Exploring Text-based and Graphical-based Usable Interfaces for Mobile Chat Systems

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Abstract Current text-based mobile chat systems hinder navigation with long chat archive in a limited screen display. Moreover, it is time consuming and cumbersome to track messages that are sent by specific chatters. Hence, we proposed a graphical-based usable interface that aids navigation and message tracking with minimal key-presses and enhances the chatting experience with avatars and emoticons. In addition, we explored the usable interface design of mobile chat systems by visualising the navigation to facilitate easier understanding of the messages' contents. We statistically evaluated the relationships between user interfaces and usability to uncover the key attributes that enhance mobile chat usability. The empirical research outcomes exemplified that there was a significant linear relationship between the user interface and usability on text-based and graphical-based usable interfaces for mobile chat systems. Moreover, the experimental evaluation results indicated that text-based usability can be improved by creating interface that encourages usages; whereas the graphical-based mobile chat is augmented by creating a user friendly interface that enhances user satisfaction, encourages usages and promotes ease of navigation. The findings and results typified the potential use of graphical-based mobile chat systems to substitute the current text-based systems which is under utilised in the commercial arena.

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1 Introduction

Communication is a salient part of life. It is used to convey social presence, augment social bonds and relay information. The advent of networked computer has inadvertently facilitated communication with services such as electronic mail, instant messaging, chat and video conferencing which are incorporated into existing computing technology. The emerging trend of migrating commercially successful desktop applications into mobile environment has set the stage for numerous research work. Generic categorisation of the offered mobile services has been developed and classified into content, commerce and communication [1]. Hence, mobile chat systems are intended to be the core communication of the study in this paper.

Vronay et al. [2] have conducted an in-depth investigation on chat systems and defined chat as "two to twenty or more people who appear together in a common channel of communication known as chat room." This somewhat vague explanation merely stresses on the social gathering in a public chatting space without emphasising on actual engagement of conversation or the nature of the communication.

ISO/IEC JTC1 SC36 [3] defined chat as "a form of synchronous interactive online typewritten communication which allows users to engage in a text-message conferencing. Chat is also used for private communications between a subset of participants." The definition neither refers to usability nor conceptualises non-verbal cues such as body language and facial expressions that are crucial in conversation.

Evidently, a novel definition that takes into account expressive communication is needed: Chat is characterised as a virtual congregation of two or more participants in a synchronous communication that articulated the interaction via text, graphics and images in either private or public chat rooms.

In the effort to support mobility, the biggest design obstacle for mobile devices is the small physical size of the device itself. Consequently, the size of the screen is limited [4] and effective presentation of any significant amount of information through the limited screen dimension poses a dilemma. Furthermore, one must adhere to the limited processing capacity afforded by mobile hardware, and mobile programs must minimise computational intensive tasks [4]. Similar consideration should be given to avoid high consumption of limited storage and memory. Additionally, the nature of wireless connectivity can delay or hinder the interaction among users.

The small screen size of mobile devices limits the maximum number of displayable lines at any one time which subsequently hampers the mobile chat usability. In contrast to immobile chat systems which archive history locally, mobile chat systems are not afforded this luxury due to their inadequacy of storage capacity. In turn, mobile device limitations impede mass gatherings, by reduction of the optimal number of users logged into a chat room. Navigation via both mobile and stationary chat systems

differ due to their respective input devices. Navigating the screen with a mobile keypad can be unwieldy and this therefore needs to be taken into greater account in the design of mobile chat systems.

Generic problems exist between mobile and stationary chat systems can be resolved by improving and enhancing the user interface of the systems. In particular, the chat system does not facilitate recognition of previously logged-in users and the details of those users [2]. Consequently, the tension between users may be created if users are offended by other being forgetful of their presence. Furthermore, the individual presence of users who are not actively participating in the chat room is not conveyed appropriately [2]. Indication of the users status such as "away" and "busy" should be revealed to display and update of the users activity. The inability of chat systems to express complex human embodiment that is crucial in daily interaction must be dealt with.

