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# DEVELOPMENT PROCESS AND EVALUATION OF A CUSTOMER SERVICE CHAT APPLICATION

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# ABSTRACT

This thesis presents a customer service chat application: Livezhat mobile application. Its purpose is to allow customer service representatives chat with website visitors in real time, independent of the location. We examine the functional requirements of such an application. The requirements are: interactivity, enhancing customer relationships and satisfaction, good quality and fulfilling a need.

The application is communicating with two servers to provide notifications and enable information exchange. It was found to enhance customer relationships with its quality and interactivity. According to survey evaluation, the application was easy to use and appealing. Out of two customers who used the application during a test period, one used the application rather much. Other feedback from the evaluation provided us a chance to improve the application in the future.

The thesis' contributions are: the design, implementation and evaluation of a novel customer service chat application used in mobile devices.

Keywords: application development, application, chat, customer service, mobile.

**Kallio R. (2015) Asiakaspalvelun chat-sovelluksen kehitys ja arviointi.** Oulun yliopisto, tietotekniikan osasto. Diplomityö, 42 s.

# TIIVISTELMÄ

Tämä diplomityö esittelee asiakaspalvelun chat-sovelluksen: Livezhat mobiilisovellus (Livezhat mobile application). Sen tarkoitus on antaa asiakaspalveluhenkilökunnalle mahdollisuus keskustella (chattailla) verkkosivuvierailijoiden kanssa reaaliajassa, sijainnista riippumatta. Työssä tutkimme tällaisen sovelluksen toiminnallisia vaatimuksia. Vaatimukset ovat: interaktiivisuus, asiakassuhteiden ja asiakastyytyväisyyden parantaminen, hyvä laatu ja tarpeen täyttäminen.

Sovellus kommunikoi kahden serverin kanssa, jotka mahdollistavat ilmoituksien (notifications) kulkemisen ja tiedonsiirron. Se parantaa tutkimuksen mukaan asiakassuhteita laatunsa ja interaktiivisuutensa vuoksi. Arviointikyselyn mukaan sovellusta oli helppo käyttää ja se näyttää hyvältä. Testiperiodin aikana kaksi asiakasta käytti sovellusta, ja heistä toinen käytti sitä paljon. Arviointikyselystä saatu muu palaute antoi meille mahdollisuuden parantaa sovellusta tulevaisuudessa.

Diplomityön työpanostus on: uuden mobiililaitteissa käytettävän asiakaspalvelun chat-sovelluksen suunnittelu, toteutus ja arviointi.

Avainsanat: asiakaspalvelu, chat, mobiili, sovellus, sovelluskehitys.

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# FOREWORD

I would like to thank my thesis supervisors Prof. Vassilis Kostakos (University of Oulu) and Ph.D. Denzil Ferreira (University of Oulu) for giving me guidance and support in writing this. Thank you all my colleagues at ZEF. You have provided me the support in developing the application. You're like a second family to me. A big thank you to my family. My mother, Heli Kurki, thank you for always believing in me and being a loving mother. My father, Kari Kallio, thank you for spending time with our common hobby, motorcycles, and believing in my talents. Thank you my sister, Niina Kallio, for giving me the initial spirit to follow my enthusiasm towards technology. You are one of the main reasons I am now writing a thesis for a university degree in computer science and engineering. A great thank you goes to my girlfriend, Maija Niemelä, for understanding me when I was working late. Thank you for being there when I needed you.

Helsinki, 17.11.2015

Riku Kallio

# ABBREVIATIONS

| | |
|---|---|
| API | Application Programming Interface |
| CSR | Customer Service Representative |
| GCM | Google Cloud Messaging |
| HTTP | Hypertext Transfer Protocol |
| JSON | JavaScript Object Notation |
| UI | User Interface |

# 1. INTRODUCTION

## 1.1. Motivation

Traditionally customer service people sit at their computers and answer to customers' inquiries. For small company's website, e.g., less than 10 employees, a website visitor may ask a question sporadically. In this scenario, it makes no sense to hire dedicated full-time customer service personnel to sit at a computer and wait for customers to pose a question. On the other hand, a mobile support application is ideal: when a notification on the mobile device is triggered, the support personnel may respond immediately and carry on to other work tasks when finished. Compared to email, for example, a live chat software handles the chats better, being synchronous, showing them individually in a list, and each chat can be closed after the customer's needs are satisfied. For the customer (i.e., website visitor) it is far easier to use the chat box located directly on the bottom corner of the website than sending an email to support staff. All the basic functions such as listing chats, receiving visitor messages, sending message and getting visitor information can be easily implemented to the mobile application.

ZEF's original mission and goal is to help people in decision-making [1, 2]. ZEF is currently helping in decisions like what product to buy but later ZEF will be helping in other decisions as well, such as choosing a partner based on all your opinions. In addition, ZEF has five other goals: bringing transparency and democracy to the world; making most popular comparison applications in the world; offering the best SaaS in the world; have an excellent international team who all match our values Love, Passion and Bravery; and have a turnover over one hundred million euros. With the four products *VotingAid*, *Matchit*, *ZEFsurvey* and *Livezhat*, these goals can be achieved.

> *"We founded ZEF to help people in decision-making. Our dream and purpose of being is to build a decision-helping community where people worldwide help each other in all life's choices.*
> *With our popular online tools, you make and help your customers make better decisions. With our most well-known tool, VotingAid, we support democracy and transparency all over the world.*
> *We have over 1000 satisfied customers including Rovio, Al Jazeera, MTV, IMF, Reuters, ITV, Vianor, Marimekko and Disney. 95% of them recommend us for their friends."*

*VotingAid* is ZEF's most famous application. It is fulfilling the goal of bringing transparency and democracy to the world by offering a software that helps voters to choose their candidate to vote [3]. *VotingAid* has an outstanding reporting included in the software. After the elections, a report can be published (or shown locally) where users can compare candidates' answers or parties' answers and/or see how parties agree with each other. A good example of this is found in MTV's article [4], where newly selected (in April 2015) Finnish parliament can be tested based on their answers to questions on MTV's *VotingAid* test.

*Matchit* is the cornerstone of ZEF's ideology. With *Matchit*, entrepreneurs can increase sales and by creating fun product selectors to help customers select the right products or engage and educate website visitors with fun quizzes [5]. Obviously, *Matchit* is closely related to the community idea and the mission of helping people in decision-making.

With *ZEFsurvey* users can create and publish different kind of surveys, for example, a employee satisfaction survey [6]. A reporting tool is in an important role with this product as well as with *VotingAid*. In this case, entrepreneurs will see how their employees answered in the survey and has a clear vision of how to improve the satisfaction (for example).

The fourth product, *Livezhat*, is the most closely related to this thesis and where the contributions of this thesis lie. Livezhat is a software that allows Customer Service Representatives (CSR) to chat in real time with their website visitors [7]. With the chat, CSR's are able to select potential customers and help them in making a buying decision answer any questions they might have.

Before this thesis was made, *Livezhat* was restricted to the browser, where customer service staff can answer to website visitors' questions. The chat box, where website visitors ask their questions, is also restricted to the browser. To make CSR's work more efficient, a mobile application is needed (*Livezhat Mobile app*). This thesis' goal is to reduce the drawbacks of a web-based only solution. The application implemented does all the basic functions that the browser version of *Livezhat* does but adds one major addition into customer service experience: the aspect of mobility. Hence, the main research question is:

*What are the functional requirements for a mobile customer support service?*

In this thesis, we describe the requirements, architecture, implementation and evaluation of *Livezhat Mobile app*. With the evaluation, we investigate the impact of *Livezhat Mobile app* in CSR's workflow – in practice and by using a survey – with the following questions: How frequently the app is used? What's the busiest time of day (when app is used)? What is the overall user satisfaction score?

# 2. LITERATURE REVIEW

## 2.1. Customer Relationships

Customer service is usually the decisive selection factor between two companies offering similar products. In their paper [8] Murphy and Tan discuss customer relationships, where e-service tools, such as the Web, chat and email are enhancing these relationships. Furthermore, customer service has a strong link to customer satisfaction, which then yields to customer loyalty and long-term profitability [9]. However, before maintaining customers, one must first get customers both being as important. Getting customers and maintaining relationships is described as relationship marketing.

This relationship between companies and customers is first established when a company learns about customer needs. Internet chat rooms have been successful in this preliminary step, offering invaluable insight into better products and solutions [10]. On the other hand, there exists arguments that investing in customer relationship management technology may not increase customer satisfaction [11]. This is due to the fact that IT management practices associated to customer service vary widely among firms and no practice is recognized as a common one among firms.

Customer service has always been of great importance for ZEF. ZEF wants only the best for the customers and every customer is treated with personal care. Although ZEF is working with technology - for example with *Livezhat* the best service is given to the customers - the warmth of a real person without too much automation has been essential.

## 2.2. E-Service Quality

Buyers and non-buyers on a website are evaluating an e-service slightly differently. Both, Internet purchasers and non-purchasers, find the following dimensions to influence quality of an e-service: reliability, access, responsiveness, availability, ease of use, personalization, security and credibility [12]. Reliability (trust) was found to be the most important dimension for Internet purchasers while non-purchasers consider security as their most critical concern. Organizational reputation, relative advantage and perceived risk have a significant effect on the customers' attitude and behavior towards e-service, all of which are evenly important [13].

*Livezhat* was developed with these factors in mind: reliability, ease of use, security and credibility. ZEF as a company is gaining reputation all the time across the globe.

## 2.3. Trust And Loyalty

Customer satisfaction yields to customer loyalty [8]. Trust-based e-business strategy should be built [14]. Unless users feel a sense of trust, buyers will not return to a business (offline and online). Trust environments can be split into two types: (1) trust in the relationship among businesses, consumers and other stakeholders; (2) trust in the B2B website and its functionality [14]. Both of these trust environments must be handled.

