A Warmer Welcome
Application of a Chatbot as a Facilitator for New Hires Onboarding
Abstract

Despite being explored and constantly improved through the years, onboarding of new hires in corporate organizations has remained a challenge. Many of the issues can be linked to a lack of communication between the organization and the new employee, as well as the common nature of these environments where information is spread across job titles and sources.

This thesis discusses the feasibility of implementing a basic chatbot that will allow new hires to ask questions and request varied information at all times, using an interface such as a messaging app. This research explores the way chatbots should be designed in order to be effective, reliable and enjoyable from a user experience perspective.

The chatbot was developed using the Chatfuel platform and tested by new employees at a corporate environment. The users were requested to explore the chatbot freely and then asked to answer a survey. The interactions were also recorded and analyzed from in both qualitative and quantitative ways (chat logs and analytics).

The study proves that an onboarding chatbot is a useful tool for new hires and can be used as a communication facilitator between the organization and the new hires during the first weeks of employment, and also after that, serving as an information source and a broadcasting method. The chatbot gives the new hires an accessible source of information that helps on the process of getting to speed, and enables a positive experience that increases familiarity in the new workplace.

Keywords
Human resources, chatbots, onboarding, automation, messaging apps, chatbot, design thinking, conversation design, personality design, conversational interfaces, dialogue
I declare that this thesis is my own, unaided work, except where otherwise acknowledged. It is being submitted for the degree of Master of Science in Social Media and Web Technologies at Linnaeus University in Vaxjo, Sweden. It has not been submitted before for any degree or examination in any other university.

Natali Asher
30th May 2017
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1 Introduction

1.1 Background

According to Bauer, Erdogan and Zedeck (2011) organizational socialization (or more commonly called onboarding) is an absorption process through which new employees in an organization move from being outsiders to becoming insiders. In the past three decades, our understanding of a newcomer's adjustment to organizations increased substantially, and it is clear for organizations that the early stages of onboarding are crucial to establishing a lasting bond between employees and the company (Snell, 2006).

The business case for effective onboarding is strong. The adaptation of a new employee to the workplace is associated with important employee and organizational outcomes such as satisfaction, commitment, turnover, and performance. There is an understanding that managing the process of socialization will provide competitive advantages to organizations (Bauer, Erdogan and Zedeck, 2011), and that, the faster new hires feel welcome and prepared for their jobs, the faster they will be able to successfully contribute to the firm's mission (Bauer, 2010). A Boston Consulting Group study found that onboarding was related to 2.5 times the profit growth and 1.9 times the profit margin as compared to organizations leaving onboarding to chance.

While the existing onboarding programs in large organizations are often expensive and time-consuming, data indicates that they might not be as effective as expected. According to recent surveys from the SHRM Foundation (2010), every year more than 25% of the working population experiences career transitions. Unfortunately, many transitions are not successful. In Fortune 500 companies alone, about 500,000 managers take on new roles each year, and overall, managers
begin new jobs every two to four years. However, in these transitions half of senior outside hires fail within 18 months.

According to Bauer, one of the ways for organizations to enhance high levels of role clarity and confidence for new employees is to leverage technology so that employees can easily access information in a self-service manner. Firms such as Kellogg’s and Microsoft maintain in their intranet dedicated onboarding websites that allow new employees to access information 24 hours a day. By having one location to find answers to questions, it helps new employees understanding their new roles in the organization as quickly as possible (Bauer, 2010).

Chatbots are one of the technologies that could be considered suitable to make information more accessible. A chatbot is a service with which a person can interact via a chat interface using text inputs or sound. Chatbots are considered the hottest development trend in 2016, being that since the last quarter of 2015 the usage of messaging apps has surpassed social networks in terms of monthly active users (BI Intelligence, 2016). It’s been noted that 90% of the time we spend on mobile is on email and messaging platforms (Schlicht, 2016). We know that millennials are especially keen on chatbots, as this technology fits their habits and routines (Holt, 2016).