This paper explores the user interface design of mobile chat systems by employing externalisation to increase usability and in turn augment the usages of them. It aims to draw on these observations to explore a novel user interface design which enriches the chatting experience by reducing keypad navigation through the user interface. The usable interfaces aim to improve user satisfaction and efficiency, assisting message tracking and navigation by employing visualisation, and enhancing users identification and human embodiment which facilitate understanding of the messages' contents. We statistically evaluate the relationships between the user interface and usability for mobile chat systems, and draw from these observation and findings to uncover the key attributes that enhance the mobile chat usability.

2 Literature Review

Burak and Sharon [5] have conducted an extensive usage study on mobile services, named FriendZone. They have concluded that chat application is not suitable for mobile phones due to the small screen display and cumbersome keypad that does not encourage fast text entry. In opposition, Grinter and Eldridge [6] [7] argued convincingly that teenagers are flexible in adapting to the physical restrictions of the mobile devices for efficient text entry which consequently becomes the primary motivation for the mobile chat usage. Hence, prior to the design of mobile chat system, in-depth knowledge with regards to habits and preferences of potential users should be gained to increase usability of the system and enrich user experience.

Principally, communication in mobile chat is carried out in turns. Turns are lines(s) of text sent by a particular participant to be viewed by others [2]. Linear progression of turns forms an archive of conversation or chat history. Broadly, the user interface of chat system is demarcated into three sections, user text entry, list of logged participant and chat his-

tory. The primitive user interface of these designs suffers from incoherent conversation due to poor arrangement of turns. The simultaneous participation of multiple conversations in one chat room leads to confusion and high repetition rate of misapprehension [2]. Graphical chat systems have been proposed to rectify these shortcomings. Chat Circle [8] [9] manipulated basic geometry and unique colour to represent each participant and as a result it reduced the disorder of turns. On the other hand, Vronay et al. [2] have rearranged conversational layout to maximise screen display and to form comprehensible archive of turns. Despite their effort, none are widely adopted in the commercial arena. An evaluation of the interface reveals that these new designs do not resemble the conservative interface that users are accustomed to. This observation reveals the resistance to learn and familiarise with the new interface. This can be one reason why graphical-based chat systems are poorly received.

Additionally, Vronay et al. [2] proposed a novel interface that is efficient to cater for a large amount of users, but porting such a design to the small mobile screen space is inappropriate as it clutters the screen display easily. Nonetheless, we believe that by displaying interactions in a horizontal manner facilitates the efficient tracking of turns in a limited screen display.

The minimalist approach adopted by Viegas and Donath [8] [9] in Chat Circles series manipulated unique colours to represent individual presence. Colours are perceived differently according to cultural and demographic background. For instance, green is perceived as unlucky in Britain in some situations [10]. Conversely, green represents longevity and life to Chinese in conjunction with their preference to green jade or nephrite [10]. Therefore, the selection of appropriate colours to be used in a specific community may not be welcomed and even treated harshly. Furthermore, favourable colours may be highly utilised resulting in ambiguous representation of individual identity due to the small colour palette. Therefore, these observation suggest that usages of colour for identity representation is highly controversial and critical. Viegas and Donath [9] have integrated background images which served as shared contexts to promote congregation and encouraged conversation around the images. Amin et al. [11] have supported this notion by stating that shared awareness of the settings, objects and influences in the surrounding context can incite communication and minimise misapprehension. As a result, the use of background images should be employed as it encourages interaction and introduces topics for discussions.

Chat system that depends on text as the sole communicative element lacks in the ability to convey the non-verbal cues in a face-to-face communication. Numerous investigations and experiments such as [11], [12], [13] and [14] have been conducted to enrich the user experience by integrating emotional expressiveness such as anger and disappointment into avatars and emoticons. Amin et al. [11] have recommended an extension to Short Message Service (SMS) named SenseMS which allows emotion and con-

text to be readily perceived prior to the viewing of the messages' content. While this design is developed for asynchronous communication, repeated display of emotional status prior to each turn in real time environment introduces redundancy and attenuates the usability of the system.