How to be a trusted company? Given the fact that different cultures have differing expectations of what makes a web merchant trustworthy, this might not be an easy task [15]. According to the study, seven factors influence trust: brand and good ratings are needed to establish trust. Management domain knowledge, good security and clear privacy policies, current and functional technology, good order fulfilment and responsive customer service are essential to operationalize and maintain trust. Live advisers, text chat, audio and 1-800 numbers all help create an environment conducive to building trust. On the other hand, lack of these live advisers is identified as “trustbusters” that can break a company [14].

Companies should create customer loyalty in online environments. As online shopping experience may be lacking human warmth and sociability, understanding how to create customer loyalty in such environments is a complex process [16]. In contrast, adding automation in live chats could provide huge savings to organizations and some aspects of conversations can be replaced with a machine-based answer [17].

In conclusion, many papers are encouraging to building a trust-based company [8, 14-16]. ZEF puts effort in being a trusted company by providing a responsive customer service. We see that automating chats would decrease human warmth in the e-service experience. Instead of automating whole chat, *Livezhat* provides Saved answers functionality to answer quickly to frequently asked questions.

## 2.4. Interactivity

Interactivity can improve customer satisfaction. Interactivity is achieved with perceptions of responsiveness and mutuality, which further increase customer intentions to buy [18]. Other than that, interactivity has five dimensions [19] (i.e. what makes something interactive):

1. **Playfulness**: Voluntary behaviour that is not perceived as work.
2. **Choice**: User has a choice what to do. User has an unrestrained navigation on the website, for example.
3. **Connectedness**: Websites connects users to the world. Users are able to connect to a person on the other side of the world.
4. **Information collection**: This is primarily a need of the communicator. By collecting data from the users, the content can be tailored for the users.
5. **Reciprocal communication**: Traditionally, mass media communication is one way. The information is spread to a large audience without expectation of

feedback from the audience. This can be switched to be a two way communication where websites communicate back to the visitor as well.

Ha and James divide users into three groups: *Self-indulgers and Web surfers*, *task-oriented users* and *expressive users*. Regarding aforementioned dimensions of interactivity, all three groups have one or few dimensions that fulfil a need [19]. The study suggests that for *self-indulgers and Web surfers*, the playfulness and choice dimensions of interactivity fulfil self-communication and entertainment needs. For *task-oriented users*, the connectedness dimension fulfils information needs. For *expressive users*, the information collection and reciprocal communication dimensions allow them to initiate communication with others of common online interests.

In a scenario where consumers send instant messages to an e-store, type of message, i.e. how personal a particular message is, is the strongest predictor of interactivity perceptions [20]. Interactivity perceptions and site effectiveness enhances when the level of personalization increases. This means that users see interactivity through the personal aspect of a message. In addition, online chats offer more interactivity and allow a richer experience for both CSR and user than instant messaging programs [21].

### 2.5. Customer Satisfaction & Online Chats

Customers are more demanding, requesting their questions, problems and concerns to be solved instantly on the spot rather than waiting to receive a reply. This is exactly what live customer support chat is all about: answering to the customers instantly on the spot. Live customer support chat bypasses traditional, non real-time support types such as online forms and e-mail [22]. Although Andrews and Haworth stated in 2002 [23] that live chats would not improve online shopping experience, Elmorshidy's study [22] in 2013 proved otherwise.

Whereas Murphy and Tan reported that e-mail is a good tool for customer service [8], results in the Froehle's study [24] suggest that all three technology-mediated contexts (telephone, e-mail and online chat) are as good. CSR characteristics influence customer service satisfaction similarly across all three aforementioned contexts. The characteristics of a CSR should be thoroughness, knowledgeableness and preparedness. It is also stated that characteristics that are traditionally believed to be important in face-to-face encounters such as courtesy, professionalism and attentiveness had no significant impact on customer satisfaction in the technology-mediated contexts studied.

Live chat has lots of benefits. By installing a live chat software to a website is one of the best options to gain competitive benefits [25]. Information technology (such as a live chat) improves customer service experiences [26]. In chat programs, perceived usefulness, perceived ease of use and perceived enjoyment have a positive impact on customer satisfaction [27]. Obviously, how people rate these aforementioned predictor variables varies among individuals.

In The Wall Street Journal in 2006, there was an article [28] written by Bauerlein about how online banking should use a live chat and with how it provides a human touch. They state that a live chat increases sales and help customers finish their banking business faster and easier. There have been patents concerning live chat softwares. One patent had a live chat software integrated into an online credit card application [29]. Another was a patent about a method system and a computer program where customer service is provided over the Web [30]. Patented systems ensure that live chat is used and acknowledged by people.

Customer service online chat has its disadvantages, too: The older a customer is, the less positive he/she is likely to be about obtaining customer service over a technology-based medium [31].

Online chats have multiple positive effects. ZEF has chosen to be the best service provider for online live chat software. The company offers customer service via *Livezhat*, ZEF's live chat software.

### 2.6. Uses And Gratifications

It is worth studying generally why people use any product. Ruggiero in "Uses and gratifications theory in the 21st century" [32] have studied this question in detail. Traditionally, biological, psychological and sociological motivations are the reasons why people use a medium. Needs can be such as self-actualization, cognitive needs (curiosity), aesthetic needs and expressive needs, all of which are inherent in every individual but influenced by culture. Besides needs to use a medium, motivation is derived from interests and externally imposed constraints. The majority of media audiences are seeking entertainment, relaxation, or escape, and for most people, leisure and mass media are nearly synonymous.

Computer-mediated communication has revived the significance of uses and gratifications. Contemporary and future models must include concepts such as interactivity, demassification, hypertextuality and asynchroneity (for example, to be able to read e-mail at different times and still interact with the recipient). "In the information age, media users will seek information." The Internet has changed U&G theorems, since users can and some will take on new personalities, ages and genders.

Factors as confinement to home, low income, and some forms of stress form high levels of attachments to media (such as television, newspapers and remote control devices). Motivation to use any mass medium is affected by how much an individual relies on it and how well it satisfies his or her need. Use of medium can be ritualized and/or habitual: "audience activity involves the concept of utility, an individual's reasons and motivations for communicating, but little intentionality or selectivity". On the other hand, it can be instrumental use, which means more goal-oriented. Type of use depends on background, time and situational demands. The paper [32] also states that individuals with a high need for activation were exposing themselves more to media sources of public affairs information than individuals with a lower need for activation and less cosmopolitan lifestyles.

The use of a personal computer is often linked to motivations of using the Internet and linked to gratifications such as social identity, interpersonal communication, parasocial interaction, companionship, excape entertainment, and surveillance. It is worth noticing that as technologies rapidly materialize, the range of possible topics for U&G research also multiplies.

The impact of a live chat software (*Livezhat*) in customer's websites was studied in ZEF's blog [33] (http://blog.zef.fi/en):

- 90% of the customers finds live chat enhancing the online experience.
- 44% of the customers finds live chat to be one of the most important features in a webstore.
- 17% of the customers want service preferably via live chat.
- 11% of the customers recon it sales enhancing.
- *Livezhat* is easy to install [34] and it increases sales [35].

What will users do with a chat, what they want when starting a chat? According to a survey [36] made by Finnchat, most of the chats were about a product on the website (where chat was installed). Almost 60 % of the users wanted more information about a product. Other most common topics were product's availability, help with choosing the right product, help in finding information on the web page, warranty and services and delivery of a product.

# 3. LIVEZHAT MOBILE APP

This chapter covers an overview of the developed mobile application (*Livezhat)*. Current version (as this paper is written) is 0.73 beta and it is downloadable from http://livezhat.com/download-app/.

*Livezhat* uses a client-server architecture (Figure 1). The app (mobile application) is responsible of showing the data and visualizing it on the mobile device. *Livezhat* has one main server responsible of storing data and sending data upon requests. In addition, Google Cloud Messaging server (GCM) is used to handle notifications. *Livezhat mobile application* sends HTTP GET requests to *Livezhat* server's JSON API. The following flowchart on the next page illustrates the connection between the mobile app, *Livezhat* server and Google Cloud Messaging server.

The boxes GCM Service and ServerConnection represent java classes within the mobile app. GCM Service is responsible for handling the notifications, shows them on the device if necessary and updates the list of messages. ServerConnection class is responsible for the connection to the server. The only part *Livezhat* Mobile app uses on the server side is the JSON API.

Google's server is responsible for sending notifications to the device when the *Livezhat* server detects a new message or chat (see figure). The Android device, where *Livezhat* mobile app is installed, has registered its GCM ID to Google's server. When the *Livezhat* server sends a notification to Google's server, it looks up for registered devices and sends the notification to the registered device.

In the JSON API, commands used are login, status, list_open_chats, load_messages, user_info, message, close_chat, saved_replies, own_saved_replies and save_own_reply. Each of these commands take different arguments as input which can be seen from the figure above. Some commands don't have output and some do, depending on the use of the command. By using HTTP GET requests (with input arguments in the URL), the *Livezhat mobile app* is able to use these commands in the JSON API.