Chatbots have been around for years, but nowadays they are making a comeback due to the rise of AI\textsuperscript{1} and IoT\textsuperscript{2}. In the early days of ELIZA\textsuperscript{3}, chatbots were seen as an intriguing (but mostly useless) technology. Today, chatbots are poised to revolutionize the way we communicate and expanding into all possible fields of human interaction, going from simple weather chatbots that tell you the daily forecast (Facebook’s Poncho\textsuperscript{4} chatbot is the most notable example), to news chatbots that keep you updated with

\begin{itemize}
\item \textsuperscript{1} Artificial Intelligence
\item \textsuperscript{2} Internet of Things
\item \textsuperscript{3} A computer program created by Joseph Weizenbaum in 1966, and is generally recognized as the first chatbot. It is considered a dumb chatbot, as it basically rephrases whatever the user says and poses it back as a question (chatbots.org).
\item \textsuperscript{4} https://www.messenger.com/t/hiponcho/
\end{itemize}
current events, or chatbots for finding a ride (such as the Uber\textsuperscript{5} chatbot, which was created by Uber as an alternative to the app). Furthermore, there are chatbots available for most of the common fields of e-commerce (e.g. ordering flowers, pizza or flights) and chatbots for getting information in various topics (mortgage, healthcare, food recipes and the list is nearly endless).

Chatbots are already being used to help HR teams develop better forms of communication with employees. With examples such as Jane\textsuperscript{6} (a Slack-based chatbot that can answer employee questions in real time), Mya\textsuperscript{7} (a recruiting assistant chatbot) or Talla\textsuperscript{8} (a white-label\textsuperscript{9} HR chatbot focused on sending polls and gathering feedback from employees), it is clear that chatbots could enhance the onboarding experience and contribute to the success of newcomers in the organizations, by enabling better communication and filling the gaps on finding small pieces of critical information in an informal, on-demand manner. While most of the simple, rule-based chatbots are perfect for answering basic questions, in the future intelligent chatbots could also be applied by businesses looking to streamline processes, maximize efficiency, and create overall better forms of communication (Wolfson, 2016).

This thesis is an exploratory effort to apply a basic, rules-based chatbot as a facilitator agent for onboarding of new hires in large organizations. The research focuses on the usability and user experience aspects of planning a chatbot, and includes the research of the onboarding needs in a particular organization and the evaluation of different development approaches. Also, I evaluate the user experience of the final product in two iterations, which include a usability study and user survey each.

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{5} https://www.messenger.com/t/uber/
\item \textsuperscript{6} http://www.loka.com/jane/
\item \textsuperscript{7} http://www.trymya.io/
\item \textsuperscript{8} https://talla.com/
\item \textsuperscript{9} A white label product is a product or service produced by a company, and purchased by other companies that rebrand it from a content or look-and-feel perspective to make it appear as if it was developed or created in-house.
\end{itemize}
\end{footnotesize}
1.2 Motivation

In the last seven years I’ve experienced first hand the process of onboarding – initially as an employee, and later as a hiring manager. I’ve had the opportunity to assist many colleagues on their first days and weeks at the office, being able to answer their questions and helping them get up to speed in their new jobs. I’ve identified similar concerns and feelings of new employees in all of the workplaces I’ve been part of.

During the first days at the job, it is easy for new employees to get lost on trying to grasp all the relevant aspects that would make the daily work smooth. Despite all the effort, thoroughness and intention put on these processes by HR departments, they are often structured and not flexible, not leaving enough space for the newcomer to expose doubts, ideas and worries. The event of starting a new job is overwhelming enough for most people. New hires are eager to impress their new bosses. So, if they don't know where the photocopier is or how to use it, chances are they aren't going to ask, and they will waste time trying to figure the little things out for themselves instead. During the first days on a job HR teams can send out an overwhelming load of information, and yet most small pieces of information are forgotten, or documents that will be needed in the future are thrown away. New employees usually have a hard time remembering where this information could be found again.