3 Designing Usable Interfaces

Prior to design, a strong foundation of user interface design should be acquired to generate desirable outcomes. User interface defined in [19] embodies both physical and communicative aspects of input and output for interactive activity. Consequently, we believe that a good user interface should be grounded on usability principles discussed in [20, 21] to create usable interfaces that is attributed to user friendliness, eases of navigation, encourages the usages, and increases user satisfaction.

User interface design that works effectively and efficiently in the context of stationary chat systems may not yield the same effect in the mobile chat systems [22]. In certain instances, mobile chat systems can prove to be disastrous and hinder effective usages among the chatters. For example, time stamped messages arranged in chronological order in a conventional chat system is cumbersome in a small screen display which can accommodate, say, 5 lines of text with each line containing 15 characters for 128 by 160 pixels resolution phones [23] though these differ, as they are dependent on resolutions which can typically range from 100 by 80 pixels to 240 by 320 pixels [4]. Such design means slow navigation with the possibility of losing track of current spatial location in the long chat archive which grows proportional to time. Moreover, finding or tracking a specific message from a particular chatter can be extremely difficult as conventional chat system does not provide a means to accomplish this task conveniently. Furthermore, features available in the conservative chat systems that aid in the recognition of chatters such as users' profile are not implemented in the mobile counterpart. The lack of means to convey complex human expression for effective communication through the adoption of avatars in stationary chat systems does not replicate in the mobile context. In the effort to constantly maintain awareness of current spatial location in the chat archive, the display screen is divided into 2 halves. The first half displays the externalisation of the chat archive and the second half exhibits the specific message from a particular chatter corresponding to the node in the externalisation. Figure 1(a) depicts an example of the chat archives and turns. By judging from the externalisation perspective, participating chatters are assigned to a horizontal bar which are labelled with the chatters' pseudo names and contains node(s) that signified the turns that are sent in a chronological order. Two vertical coloured bars are employed; the blue bar is utilised to delineate the current node with the corresponding turn that is being displayed, and the yellow bar to imply the last node of the chat archive. As chatters enter messages, the new

message is represented as a black rectangle drawn after the last node in the horizontal bar assigned to the sender and the yellow vertical bar is moved to highlight the last node.

The blue bar that is controllable by the chatters can traverse the chat archive bi-directionally and select a specific node. The messages are displayed at the second half of the screen. Viewing of the last message is mirrored in the externalisation as both blue and yellow vertical bars that are positioned in the same spatial coordinate. Each turn displayed begins with a label of the senders' avatar, pseudo name and the sending datetime and followed by the message. For a long message that exceeds the space allocated for the display, a scroll bar is automatically inserted to render the space for the incorporation of long turn such as in Figure 1(b). By structuring and organising the chat archive as a horizontal flow of messages denoted by nodes, the resulting compact visualisation provides an overview that allows chatters to quickly identify the current spatial location in the chat archive which is also made easier through the coordination of the blue vertical bar. Tracking a message that is sent by a specific chatter becomes efficient as the effort only involves observing the presence of nodes in the horizontal section assigned to that chatter. The split between the externalisation and the message is automatically configured in which lesser number of chatters is tolerated for higher amount of messages length to be displayed in the second half of the screen and vice versa. Nevertheless, a threshold should be determined if the amount of the chatters exceed the effective reading of the message. For instance, externalisation with 7 chatters only permits simultaneous display of 2 lines of message for the turn on the screen as depicted in Figure 2(a). As other chatters join the chat room, the spaces assigned for the display of the turn are significantly reduced to obstruct them reading from the messages. As a result, a threshold of maximum 6 chatters to be displayed at any one instance on screen is applied to the externalisation with the viewing of other chatters through the interactive scroll bar as illustrated in Figure 2(b).