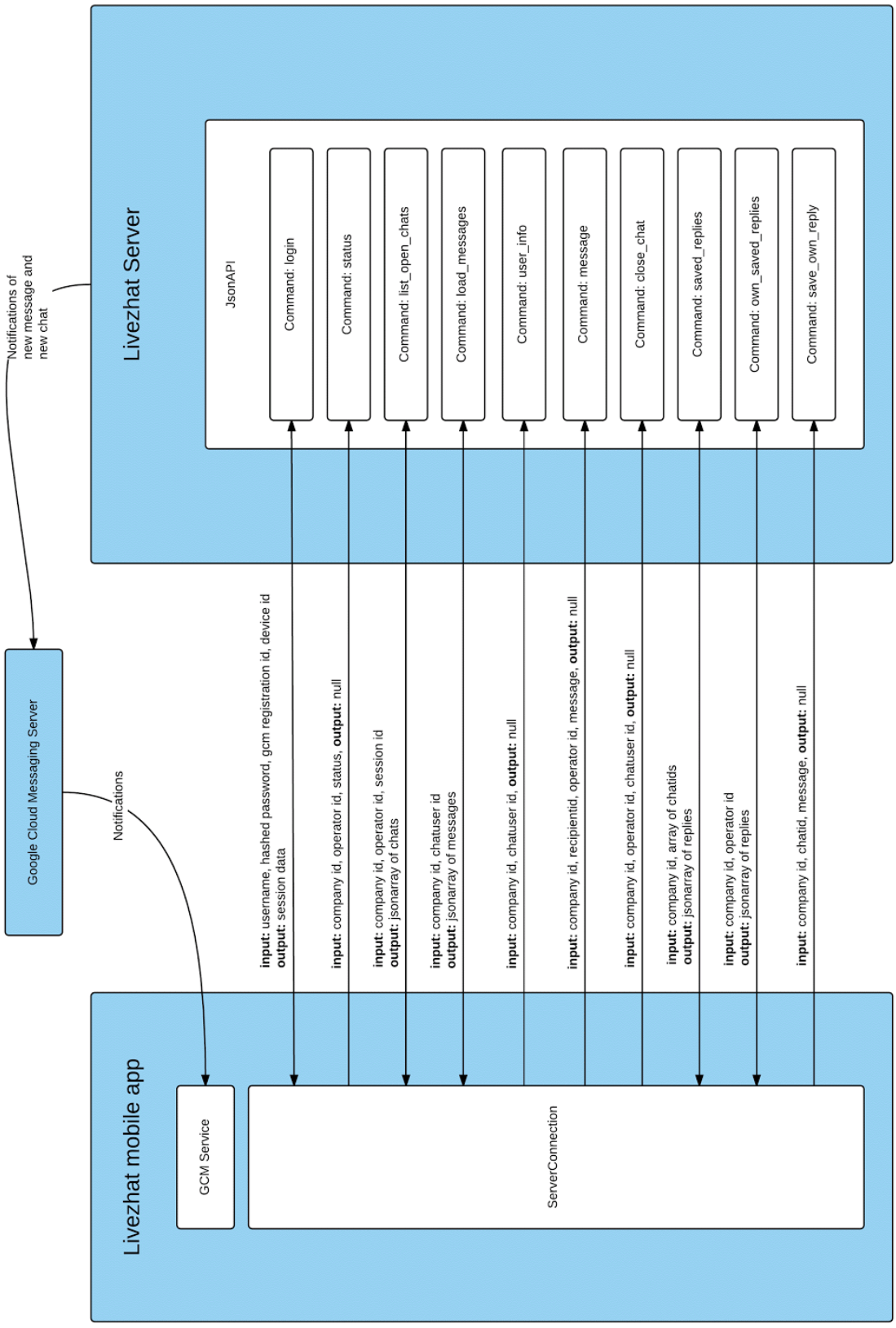



Figure 1. Livezhat mobile app overview.

# 4. DESIGN & IMPLEMENTATION

This chapter covers the design and implementation of the *Livezhat mobile app*. Screenshots are covered and the functionality in them is explained. The chapter starts by explaining how the project was scheduled and carried on. Design process is introduced next, followed by screenshots of the final UI.

## 4.1. Scheduling

The project started in September 2014. First, a baseline for the application was set - what it should do in general and what features should it have. We sat down in a meeting with ZEF's CEO, R&D director and CTO to discuss these facts and what would be the purpose of the application. It was decided to make a simple mobile application of the desktop version of *Livezhat*. Not all features would be implemented in the mobile app from the desktop version but rather making the most necessary functions. These feature requirements were:

- Show a list of currently open chats.
- Ability to send and receive chat messages.
- Every new message would produce a notification.
- Use of saved answers to respond quickly.
- Show information about current website visitor.
- Settings pages

After setting the baseline for functionality of the app, the design phase started. Sketches of the UI were drawn and by iteration we ended up in a design to be implemented. The design was then implemented in an Android sketch application. The application didn't have any functionality and included dummy data but instead was to demonstrate what would the application look like. After approval of the sketch application, functionalities were to be included and at this point, the actual implementation started. The beta version of the application was released in May 2015. With the beta release, an evaluation stage started with two *Livezhat* customers.

## 4.2. Design Process

### *4.2.1. Login*

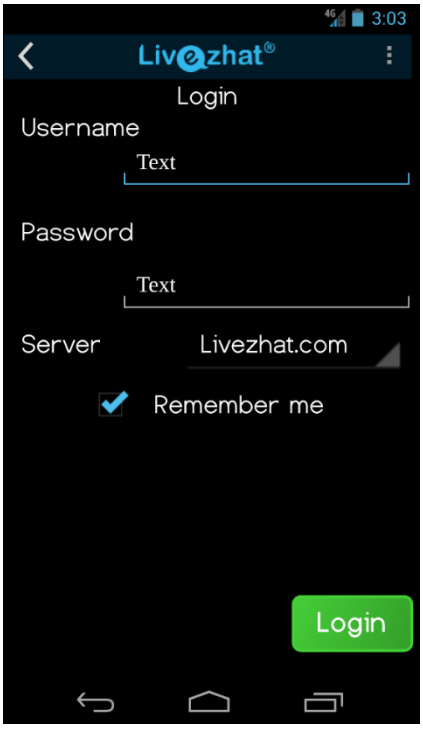



Figure 2. Designed login screen.

This is the login screen as designed in the design phase. In order from the top to bottom, there are inputs for username and password, option to choose the server instance (between .com and .eu servers) and a green login button. Later, in final version, the design was changed. Topics of the text fields were removed and they were replaced by a hint text. This gives more space to the design being clearer and simpler. The login button color was changed and moved upwards. The server selection is used so rarely that it is almost hidden below login button in the new design. See figures of the final design in the following section *Final UI and functionality*.

### *4.2.2. Main Activity*

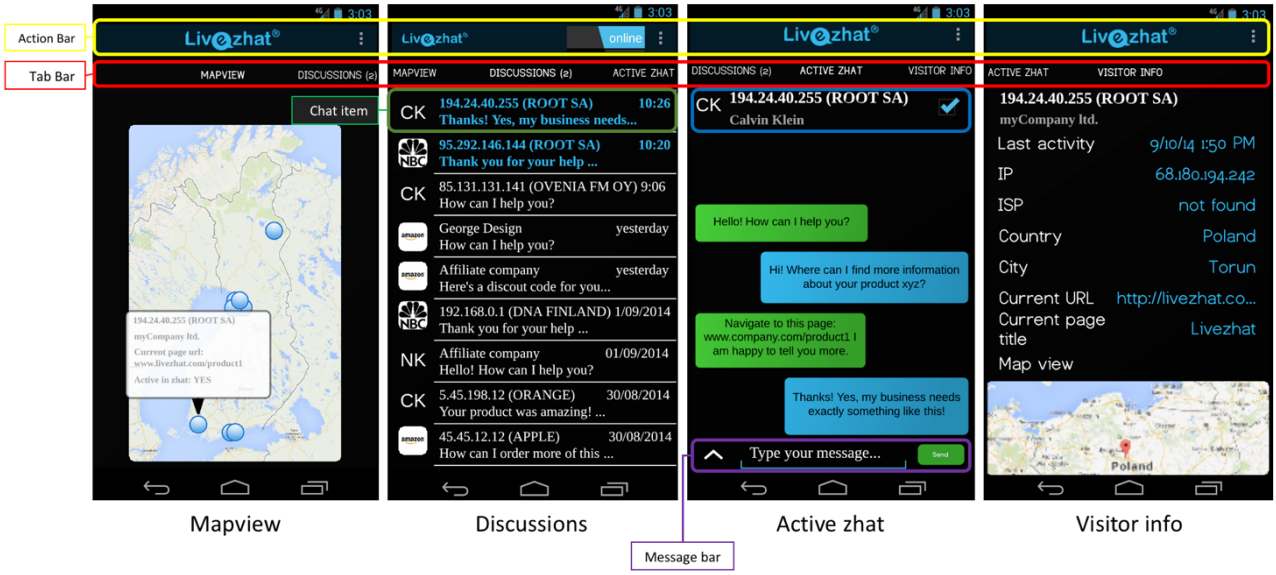



Figure 3. Designed main activity.

Four screens were designed to be shown in the *Main activity* which is swipeable. The leftmost screen, *Mapview* was removed during early stages of the implementation process and we were left with three screens: *Discussions* (later *Chats*), *Active zhat* (later *Active chat*) and *Visitor info*. Some screen titles were renamed to provide simplicity. The purpose of the *Mapview* was to show all web page visitors on a map and user could have easily open a chat with a visitor from the *Mapview*. Each blue dot would represent a visitor on the web page and upon a click it would show similar information to *Visitor info* view but in shorter form. A click on the info badge would start a chat with this website visitor.

The *Action Bar* is labelled with yellow rectangle. It includes *Livezhat* logo, online status switch and application menu. *Livezhat* logo works as a home button, is clickable and redirects to the *Chats* view when clicked. The online status switch is used to change the status between *online* and *away*. If all CSR's are *away* or not logged in, the chat is not visible on the website. This means that a user that is *away* is not counted as logged in, but that user can chat normally. User can select whether to receive notifications or not when they are *away* - default behaviour is not to send notifications when in *away* state. The online switch was designed to only one screen but later it was decided to have it on all screens of *Main activity*. There are three dots in the *Action Bar* that opens *Application menu* (some Samsung phones do not have these three dots but instead have application menus in a device menu button). The application menu has actions *Refresh* (the chat list), *Logout*, *Settings* and *Support Chat*.

The red rectangle indicates the *Tab Bar*. Its functionality is to show the name of current screen and give a hint of the next screen on the right and previous on the left. Number of unread chats would show up besides the *Chats* (*Discussions* in the design) title. The titles are clickable in the *Tab Bar*.