During my studies at the Social Media and Web Technologies Master Program we’ve been continuously encouraged to find creative, practical solutions to day-to-day problems by applying various cutting-edge technologies, from simple websites that combine several services to make a specific task easier, to applying augmented reality to enhance experiences. During the extent of this master program the focus has been to identify problems in all spheres of life and work, and define, design and develop solutions utilizing global digital media and Internet services. In the case of this thesis, the approach has been to choose a long-time existing technology such as chatbots,
and take advantage of the latest advances in the field to provide
an innovative solution at most, or a positive subset to the painful
process of corporate employee onboarding.

The implementation of a chatbot that is available for new
hires seeking information and advice could be a handful and
useful tool that would also remove the pressure of “not
remembering the small details”. A chatbot is an all-times
available resource that can be queried multiple times (as opposed
to asking a fellow worker or HR team member, whom a new
employee wouldn’t want to pester with recurring questions). As
an initial assumption, a chatbot could be an appropriate solution
to give simple answers in real-time, and in more complex cases, to
quickly connect to the source where more information can be
found, or even better, to the person in charge of a specific area or
service for the new hire. It can be assumed as well that the
interaction with a chatbot may constitute an enjoyable
experience, considering the interactions and conversation loops
have been appropriately crafted.

The main output of this thesis is a chatbot capable of
answering basic questions from new hires, mostly related to office
issues such as:

- Information for arrival on first day
- Transportation and parking information
- Entrance and office hours
- Location and usage of facilities such as printers, cafeteria,
office materials and Wi-Fi
- Contact of key people
- Information on food card and employee benefits, payment
date, vacations days and company events

By analyzing the user answers and running a user survey,
this study evaluates how successful is a chatbot at providing
answers to information required, the level of reliance on the
provided information, the level of satisfaction from the interaction
itself, and the perceived intelligence of the chatbot.
The study attempts to discover if a chatbot would be a positive factor and useful tool for new employees in an organization - acting as an all-times available knowledge source for newcomers, by enabling better communication in informal ways, in an on-demand manner.

Chatbots represent an area of opportunity for exploration, to use technology to improve processes and help create a company culture that is aligned with its strategic priorities, that in turn improves the overall experience. Also, chatbots are in the heart of the Social Media and Web Technologies field, and can be considered a relevant topic for research in the field of HCI\textsuperscript{10}.

1.3 Outline of Thesis

This master thesis is split into nine chapters:

Chapter 1 presents the background of this research, by introducing the problem of onboarding in organizations and the suggested solution, as well as the motivation around these topics.

Chapter 2 presents the initial assumption, which represents the beginning of this study, together with the inferred research questions.

Chapter 3 includes the preliminary research, based on related work on the onboarding domain, and reviewed literature on the areas of employee onboarding, chatbots state-of-the-art, application of chatbots to HR operations, and user expectations from chatbots.

Chapter 4 describes the methodological approaches and decisions for the creation of the chatbot, starting from the research design, through discovery of organizational gaps, analysis of possible development options, usability and user experience aspects of chatbot development, and intelligence definitions.

\textsuperscript{10} Human Computer Interaction
Chapter 5 defines the conversational design goals and initial interaction flows, as well as the mapping of secondary conversation components.

Chapter 6 explains the chatbot development and implementation, together with usability testing results in two rounds of exploration.

Chapter 7 summarizes the results and provides the conclusions by answering the research question.

Chapter 8 lists the limitations of this study.

Chapter 9 explores the possibilities of future work and expansions.
2 Hypothesis and Research Questions

The initial assumption for this thesis is that the existing gaps in the onboarding process of new hires in large organizations are mostly due to misinformation and lack of communication - and chatbots are the kind of technology that could fit to solve this communicational gap. By answering questions in real time, a chatbot may result in faster decision making for employees. A new hires chatbot might be an effective approach to answering crucial questions such as “When do we get paid?” “What is my monthly food budget?” “What do I do if I forgot my employee card?”, therefore reducing stress and getting employees up to speed in a much faster and more efficient manner.

The main purpose of this descriptive research is to explore the ways the onboarding process of new hires in an organization can be improved through the implementation of a chatbot. Considering the general purpose the following research questions will be investigated:

**RQ1:** How can a chatbot support new hires on their onboarding process in a large organization?

With RQ1, the goal is to figure out how it is possible to use the chatbot technology in order to enable a smooth and seamless onboarding process to a new workplace. RQ1 is meant to discover which are the topics that new hires need information about.