The threshold is dynamic and dependent on the screen size of each heterogeneous model on mobile phones available in the market even though the characteristics and features of each phone may be relatively different from one another. Options to view all participants in a chat room is shown in Figure 2(c). The feature of viewing all participants is vital as it provides an easy and quick indication to a new participant about the amount and pseudo identity of the participants in the chat room. In the context of information visualisation, this design facilitates the browsing phase in the framework for navigation as the chat outline can be easily viewed. Subsequently, the chat pattern observed can be constructed in the modelling phase of the framework to form a cognitive map for further interpretation. The conventional chat archive effectively aids in the comprehension of the excessive long chat archive in a small screen display. In this case, the chatters are not burdened to the constraint of

scrolling through long chat archives. This enhances the interaction experience and increases users satisfaction. Messages are effectively and efficiently tracked and enhanced the usability of the interface design. The design of the mobile chat systems significantly allows ease of navigation to achieve minimum key-clicked through various features and functionalities offered by the software. The major bottleneck that hampers the usability of most conventional mobile chat systems is the navigation or scrolling through the long chat archive from one message to the next. Hence, navigation from one message to another and within the message itself is given sufficient consideration. Figure 3 portrays the navigation mechanism for the design in which nodes can be traversed bi-directional by clicking the left or right buttons of the mobile phones; whereas a single turn can be navigated through the up and down buttons. In addition, the messages can be accessed quickly and efficiently without redundant clicks.

The notion of fast access adds values to the usability aspect of the system which stresses on effectiveness, efficiency and users satisfaction [24]. The strategic placement of frequently used functionalities organised in menus facilitates chatters to access and utilise these commands with ease. Figure 4(a) demonstrates menus that reflect this design. Functions related to chatting such as "Send Message," "Pause Chat," "End Chat," "Join Chat" and initiates a "New Chat" are classified under a menu labelled as "Chat." The options to view the selected chatter profile include "View User Profile," "View Own Profile," "View Chat List" and "Edit Background" images are categorised as "Menu." By constructing the menu with the consideration of usage frequency, highly utilised commands can be made apparent and easily accessible to chatters. As a consequence, usability of the system is considerably enhanced by filtering the higher priority from the list of lower priority information. The design proposed to support complex human expressions, specifically behavioural cues which add values to the interpretation of the messages as the chatters mood can be evidently perceived through the usage of expressive avatars. The expressions such as angry, happy, and sad are dynamically altered at any point of interaction and viewed by other participants within the chat room. An example of the expressive avatar is depicted in Figure 4(b).

The need for user profiles arises because current mobile chat systems lack of users recognition and do not provide a way to retain personal details. Hence, we designed a "profile" feature to allow chatters to specify the details about their age, gender, location and brief self description to be viewed by other participants as shown in Figure 4(c). As the externalisation relies on distinct colours to uniquely identify chatters in the horizontal sections, chatters are assigned a unique and differential colour theme within the chat room. If chatter has selected the colour theme "Pink," no other chatters within the same chat room can assume this colour theme with the exception that the original chatter leaves the chat room. Although the usage of colours for self identification and representation is critical, application of colours in this manner promote quick

(a) (b)

Figure 1: 1(a) Externalisation with 5 chatters and non-scrollable turn, 1(b) Externalisation with 5 chatters and scrollable turn

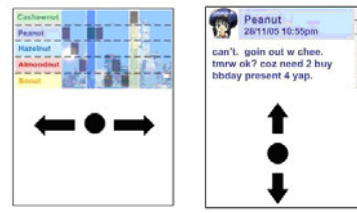
(a) (b) (c)

Figure 2: 2(a) Externalisation with 7 chatters and 2 displayable lines of message, 2(b) Externalisation with 8 chatters and 3 displayable lines of message, 2(c) Externalisation with 8 chatters

comprehension and identification of chatters within a group. Moreover, the interaction among chatters can be enriched through the interpretation of background images. The adoption of the images in chat archive externalisation (refer to Figure 4(a)) is to create a shared context which introduces and promotes conversation. On the contrary, utilisation of the images in users profile (refer to Figure 4(b)) is to imply a surrounding influential environment that participants are in, and to reinforce intent as well as content.