The *Chats* view's functionality is to list all open chats and to allow users to start a chat with a visitor. Unlike *Mapview* would show visitors on a map, this view shows chats as a list and therefore *Mapview* can be replaced with *Chats* view. A *Chat item* (or a chat in the list) is labelled with a green rectangle. A click on a *Chat item* opens chat's messages in *Active chat*. A *Chat item* in the list includes an icon that represents the *chat area* where the chat takes place, the name of the chat or IP if name is not defined, the latest message and time of the latest message. The list is ordered newest first. All unread messages in a chat are highlighted with a blue color. The *Chats* view has changed a bit since the design phase. The spacing has increased and text colors have been changed (see final UI).

*Active chat* view shows the messages and user can send new messages from this view. The chat name (or IP when name is not available), *chat area* and a corresponding icon are showed in the top of the view. This is labelled blue in the figure. Next to this information is a checkbox on the right side. This checkbox was designed to allow users to mark a chat to be handled by them. When a chat is handled by a user, other users (or CSRs) are notified that it is being handled by another user. Other users can still participate in a chat even though it is handled by another user. This functionality was removed from implementation.

*Message bar* is highlighted with a purple color. There are three items: an up caret icon representing *Saved answers* button, input field for typing a message and a green *Send button* used to send the message. This design has been modified in the final UI. The icons have been changed and send button uses the icon preferred by Google's Material design. The chat bubbles' color has been changed after this design. In the new design they're blue and white. Also the text color in the blue chat bubble is changed to white. This way they are easier to read.

Information about the currently selected chat is seen on the right side in *Visitor info* view. Similarly to *Active chat* there would be name or IP and chat area name on the top of this view. This view would show information such as last activity, IP address, location approximated to a country and a city, GPS coordinates, and the current web page (the chat owner could have the chat embedded in several pages). The view's layout has been modified in the final design (see final UI).

#### *4.2.3. Settings*

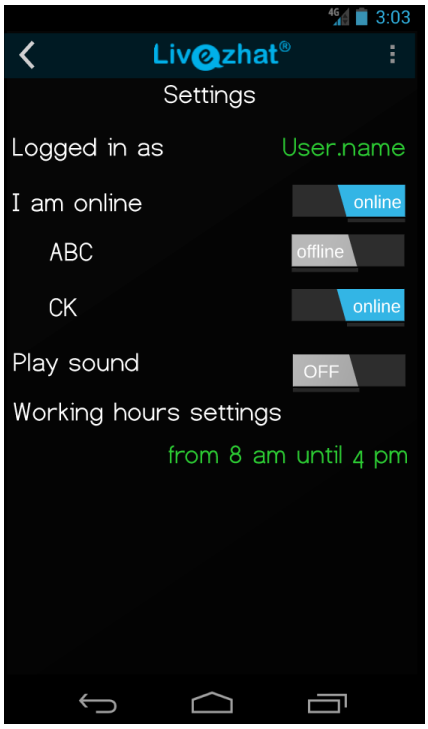



Figure 4. Designed settings screen.

Settings view would be shown when selected from the application menu. All application settings would be set here. Settings page would show what account was used to log in. We designed a feature where online status could be changed for each chat group, but this function was ditched later in the in the implementation process. Now online status is selected globally in the app. This version had "Play sound" setting, but it was later replaced with Notification settings. Working hours was a feature designed to automate logins and logouts according to user's specified hours.

After these sketches were approved, we moved on to the actual implementation of the app. Next, all functionalities of the app are discussed accompanied with screenshots.

### 4.3. Final UI And Functionality

#### *4.3.1. Translations*

*Livezhat mobile application* is translated into English and Finnish. It is fairly easy to create a new translation. Every string variable showed to user are stored in strings.xml file, under the corresponding language folder. Login screen is shown in both languages, but other screenshots are presented only in English.

### *4.3.2. Login*

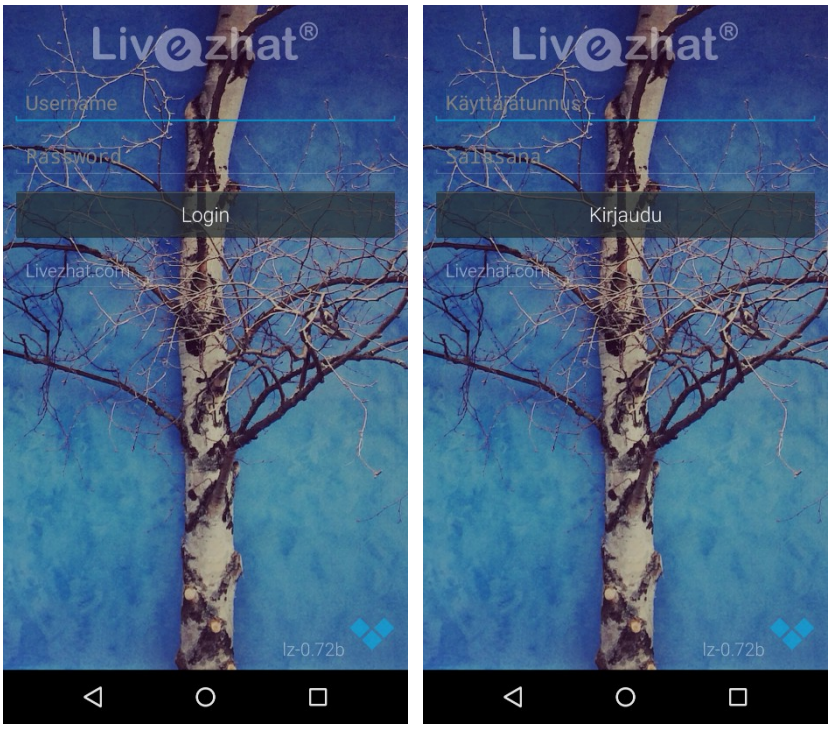



Figure 5. Implemented login screen in English and Finnish.

Login screen is what user sees the first time when opening the app. It will ask user to insert username and password. These login credentials are remembered until logged out. This means that if the user closes the application, and opens it again, the login screen is bypassed and it goes straight to the main screen. The same applies to the notifications. When user receives a notification, it opens the application by clicking the notification without the need of login. When user selects *Logout* from the application menu, the username and hashed password are deleted from the memory and *Login screen* is showed to ask for the login credentials.

### *4.3.3. Main Activity*

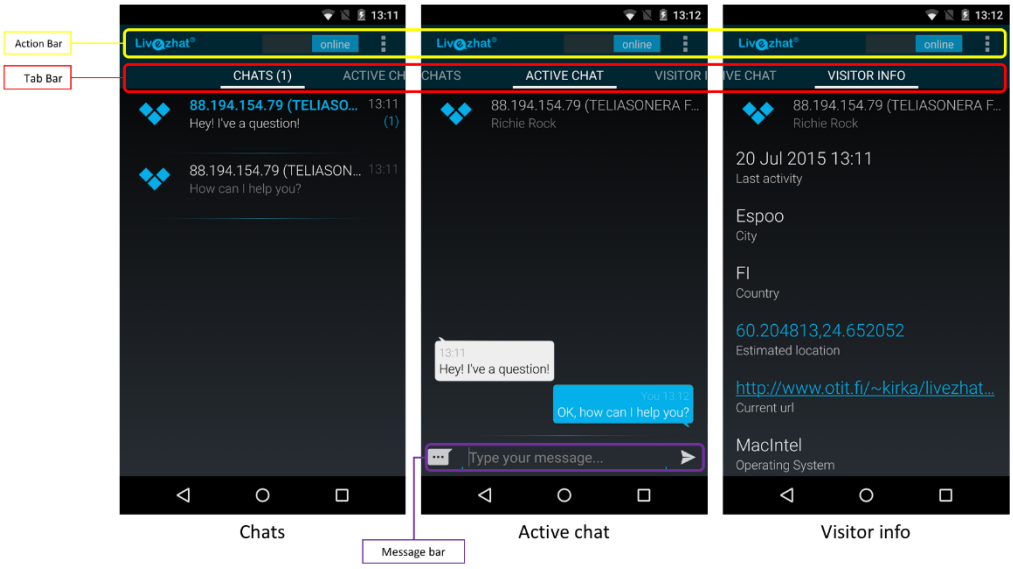



Figure 6. Implemented main activity.

Main activity consists of three parts: Chats, active chat and visitor info. They are all swipeable horizontally. The implemented application has Action bar (labelled yellow) and Tab bar (labelled red) as it was designed.

The Chats view (the leftmost screen) is the main view. By clicking a chat, chat messages are shown in the Active chat view on the right. By swiping further to the right, user sees the information of the current visitor (Visitor info). The list in the Chats view shows all open chats and is ordered newest first. When there are unread messages, a chat item is highlighted with blue color and two numbers appear: in the title bar and in the chat item. The number in the title bar indicate number of unread chats and the number in each chat indicate number of unread messages in the chat.

The messages in the list are in bubbles. Visitor's messages are in bubbles with black text and white background and aligned to the left; CSR's messages are in bubbles with white text and blue background and aligned to the right. Both have timestamp on the top with a light color. CSR's message has sender's name next to timestamp unless it is sent by user currently using the app, in case it says "You".

In addition to showing all chat's messages and function to send messages, Active chat view has a function called Saved answers. Saved answers button is on the left side of the Message bar (labelled purple). Click on this button opens a grouped list of saved answers. Groups can be created from the *Livezhat* user interface on browser version. Users can save a reply by long-clicking a message in Active chat view. Saved answers function enables fast response to frequently asked questions.

Visitor info view shows last activity, city, country, estimated location in GPS coordinates, current URL, current page title, operating system, browser and IP by default. In addition to that information, users can create more information to be collected from the user with so called integration parameters. These are configurable from the desktop version of *Livezhat*. With integration parameters, *Livezhat* users can

get, for example, visitor's shopping cart contents and it could be shown here in *Visitor info* view.