RQ2 is divided into three sections, which are related to perceived aspects of the interaction with the chatbot.

**RQ2A:** To what extent is the interaction with such a chatbot perceived as delightful?

**RQ2B:** To what extent is the information provided by such a chatbot perceived as reliable?
**RQ2C:** To what extent is such a chatbot perceived as intelligent?

With RQ2, the effort is to understand how is the perceived user experience of a chatbot as an onboarding buddy, by taking three quality indicators: delightfulness of the interaction, reliability of the provided information, and sensed intelligence of the chatbot.

The delight of the interaction with such a chatbot is a critical parameter when it comes to adoption of a technology of this kind, as it could be its advantage as opposed to a website or other types of technology that can provide the same type of information. In the same way, it is necessary to confirm whether the information provided by such a chatbot during the interaction is perceived as valid and trustable. Lastly, it is a goal to establish whether crafting a successful user flow can overcome the lack of artificial intelligence and techniques, while still enabling the access to information in an acceptable manner.
3 Literature Review

In the following sections more information is provided on the domains related to this research - onboarding in organizations, chatbots introduction and state-of-the-art, application of chatbots to HR problems and relevant findings on users’ expectations from chatbots.

3.1 Onboarding Processes in Large Organizations

The term onboarding has emerged from near obscurity in the 1990s to the mainstream language of businesses and talent management today. As many as 66% of organizations use some aspects of formal onboarding programs and 53% invest in onboarding across a new employee’s first year (Laurano, 2012).

Onboarding refers to the process and activities required from new employees to acquire attitude, knowledge, skills, and behaviors needed to perform and succeed in their new job. Onboarding helps new hires to adjust to the social and performance aspects of their jobs so they can quickly become productive, contributing members of the organization. This process of learning to become an effective organizational member is different from occupational socialization, which focuses on learning the norms of one’s profession, such as police officer, scientist, or medical professional. The employee’s onboarding process is influenced both by the organization characteristics and efforts, as well as the new employee’s nature and behaviors (Bauer, Erdogan and Zeneck, 2011).

Nowadays, HR experts recommend beginning the onboarding process even before the first day at the corporation; this is, in the time between the contract signature and the first day of work, or even before that - during the recruitment and hiring process. During this time the new employee is usually
excited and full of expectation, which makes this an ideal time for HR to show interest and require information from the future employee, while still not physically at the company.

According to business coach Richard Jordan, 'The orientation should begin at the first click of the mouse when someone first goes on the company's website, so that by the time the person comes in for the interview, they already know quite a lot about the organization'. This way, the organization is more likely to attract candidates who are aligned with the company's goals and culture, are more likely to become highly productive employees and to stick for long with the company (Vander Bos, 2010).

Most large organizations have in place formal onboarding processes, with a carefully planned first day, first week and follow-ups. Some organizations also assign a 'buddy' who leads the new hire on the first day while they figure out all the details. All in all, it is a process that has been relatively well optimized and fine-tuned, with most large organizations following a strict checklist of what needs to be covered. However, it seems that most organizations have not automated big parts of the process. The leverage of technology on this area could make the process more effective, cheaper and less time consuming. The real-time, always available nature of the chatbot technology could allow new employees to start their onboarding process even before their first day, potentially reducing stress, making the first day tasks more seamless, breaking the ice and also streamlining the follow up on the first day, week and month.

3.2 Chatbots Introduction and State-of-the-Art

Different terms can be found on the Internet to refer to chatbots - conversational agents, dialog systems and virtual assistants. This is due to the multiple systems built that are similar in purpose but with different technical architecture (Perez-Marin and Pascual-Nieto, 2011).
For the scope of this research, a chatbot is defined as a service, powered by rules and sometimes artificial intelligence, that users can interact with by utilizing a chat interface (Schlicht, 2016). This thesis will focus on text-based chatbots that can be accessed via messaging apps\textsuperscript{11}.