4 Research Design and Methodology

Mobile Chat Prototypes. The chosen local mobile chat service was Maxis SMS Chat which uses SMS as the underlying communication protocol for messages exchange. Maxis SMS Chat is referred as a text-based mobile chat system (TMC) and our proposed system as a graphical-based



(a) (b)

Figure 3: 3(a) Horizontal navigation of externalisation, 3(b) Vertical navigation of message viewing

(a) (b) (c)

Figure 4: 4(a) Menus, 4(b) Chatter's profile, 4(c) Edit profile

Figure 5: User interfaces of TMC and GMC respectively

mobile chat system (GMC). The notable difference between TMC and GMC was that the user interface design of TMC utilised text as the sole element; whereas GMC employed a myriad of text and graphics, background images and appropriate avatars, emoticons and colours in the interface design as illustrated in Figure 5. These differences were highlighted by investigating the user interfaces and usability of both text-based and graphical-based for mobile chat systems. The platform used was Java technology and network connectivity such as Global Packet Radio Service (GPRS) and Third Generation telecommunication system (3G). The minimum features for mobile devices to utilise the chosen prototype (GMC) were colours, graphics and Java-enabled phone with stabilised network connectivity. The prerequisite for synchronous mobile chatting application is a constant network connection to retrieve and post messages from or to a central server. Malaysian telecommunication service providers such as Maxis, Digi and Celcom offer 3G connectivity which operates at 384 kilo bits per second [26]. This large bandwidth is highly sufficient as graphics and Applet can be downloaded swiftly. For example, 1 mega byte of data can be downloaded in less than 2.6 seconds.

Demography of Test Subjects. Teenagers were chosen as the target sample for this study, and it has been noted as the forerunners in the use of mobile chat systems. 4 similar surveys have been carried out in different times and locations to take into account the availability of the test subjects. The experiment involved 53 test subjects with ages ranging from 15 to 21, including 25 females and 28 males. To distinguish participants in the sample based on the education level, 27 test subjects were selected from The University of Nottingham, Malaysia, and 26 from a local secondary school in the district of Klang Valley, Malaysia.

Materials Used. 2 additional documents were enclosed with the questionnaire that was distributed to the test subjects: the user documentation of Maxis SMS Chat; intended to aid understanding of the existing commands for service activation and utilisation; and supplementary material aimed to define terminology found in the questionnaire that may be unfamiliar to teenagers with less computing knowledge such as "user interface," "usability," "navigate" and so forth. The questionnaire used was adapted and modified from System Usability Scale [25] and User Interface Assessment to enhance the validity of this study. The User Interface Assessment was specifically designed to probe the quality of the user interfaces that was being evaluated. It aims to investigate the relationships between the user interface and usability. The test subjects asked to rate on a Likert scale, where 1 is "strongly disagree" and 5 is "strongly agree."

Experiments. The procedures began with a briefing, highlighting the aims of the experiment, followed by testing and evaluation of TMC and

GMC in a laboratory. Test subjects were required to explore the user interfaces and functionalities of TMC and GMC prototypes for an hour, and filled in the questionnaires at the end. Test subjects were required to assess the user interfaces and usability attributes such as navigation, user friendliness, user satisfaction, and other outlined in the questionnaire distributed.

Hypotheses Evaluation. Prior to data analysis, reliability of the instrument was assessed to ensure the internal consistency holds. Generally, alpha value that exceeds 0.60 is accepted to have an internally consistent construct [15]. The hypotheses formulated in this case as initial presumption to evaluate the linear relationships between the user interface and usability of TMC and GMC respectively. Table 1 details the hypotheses and the corresponding descriptions. The hypotheses were formulated to test and evaluate at 95% (0.05) significant value as to fulfil the research objectives. Null hypotheses were statistically tested to determine the trueness of the claims. In the case of hypotheses H_1 and H_2, multiple regression analyses were conducted to test the trueness of the hypotheses with usability as the dependent variable and the user interface as independent variables.

