so that if the user is not sure or aware about his/her rights then, they can click the link and read it.
* Another feature is that, only agent has given right to create a chat group of a house, add tenants and landlord in that house group. If there is no agent dealing then, a landlord can signup as an agent.
* Only agent can rate tenants of the apartment according to their behavior. This rating feature will reduce and slowly eliminate the need of reference letter when a tenant is searching for a new apartment. The new agent can request username of the tenant to check the rating given by old agent.