Chatbots can be built for websites or apps and accessed from multiple devices whenever there is access to the messaging interface - as the chatbot is usually active from within a bigger messaging platform such as Facebook Messenger, Slack, Telegram or Skype. More than 30,000 active bots have been developed on Facebook Messenger only, since April 2016 when Facebook opened Messenger for chatbot development (TechCrunch, 2016). While Facebook is not the first company to launch a bot platform, it is significant as it provided a huge boost to the first, giving at scale the opportunity for businesses and companies to automate their one-to-one engagement with customers (Rosenberg, 2016).

According to Schlicht (2016), chatbots can be roughly divided into two types:

- Rule-Based: A chatbot that responds to very specific commands, defined by the rules, and cannot process information or commands if these are not framed or input in the right way. It is a limited chatbot, as it can only be as smart as it is programmed to be.

- ML\textsuperscript{12}-Based: A form of AI, with which the bot keeps learning from the interactions with the users using NLP\textsuperscript{13} and getting smarter from time to time. These advances are enabling chatbots to provide more accurate and intelligent responses.

\textsuperscript{11} There are several examples of chatbot apps such as Quartz (https://qz.com/app/), Vida Health (https://www.vida.com/) or Pana (https://pana.com/), in which the whole app is a custom messaging interface with a bot - but these are a minority when considering the whole chatbot ecosystem. I am not considering either voice-based bots such as Apple’s Siri, Amazon’s Alexa, Microsoft’s Cortana and Google Now, in order to keep the focus on text-based interfaces.

\textsuperscript{12} Machine Learning

\textsuperscript{13} Natural Language Processing
While this research will not go into the details of AI, ML and NLP, these terms are strictly linked and inherent to any conversation and consideration about chatbots. The following definitions are adopted in the scope of this thesis in order to ensure comprehension. Marr (2016) defines AI is the broader concept of computers (in this case, chatbots) being able to carry out tasks in a way that we would consider “smart” or “human”, by mimicking human decision-making processes. Moreover, ML is the current application of AI, based around the concept that we should give the machines access to data and let them “learn” patterns and information by themselves (Marr, 2016). Lastly, NLP applications are the latest attempt to understand natural human communication, so that machines can communicate back with us using a similar language, either written or spoken. ML is used here to help machines understand the vast nuances in human language, and to learn to respond in a way that a particular audience is likely to comprehend (Marr 2016).

It would be difficult to understand the rise of bots analyzing one reason only, as the latest “bot-mania” is at the confluence of separate trends:

3.2.1 Advances in AI Research and Computing
As mentioned above, AI is a relevant component in order to make a chatbot that can conduct human-like conversation. The latest advances in computing technologies have enabled integration of various apps and services into chatbots that can complete tasks efficiently with little or no human intervention. With its promise of automating mundane, industries in every sector from banking to healthcare and retail are already seeing the benefits (Marr, 2016).

Research firm Gartner predicts that already in 2017, only 33% of all customer service interactions will need a human intermediary, as compared to 60% in 2014 (Gartner.com, 2015).
3.2.2 Rise of Mobile Messaging as an Alternative for Apps

As mentioned above, during the last quarter of 2015 the usage of messaging apps has surpassed the usage of social networks in terms of monthly active users (BI Intelligence, 2016). The continuous growth of the messaging apps trend is pictured below in Figure 1.

Not only are messaging apps extremely popular nowadays, but also companies are facing friction in getting users to download and use new apps (Farber, 2016). The average mobile user has 33 apps installed on their personal mobile device, and only 12 apps are used daily. Out of these 12 apps, 80% of the global mobile user’s time is spent in only 3 apps (Meeker, 2016).

Figure 1. Messaging Apps vs. Social Networks Trend (BI Intelligence, 2016)

The growing messaging ecosystem brings to a trending belief that the future of apps lies in conversation, more specifically on conversational interfaces based on chatbots. Messaging bots have the capability of simplify our mobile experience, as they mostly respond to a user request, but stay invisible otherwise, even
preventing the infamous push notifications that are part of most mobile apps. For all these, many figures in the chatbot industry have declared 2016 the year of bots (Messina, 2016; Nadella, 2016; Lessin, 2016; Evans, 2016).