$H_{\#}$	Narration
H_1	There is a significant linear relationship between the user interface and usability of TMC
H_2	There is a significant linear relationship between the user interface and usability of GMC

Table 1: Research hypotheses statement

5 Findings, Results and Discussions

Background of Test Subjects. Consistent with research carried out by Grinter and Eldridge [6] [7], SMS is the most preferred chatting tool among teenagers, which in this case also applied to Malaysian teenagers. Only 3 test subjects (5.7%) have never communicated via SMS while more than half (50.9%) used the service actively in more than 20 times per week.

Multimedia Messaging Service (MMS) is consistent with study reported by Amin et al. [11]. MMS was relatively less commonly used: 73.6% of the sample had never used the service before. This is not surprising as the service is restricted to certain mobile devices and the associated cost of each message each is 2.5 times higher than SMS in Malaysia [16]. On the static Internet platform, 75.5% of the sample has used online chat service which is very similar to the findings from Pew Internet and American Life Project [17] with a marginal difference of 0.5%. Mobile group chatting services showed extremely low usage with 83% of the test

subjects did not use the service. Such low usage is expected as mobile group chatting services are not well advertised and developed, particularly in Malaysia.

Relationships between User Interface and Usability of TMC. Research outcomes of the regression analysis indicated there was a significant relationship (p=0.003) between the user interface and usability of TMC. Based on the beta coefficient, we observed that there existed a positive linear relationship (β=0.395) between the user interface and usability of TMC. The enhancement to the user interface encourages the use of the service which in turn increased the usability of TMC. This relationship can be simplified via equation 1 [18].

$$\begin{aligned} &\text{Usability of TMC} \\ &\quad = \text{(User interface that encourages usage)}0.395. \end{aligned} \tag{1}$$

The beta coefficient is essential to determine the absolute magnitude in predicting the usability of TMC. The findings signified that the increased of 1 unit on TMC usability requires a 0.395 increased of the user interface that encouraged usages. Although user interface assessments are qualitative and cannot truly be represented with real numbers or figures, the beta coefficient provides insight to the magnitude of influence that the user interface has on the usability of TMC. The results showed that the effort to enhance the usability on text-based mobile chat systems should be placed on the user interface. Other usability attributes such as navigation, user satisfaction, and efficiency were not significantly linear correlated, possibly because the importance of improving user interfaces for usages has overshadowed other usability aspects. Based on the analysis, H_1 experienced a rejection of the null hypothesis.

Relationships between User Interface and Usability of GMC. It is evident through these significant values that there were strong correlations among the user friendliness of interface (p=0.001), user satisfaction induced by the user interface (p=0.007) and usages promoted by the user interface (p=0.011). The evaluation of the beta coefficients shown in 2 ([18]) has highlighted the fact that the linear regression has a positive linear relationship with usability.

$$\begin{aligned} \text{Usability of GMC} \quad = \quad & \text{(User friendliness of interface)} \\ & \times 0.402 + \text{(Satisfaction enhanced by user interface)} \\ & \times 0.320 + \text{(User interface that encourages usage)} \\ & \times 0.303 + \text{(Navigation ease of user interface)} \\ & \times 0.171. \end{aligned} \tag{2}$$

We can safely conclude that user friendliness of the interface enhances user satisfaction and encourages usages due to the manifestation of relatively strong magnitudes in the correlations with usability on GMC. The user friendliness of interface has the highest absolute value ($\beta = 0.402$) as compared to other attributes, and correlated strongly with the usability. The equation highlighted that the increased of 1 unit on GMC usability requires 0.402 increased of user friendly interface, 0.320 of satisfied the user interface, and 0.303 of user interface that encouraged usages, and 0.171 of navigation ease. Evidently, work to improve the usability of GMC should be first creating a user friendly interface, followed by other attributes in the order of their beta coefficient values. Hence, H_2 manifested a rejection of the null hypothesis.