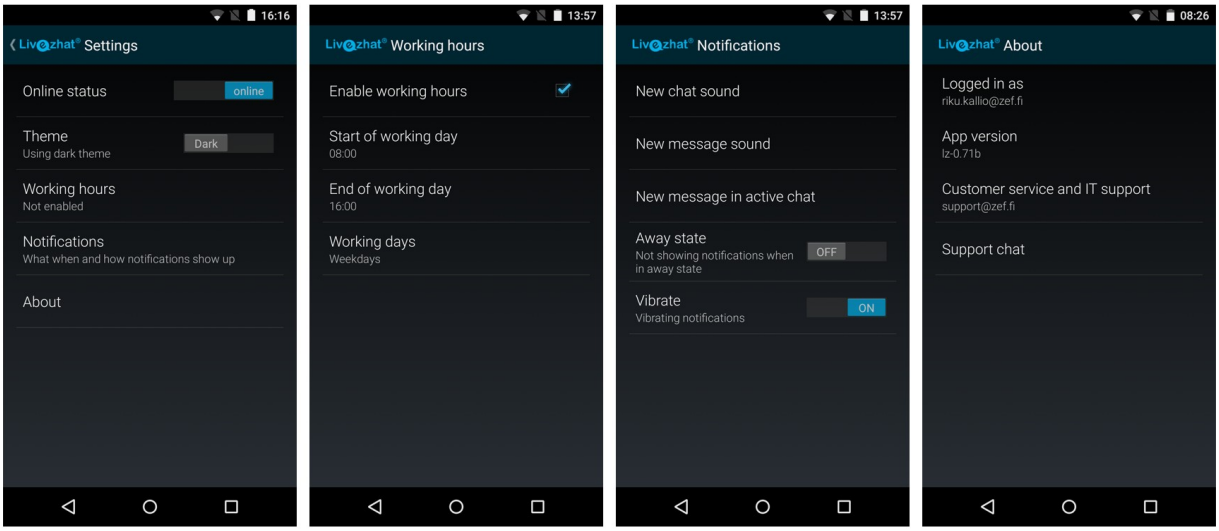



Figure 7. Implemented settings.

### *4.3.4. Settings*

The application includes extensive settings for changing the application settings such as online state, theme, notifications and *Working hours*. The app supports two themes: dark and white, where dark is the default theme (white theme in figure 8).

In *Working hours*, user can specify automated login and logout times for specified days of the week. Of course, *Working hours* is not enabled by default. Users can define start time, end time and days included. After setting up *Working hours*, users are automatically logged in on the specified hour of a working day (unless already logged in). Upon an automated logout, if the application is in foreground, an popup will ask user if they want to postpone it or logout immediately. This is useful when a CSR is working late and is chatting with a customer (i.e. website visitor) - they may not want to logout and leave the customer without an answer. When the application is not in the foreground, automated logout will be handled in the background.

In notifications, user can set sounds (or no sound at all) for new chat, new message and new message in active chat. User can also choose to have notifications when in away state or not, and whether notifications vibrate or not. More about notifications in the *Notifications* section. *About* section shows currently logged in account and the application version. Users can contact customer service via email, or start a chat with a customer service representative.

### *4.3.5. Light Theme*

We wanted to provide two themes. The theme of the application can be changed in the settings. At the moment, dark theme is the default theme.

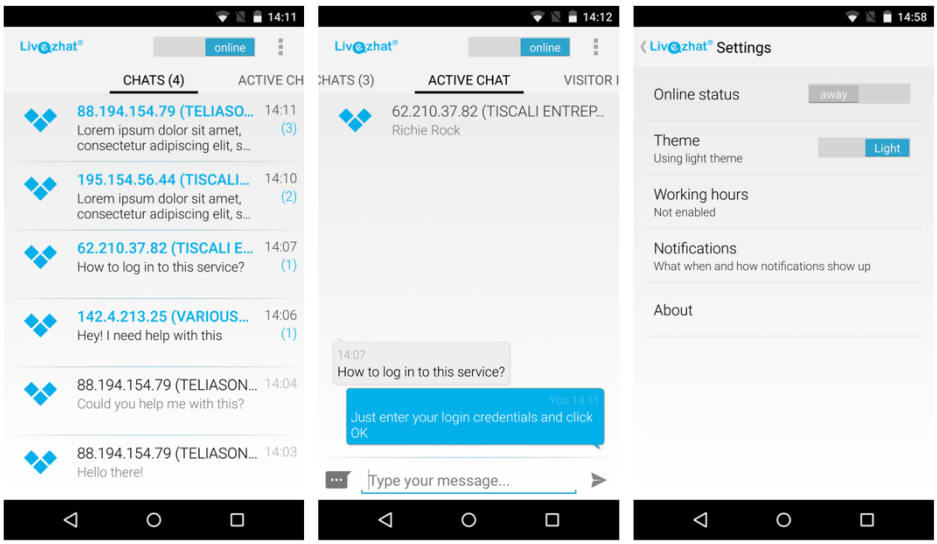
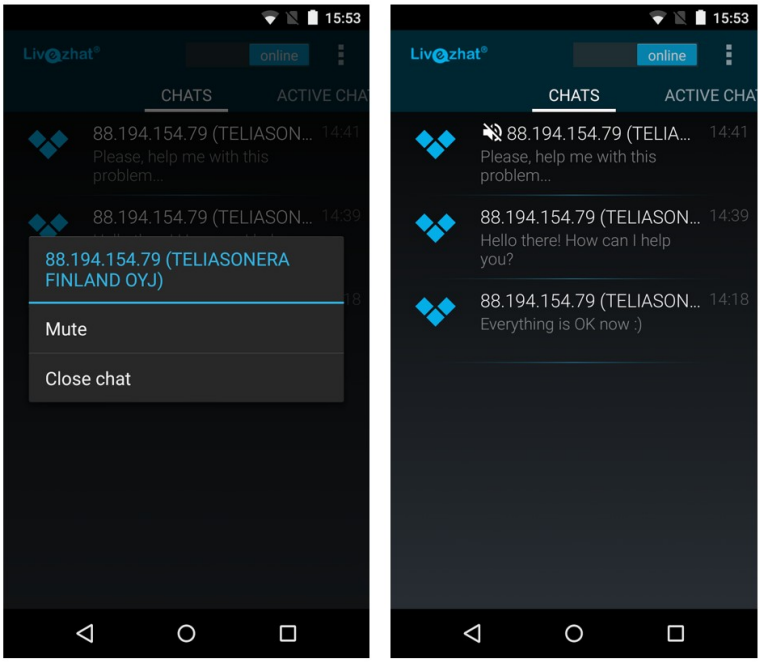



Figure 8. Implemented light theme.

### 4.3.6. Mute And Close Chat




Chat menu Chat muted

Figure 9 Close and mute features

By long-clicking a chat in the list, user can either close or mute a chat. Selecting close chat sends a close request to the server and removes it from the list. The website visitor can reopen the chat if they still have the page open. When a chat is muted, a muted icon is displayed in the chat list and no notifications are sent from this chat. However, the chat list updates if a muted chat receives a new message.

### 4.3.7. Evaluation Of The Design

We used Google's material design guidelines when designing the application. The spacings are implemented accordingly and the app uses some of those icons but, for example, *Saved answers* icon has been designed by ZEF. The Settings page is made with *PreferenceFragment* within a regular Activity. This way we get the default Settings view preferred by Android and Google design guidelines.

### 4.3.8. Security

In every HTTP GET request, the company ID must be passed in addition to other parameters. The client (i.e. *Livezhat mobile application*) knows the company ID only if the login has been done. The API, on the other hand, checks if the login session is valid in every call. Since it is HTTP and not HTTPS, the session data could be catched with the *man in the middle* method, for example. The attacker is able to get the whole syntax of the HTTP request with, for example, WireShark

(https://www.wireshark.org/about.html). Although the password is hashed in the login call, the whole request could be hashed to provide more security. This security flaw is acknowledged and future work will provide more secure with HTTPS. JSON API is designed so that it returns null if the syntax is wrong - hence, syntax can not be guessed or reverse engineered.

### *4.3.9. Notifications*

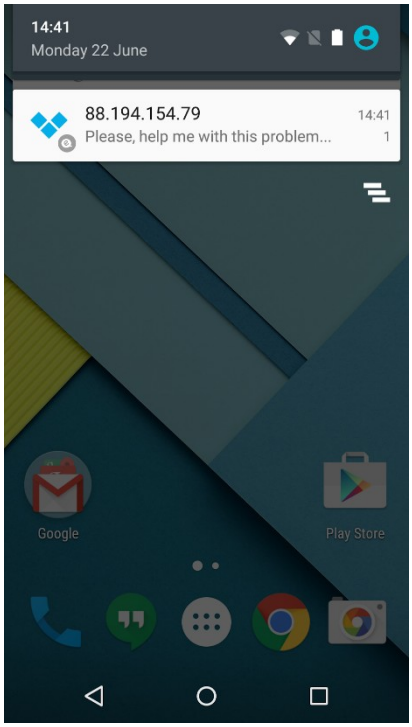



Figure 10 Notification in Android status bar

Notifications are important in this kind of a chat application. The users needs to be notified on important events such as new message or new chat so that they can respond to that event as fast as possible. That new chat might be a potential new customer for a website owner.

The application receives notifications for every new message and new chat. They are shown in the notification area only if the app is not in foreground and running - otherwise they will be cancelled after the sound has played. The notifications are grouped in one notification if there are multiple new messages. The previous notification is replaced with the new one. Notifications have their own settings as seen earlier in the figures. The user can set the sound for new chat, new message and new message in active chat, or disable them. User can also choose whether notifications are sent or not when away state is activated and whether vibration is used with notifications or not.

In the first image from the left, there's a screenshot of a notification. Every new chat and new message is sent as a notification if app is not in foreground or running. Clicking a notification opens the chat or, if multiple chats, the chat list.

### *4.3.10. Google Cloud Messaging*

We are using Google Cloud Messaging (GCM) to send notifications to Android device running *Livezhat mobile app*. The GCM needs registration ID to know what device the notification should be sent to. The registration ID is sent to *Livezhat* server with login call. When a notification is triggered from *Livezhat* server, GCM server receives it and checks if device with the registered ID is online. If it is not online, it tries sending the notification later. Otherwise the notification is sent immediately and the app can handle the notification.

# 5. EVALUATION

We collected data from the participants using email and a survey. The users emailed us during testing with their feedback. The survey was sent to testers in the end of test period. 11 users participated in the survey.

The survey used was made with ZEF's product ZEFSurvey. ZEFSurvey uses a patented method *Z-scored Electronic Feedback*, which is based on z-scoring. This is where company's name originates. *ZEF method* [37] processes survey results from absolute into normalized results. In the heart of *ZEF method* lays fourfold table question type, where performance and importance of the question can be evaluated simultaneously. The answers are put into perspective so that it is clear which questions are most important regarding to the performance of the issue.

The purpose was to make a short survey that would enable us to collect valuable information about the app. ZEFSurvey is usually used to ask only positive questions. This could end up in biased answers, and therefore we changed some of the questions to be negative and some positive. The survey had three fourfold table questions, one agree/disagree scale question, and four free text input fields:

1. Welcome to Livezhat mobile application survey
2. App is easy to use (fourfold table)
3. Important features are missing from the app (fourfold table)
4. App looks good (fourfold table)
5. I prefer desktop version over the mobile app (agree/disagree scale)
    a. Comment why? (free text)
6. Things I like in the app (free text)
7. Things I don't like in the app (free text)
8. Other comments (free text)

### 5.1. Results

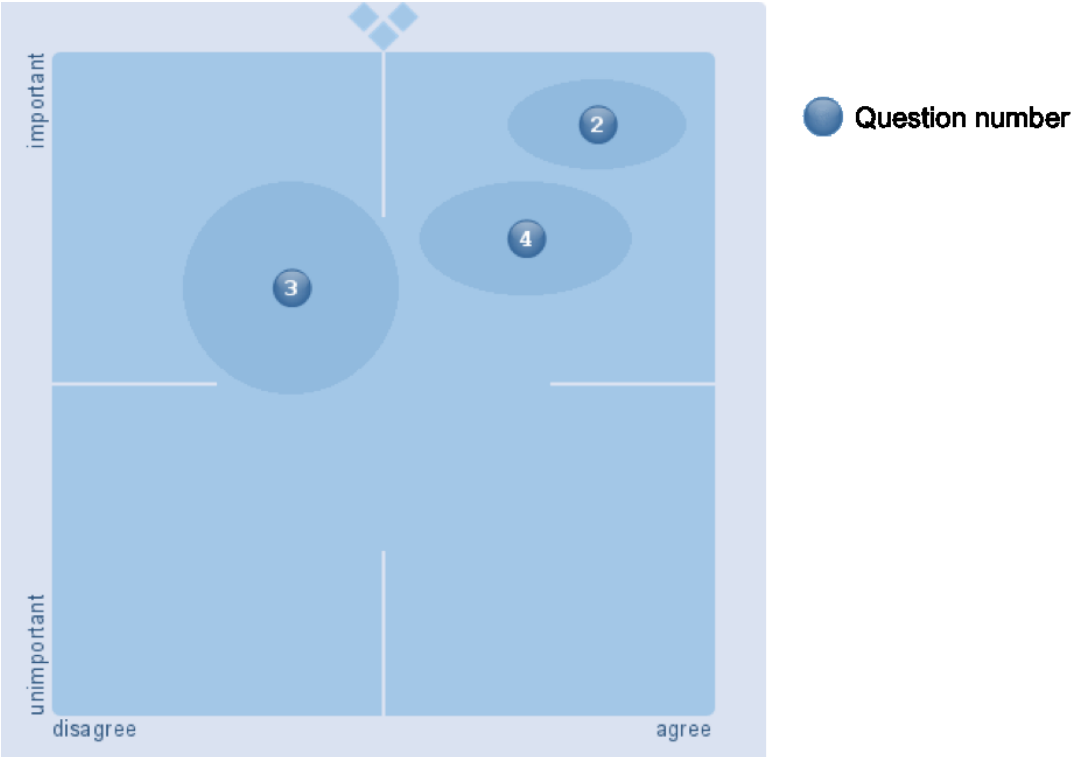



Figure 11 Survey overall of fourfold questions (absolute)

Figure above shows the overall of the three fourfold questions. Numbers are located in the average value and the ellipsis (almost circle in number three) illustrate deviation. Question number two (*App is easy to use*) had the best agree value. It is also rated as the most important question. Question number three had the most disagreements (*Important features are missing from the app*), which is good since we do not want important features to be missing from the app. Nevertheless, this question was not as much disagreed as question number two was agreed. In addition, question number three was not rated as important as question number two. Fourth question, *app looks good*, was agreed as well. Importance of this question was rated fairly high.

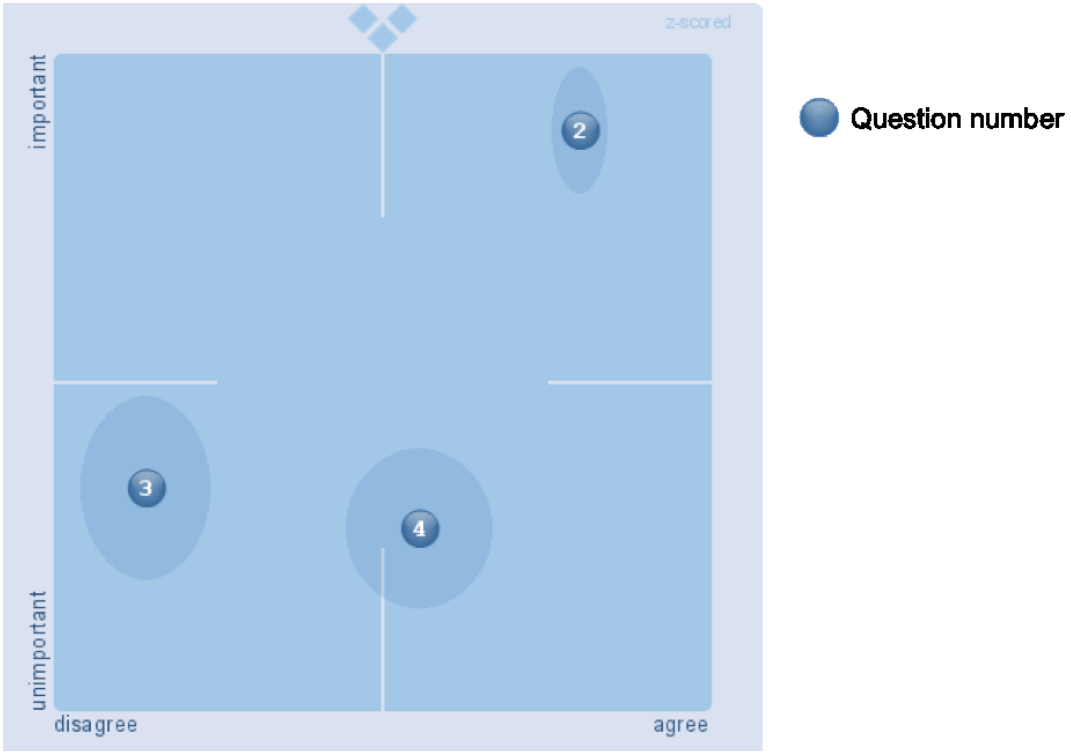



Figure 12 Survey overall of fourfold questions (z-scored, normalized)

First figure of this chapter was about absolute results. In the figure above, we see the same answers normalized or, to be precise, z-scored with *ZEF method*. This gives us a different point of view into this survey: we can distinguish the most relevant parts of our survey. The position of the questions have changed.

Still, question number two is clearly our priority. Number four has now much lower importance, which tells us that looking good is not as important to the answers as easy-to-use aspect.

Question number three is interesting. It has now much lower importance than in absolute valued figure. Still, disagreement is good in this question (*Important features are missing from the app*). After the survey, some participants noted that this question was difficult to answer being unclear. The agreement-part was understood well, but when it comes to importance, participants were unsure if lack of important features or having important features should be assessed in importance. This is admittedly a flaw in survey design. As stated before, *ZEF method* is usually used only to positive questions. This negative question was not clear to answer.

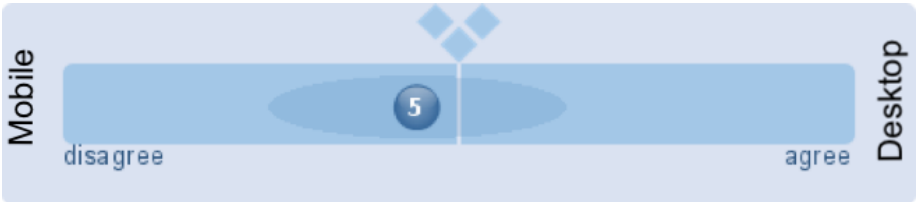



Figure 13 Question number five: *I prefer desktop version over the mobile app*

Question number five was a challenging question. We were hoping that the mobile app would have been the preferred mean of using *Livezhat*. The figure above shows that this question had rather lot of deviation, and split participants in two groups: those who prefer desktop version and those who prefer mobile version.

Fortunately, this question had an optional comment section. Some preferred mobility of the mobile version. It is more practical when one is moving and cannot be at a computer continuously. Others preferred desktop version because they prefer a physical keyboard to type and because files can be only sent through desktop version. Here are two quotes (translated from Finnish) from participants:

*"Mobile version is much handier"*
*-Preferred mobile version*

*"It is faster to type with a computer"*
*-Preferred desktop version*

Sixth question was *Things I like in the app*. This free text question gave us good feedback. According to the feedback, app was

- *simple*
- *easy to understand*
- *clear*
- *smooth*

In addition, participants found it good that app had extensive settings. This is what participants wrote:

*"It's smooth and it doesn't have anything excess or anything that doesn't belong there"*

*"App is smooth, has a clear user interface and is easy to use"*

On the other hand, seventh question was *Things I didn't like in the app*. This question did not receive as much feedback as the previous one. However, there were some important points. Here are

*"Discussions cannot be sent to email through the application"*

A participant pointed out that different chat groups should be distinguished. We designed a feature, where different chat groups would have a different logo illustrating the group. In case logo was not defined, it would have been replaced with one or two letters representing the chat group. Eventually, this feature was left out

from the implementation. The chat group is still visible fully when a chat is opened with a visitor. Two participants out of 11 pointed out that files cannot be sent through mobile app. We had designed the application to be simple and purposely left out file sending. Files can be sent through desktop version of *Livezhat*. A participant was missing the feature of sending a conversation to email. This is possible in the desktop version of *Livezhat* but was purposely left out from the mobile app.