Results and Discussions. Generally, the evaluation for each attribute in GMC surpassed that of TMC considerably with the lower mean difference being 2.42 – a very considerable 48.4% rating difference between both chat systems. These figures have highlighted the importance of graphical-based usable interfaces as a better design solution than the text-based user interfaces on mobile chat in every aspect of the user interface and usability that have been assessed. The findings and results showed that the main distinction between text-based and graphical-based mobile chat was attributed to the navigation ease with GMC scoring favourably high ($\bar{x}$ =4.47) as opposed to TMC ($\bar{x}$ =1.45). Additionally, the user friendliness of interface ($\bar{x}$ =4.51), user satisfaction ($\bar{x}$ =4.42), and promotes usages($\bar{x}$ =4.41) were the highest rated attributes for GMC evaluation. These factors are undeniably the key advantages of employing graphical-based usable design for mobile chat systems. Conversely, the experimental evaluation results denoted that usages ($\bar{x}$ =1.45), difficulty in navigation ($\bar{x}$ =1.44), non-user friendly interfaces ($\bar{x}$ =1.53), and poor user satisfaction ($\bar{x}$ =1.50) were the major disadvantages for text-based mobile chat systems. These results significantly typified that additional effort is required to enhance text-based user interfaces by improving the navigation, user interfaces and user satisfaction.

The assessments between usability and the user interface only differed marginally with a mean value of less than 0.2. In particular, the test subjects in the sample have assessed GMC favourably in both aspects of the usability ($\bar{x}$ =4.32) and the user interface ($\bar{x}$ =4.37). In contrast, the usability ($\bar{x}$ =1.62) and the user interface ($\bar{x}$ =1.60) of the text-based mobile chat systems were not gaining much support from the test subjects. The graphical-based mobile chats were perceived as better or usable interfaces; whilst the text-based user interfaces were not well appreciated.

In an effort to enhance the usability of text-based mobile chat, primary attention should be devoted to create user interfaces that facilitates or encourages the usages and ease of navigation. This can be achieved by firstly understand the motives for the usages, and the attributes such as ease of navigation and user friendliness of interfaces should not be

treated trivial. As for the graphical-based mobile chat systems, usability can be improved by constructing user friendly interface that enhances user satisfaction, promoting usages and navigation ease. The research outcomes have provided sufficient information for mobile chat designers to enhance the user interfaces and the specific usability attributes for the text-based mobile chat systems.

6 Conclusion

The implications of user interfaces and usability for mobile chat systems are substantial and undeniable, and the research results were relatively positive. The results strongly signified the benefits that can be gained from employing a graphical-based usable interface for mobile chat systems. The usable interfaces designed for mobile chat systems have significantly eliminated the inefficiency, ineffectiveness and poor users satisfaction of current text-based mobile chat systems. The sequential presentation of text-based chat systems is perceived as not being suitable, and the user interface design needs to be taken into greater consideration for the various factors that inherent in a mobility environment.

The use of specific components such as avatars, emoticons, graphics, background images, and colours to construct the graphical-based usable interfaces have very much addressed and improved the user friendliness, user satisfaction and navigation. Additionally, the experimental results uncovered the major key attributes which include the user friendliness of interface that enhances user satisfaction, encourages usages and navigation ease extensively hold strong magnitude and correlate with the user interface and usability on GMC.

In short, text-based mobile chat pales in comparison to that of the graphical-based counterpart. Furthermore, every aspect of the user interface and usability of the graphical-based mobile chat is well appreciated by the test subjects. The empirical evaluation has highlighted the potential use of graphical-based mobile chat as a substitution to the text-based mobile chat that is under utilised in the commercial arena. We believe confidently that the research outcomes of this study benefit mobile chat designers about the linear relationships and design criteria to be considered for creating usable interfaces, and the specific usability attributes that may be required when designing graphical-based mobile chat systems.

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