Eighth and the last question in the survey was to give other feedback from the app. We received good feedback about the app in general, but mostly similar answers had already been answered in the previous free text questions.

In conclusion, users liked that app was easy to use. App was not missing too much important features but some improvements could be done in UI of the app to make it more appealing. Some participants preferred desktop version, others mobile version. Participants liked that the app was simple and easy to understand. Quite on the contrary to question number three which implied that important features were not missing from the app, seventh question received some feature suggestions.

### 5.2. Test Period

Two customers used the app during the test period (May 27th 2015 - September 11th 2015). Customers were asked to perform their daily customer service duties as usual but with assistance of Livezhat mobile application. Naturally, they were allowed to use the desktop version as well. A tracking system was tracking the number of logins, logouts and sent messages.

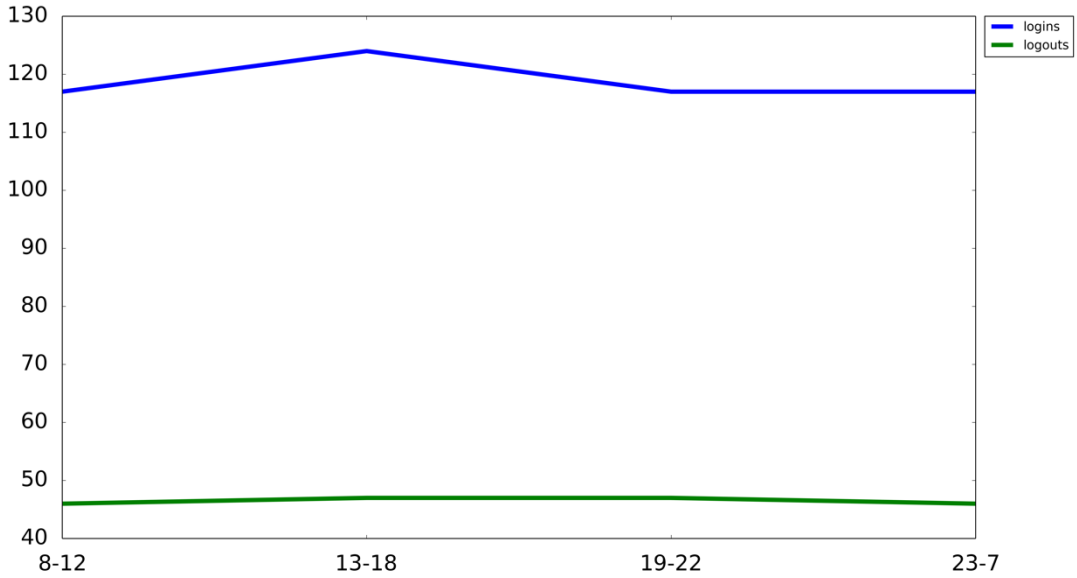



Figure 14 Customer one: Application daily usage

Figure 14 represents customer number one's daily application usage. On the x-asis we have times of a day: morning from 8 to 12, afternoon from 13 to 18, evening from

19 to 22 and night from 23 to 7. Y-axis represents the number of events: logins and logouts.

Customer number one used the application really well. Throughout the test period, customer used the app frequently. We expected user to login during the mornings and logout in the evenings, but the graph shows us wrong - all times of a day were used to login and logout evenly. There is a big difference between the number of logouts and logins which can be explained by the fact that the app logins automatically upon restart if the app has been closed without logging out.

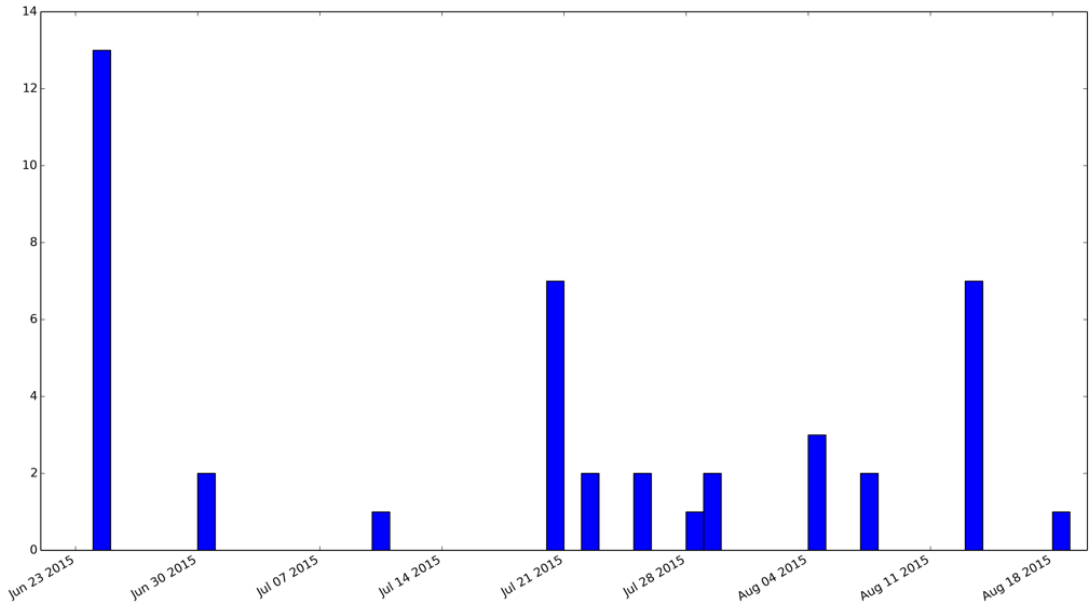



Figure 15 Customer one: Number of sent messages

Customer number one has used the app to communicate with his customers. The amount of sent messages is good. However, usually a chat conversation is not handled with only one message. We believe that the customer has used the Livezhat mobile application to answer quickly and then, if needed, continued the conversation on desktop.

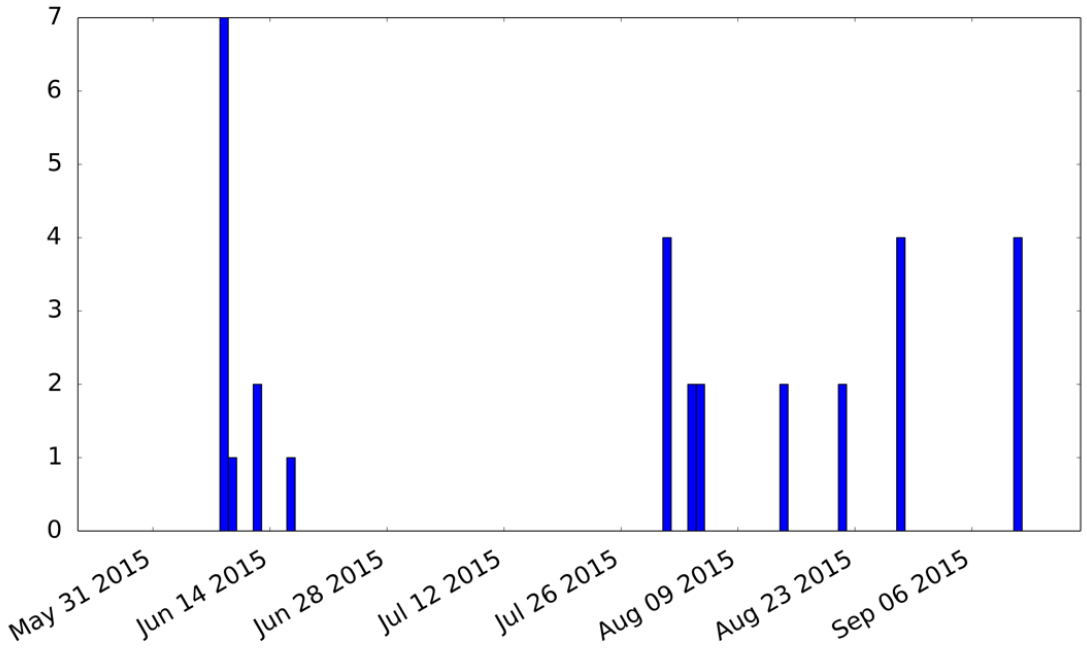



Figure 16 Customer two: Number of logins

Customer number two was not as active as customer number one. He did use the application but the data collected from customer number one is more valuable.

With the feedback we received from the survey Livezhat mobile application development can be further continued. During the test period, customer number one used Livezhat mobile application well. The test period was a proof that the application can be used in real life customer service situations.

# 6. DISCUSSION

## 6.1. Mobile Customer Support

ZEF was in need of a simple mobile application that would do *Livezhat*'s simple tasks in mobile environment. A simple application that *Livezhat mobile app* is, fulfills the company's need. There are already some users using it. Future will show how successful it becomes.

*Livezhat mobile app* brings something new to the how customer service is done. Now customer service representatives are not obligated to be at a computer screen at all times, but instead, they can do other tasks while being constantly reachable by the website visitors. The app is a big contribution to enhancing customer relationships. Murphy and Tan [8] stated that e-service tools such as chat is enhancing it. The app is a valuable tool for customer service to get to know the customer even better.

## 6.2. Real-time Customer Engagement

Why is *Livezhat mobile app* used? Ruggiero [32] stated that traditionally people use a medium for biological, psychological and sociological reasons. Here, sociological reasons are obvious to use the app: it provides customer service. The application might not be used for joy but rather for business purposes. This includes interpersonal communication and need of information need (for the website visitor).

Users liked that app was easy to use. App was not missing too much important features but some improvements could be done in the user interface to make it more appealing. Some participants preferred desktop version, others mobile version, splitting participants in two. The average was slightly preferring mobile version. Participants liked that the app was simple and easy to understand. On the other hand, there were implications that some features from the desktop version could be useful in the mobile version, too.

## 6.3. Functional Requirements For Mobile Customer Support

The requirements for mobile customer support are: interactivity, enhancing customer relationships and satisfaction, good quality and fulfilling a need. All of these are fully or partly supported by *Livezhat mobile application*. Although some of the requirements were only partly supported, the overall satisfaction was good.

The application is interactive. Yin and Straub [18] said that interactivity can be formed of different dimensions: playfulness, choice, connectedness, information collection and/or reciprocal communication. *Livezhat mobile app* fulfills three of those: playfulness, choice and connectedness. The application is made easy to use and the user interface is playful. User has a choice what to do in the application. The app connects the website visitor to the customer service representative.

Murphy and Tan [8] stated that chat enhances customer relationships. *Livezhat* in general is designed to be a tool for customer service so it enhances customer relationships. According to van Dolen and de Ruyter [27], usefulness, ease of use and enjoyment have positive impact on customer satisfaction. Ease of use was rated good in user evaluation survey. Usefulness and enjoyment were not evaluated in this thesis. In addition, interactivity of the application enhances customer satisfaction.

Based on user evaluation, this application is of good quality. Yang and Jun [12] stated that quality of an e-service is based on following factors: reliability, access, responsiveness, availability, ease of use, personalization, security and credibility. This thesis did not evaluate reliability or credibility of the application. However, ease of use, availability, personalization and security are fulfilled by the application. User evaluation survey pointed out that application was easy to use. *Livezhat mobile application* is always available. The application has an aspect of personalization by allowing users to change the theme. Security was discussed in chapter 4.3.8. By adding secure HTTPS connection, the application is more secure.

Just like any application, Livezhat has to fulfil a need. According to Ruggiero [32], a reasons to use an application are biological, psychological and sociological. In this case, it is sociological reasons: *Livezhat mobile application* provides customer service. The application is used for business rather than for joy. The application provides need of seeking information for the website visitors. For customer service representatives, it provides an interface to help website visitors.

# 7. CONCLUSION

The aim of this thesis was to provide an overview of the process of creating and evaluation of a customer service mobile application. As a result, *Livezhat mobile application* was created. The process was straight-forward: it started out with design process, moved quickly into implementation and lastly, evaluation was done. The main research question the thesis seeks to answer is:

*What are the functional requirements for a mobile customer support service?*

The requirements found in the thesis were interactivity, enhancing customer relationships and satisfaction, good quality and fulfilling a need. Literature review shows us how these requirements bind together. Interactivity and good quality of an application increase customer satisfaction which is closely related to customer relationships. Customer relationships should be handled carefully to maintain one's business.

## 7.1. Limitations

It is important to notice the context of the evaluation. We had 11 users answering the evaluation survey and we had two customers using the application during the test period. However, good results were interpreted. Time was a limitation in the project. If full working hours could have been used, the project would have finished much earlier. The project was meant to produce a small application that would do the simplest tasks. If we would have had more time, we could have implemented a more appealing application with more functions.

## 7.2. Future Work

Preferably, application would have a live feed feature. This would show website visitors in real time on a map (or a list) and users could start a chat with a visitor instantly from that view. Currently, a chat has to be started by the website visitor. This would, we believe, increase sales and improve user experience on the website.

At the moment, the login screen can be used to log in to *Livezhat* with existing account. We think it needs a feature to start a *Livezhat* trial. This is important as the application is put to distribution to Google Play. If a user doesn’t have an account, it must be easy to create one from the app directly.

Security could be increased in the future. By switching to HTTPS from HTTP, security could be increased notably. Also, all requests could be hashed whereas now only password is hashed in the login call.

The feedback survey received can be used to think of future improvements. Few users were missing file sending, a user would have liked that chat groups were distinguished in the main list, and another user wanted to be able to send a

conversation to email. These could be valuable features to be implemented in the future.

In general, we are pleased with the application. There was discussion that we would develop an iPhone version simultaneously with Android version. With the time given, this was the right choice to make the Android version first and then, if needed, concentrate on other platforms. As writing this, iPhone version is not under development.

# 8. REFERENCES

[1] ZEF. Our story - what we are made of. ( 2015).

[2] Virtanen, M. Timangi: Case Zef Solutions Oy - Vuoden 2010 Timangi-kilpailun voittaja. ( 2012).

[3] ZEF. VotingAid - The World's most popular opinion-matching tool for voters. ( 2015).

[4] MTV, K. Millainen olisi unelmiesi hallitus? Katso, miten erimielisiä puolueet ovat. ( 2015).

[5] ZEF. Matchit - Engaging Quizzes & Online Sales Tools. ( 2015).

[6] ZEF. ZEF survey - The #1 Tool for Surveys. Master opinions and improve your actions. ( 2015).

[7] ZEF. Livezhat - Powerful Live Chat Software With Free Support. ( 2015).

[8] Murphy, J. and Tan, I. Journey to nowhere? E-mail customer service by travel agents in Singapore. Tourism Management, 24, 5 ( 2003), 543. DOI=http://dx.doi.org/10.1016/S0261-5177(03)00005-0.

[9] Christopher, M., Payne, A. and Ballantyne, D. *Relationship marketing : bringing quality customer service and marketing together.* School of Management Working Papers;31/91, , 1991.

[10] Prahalad, C. K. and Ramaswamy, V. Co-opting customer competence. Harv. Bus. Rev., 78, 1 ( 2000), 79-90.

[11] Karimi, J., Somers, T. M. and Gupta, Y. P. Impact of information technology management practices on customer service. J. Manage. Inf. Syst., 17, 4 ( 2001), 125-158.

[12] Yang, Z. and Jun, M. Consumer perception of e-service quality: from internet purchaser and non-purchaser perspectives. ( 2002).

[13] de Ruyter, K., Wetzels, M. and Kleijnen, M. Customer adoption of e-□service: an experimental study. International Journal of Service Industry Management, 12, 2 ( 2001), 184-207. DOI=10.1108/09564230110387542.

[14] Sultan, F. and Mooraj, H. A. Designing a trust-based e-business strategy. Marketing Management, 10, 4 ( 2001), 40-45.

[15] Jarvenpaa, S. L., Tractinsky, N. and Saarinen, L. Consumer trust in an internet store: a cross- cultural validation. Journal of Computer- Mediated Communication, 5, 2 ( 1999), 0-0.

[16] Cyr, D., Hassanein, K., Head, M. and Ivanov, A. The role of social presence in establishing loyalty in e-service environments. Interact Comput, 19, 1 ( 2007), 43-56.

[17] Kim, S. N., Cavedon, L. and Baldwin, T. Classifying dialogue acts in one-on-one live chats. In Anonymous *Proceedings of the 2010 Conference on Empirical Methods in Natural Language Processing.* (). Association for Computational Linguistics, , 2010, 862-871.

[18] Yin, J. and Straub, D. The interactivity of internet-based communications: impacts on e-business consumer decisions. ICIS 2002 Proceedings, ( 2002), 62.

[19] Ha, L. and James, E. L. Interactivity reexamined: A baseline analysis of early business web sites. Journal of Broadcasting & Electronic Media, 42, 4 ( 1998), 457-474.

[20] Song, J. H. and Zinkhan, G. M. Determinants of perceived web site interactivity. J. Market., 72, 2 ( 2008), 99-113. DOI=http://dx.doi.org/10.1509/jmkg.72.2.99.

[21] Francoeur, S. An analytical survey of chat reference services. Reference Services Review, 29, 3 ( 2001), 189-204.

[22] Elmorshidy, A. Applying the technology acceptance and service quality models to live customer support chat for e-commerce websites. Journal of Applied Business Research (JABR), 29, 2 ( 2013), 589-596.

[23] Andrews, D. and Haworth, K. Online customer service chat: Usability and sociability issues. Journal of Internet Marketing, 2, 1 ( 2002), 1-20.

[24] Froehle, C. M. Service Personnel, Technology, and Their Interaction in Influencing Customer Satisfaction*. Decision Sciences, 37, 1 ( 2006), 5-38.

[25] Kannan, K. How Website Gain Competitive Benefits using Live Chat. Promotion World, ( 2011).

[26] Piccoli, G., Spalding, B. R. and Ives, B. The customer-service life cycle: a framework for improving customer service through information technology. Cornell Hotel Restaur. Adm. Q., 42, 3 ( 2001), 38. DOI=http://dx.doi.org/10.1016/S0010-8804(01)81023-5".

[27] van Dolen, W. M. and de Ruyter, K. Moderated group chat: an empirical assessment of a new eâ€□service encounter. International Journal of Service Industry Management, 13, 5 ( 2002), 496-511. DOI=10.1108/09564230210447959.

[28] Bauerlein, V. Online banking strives for the human touch. Wall Street Journal, July, 6( 2006).

[29] Lent, J., Coltrell, T., Reddi, M. S., Tracy, C. O. and Huang, T. C. Integrating live chat into an online credit card application. (apr # ~6 2004).

[30] Kannan, P. V. Method system and computer program product for providing customer service over the world-wide web. (dec # ~20 2001).

[31] Dulude, L. Automated telephone answering systems and aging. Behaviour & Information Technology, 21, 3 ( 2002), 171-184.

[32] Ruggiero, T. E. Uses and gratifications theory in the 21st century. Mass communication & society, 3, 1 ( 2000), 3-37.

[33] ZEF. Miksi veisit asiakaspalvelijasi nettiin? 2015, 04/12 ( 2014).

[34] ZEF. Aseta chat nettisivuillesi alle 2 minuutissa! 2015, 04/12 ( 2015).

[35] ZEF and Koodiviidakko Oy. Verkkokaupan viisi parasta markkinointikeinoa. 2015, 04/12 ( 2015).

[36] Rämänen, R. 6 asiaa, joihin verkkokaupan asiakas kaipaa chat-myyjän apua. ( 2015).

[37] ZEF Solutions. Zef Method. ( 2010).