3.3.3 App Development and Distribution Cost
As a consequence of the previous trend, developers and startups seem to be moving away from the traditional mobile native apps, and moving towards chat-based user interfaces (Fin, 2016). There seems to be a fatigue of native apps from both consumer and developer sides. Consumers don’t want to install or use new traditional apps that take space on their phones and have some kind of learning curve. Developers are facing high development and distribution costs that turn the once very profitable apps business into a burden.

It is much easier to develop and launch a chatbot than an app. This provides competitive leverage to startups, as it allows to spending less time in development, e.g. building a bot for Facebook Messenger allows developing one experience that can be experienced from multiple platforms and devices, without worrying about phone sizes or operating systems. In addition, it allows more time to focus on creating positive and polished user experiences by smartly processing input (Kong, 2017).

Amunwa (2017) explains that chatbots are relevant in cases in which the interaction has the following characteristics:
- Similar or repetitive inquiries from users
- Cases in which users benefit from receiving a fast response
- Cases in which the information inquiry can be short and not necessarily a process
- Cases in which there is a relatively limited range of outputs from the system

Lastly, the question is raised on whether a simple website containing the information could be as useful as a chatbot.
According to Gonçalves (2017), at least three advantages can be noted to the chatbot favor:

- No need to learn a new user interface: While websites are planned and designed with different visual interfaces and components, people constantly have to learn how to use them. Since the latest raise of messaging apps, talking with a service or business using a chatbot will become more natural and easy to do. There is no new UI to learn, which helps first-time users getting immediate value of the product.

- Using spoken, natural language: Spoken language is the most natural way of communication, and messaging apps are just the most basic way to use this language in technology. Using messaging apps is becoming so natural because it’s easy and accessible even for people that are not tech-savvy.

- Handle onto a human agent: In a chatbot, there’s the opportunity of having a human representative ready to step in the conversation and fix whatever problem is found. In a website, it’s difficult to know if there are problems or doubts, if the user closes the website the problem is left unsolved.

3.3 Applications of Chatbots in HR Challenges

A typical challenge for a new employee in the organization is figuring out where and how to find information on policies and processes, or whom to approach with a specific question.

McNeale and Newyear (2013) define two main benefits of using chatbots as information providers:

- Possibility to tackle the problem of users that are not familiar with the terminology or jargon, this is, understanding the way users ask for information vs. the way this information is formally defined or described.

- Chatbots are not annoyed by rude users, multiple numbers of same-time requests, or even repeated queries of the same
information. Unlike humans, chatbots will remain consistently patient and polite.

It is clear that the potential interactions for an onboarding chatbot are defined by these characteristics, proving the potential suitability of the chatbots technology to be applied to HR processes. Several chatbots are either being implemented or developed currently in the field of HR. The following are just a few examples:

- Intel launched on 2013 a chatbot called Ask Ivy, which was defined as a virtual HR agent, which uses a combination of NLP, AI and optimized search hosted on the Intel Intranet to answer employees’ questions about the salary, stock, benefits and HR programs (Pearce, 2013).

- Overstock, an American retail company, is using a bot called Mila to manage employee sickness and absenteeism. When an employee needs to stay home, instead of calling and leaving a message that needs to be further listened and transferred to the relevant manager, all what’s needed is to send a chat message to Mila. The chatbot will then ask some questions and then let the manager know herself, saving Overstock time and money. In addition to chatting in sick, Mila can be used to schedule time off, check your schedule, and do a variety of other tasks that used to require making a phone call, sending an e-mail, or talking to a fellow human (Prochazka, 2016).

- Sgt. Star is a chatbot launched by the United States Army in 2007, aiming to help potential recruits on understanding and learning about a career at the Army. Sgt. Star was live on the Army recruitment webpage and eventually was launched as an app in 2014. Over the first five years Sgt. Star answered more than 10 million questions in 2.8 million sessions — an average of 1,550 per day (Coldewey, 2014).

- The chatbot Jane, developed by Loka, is a white-label chatbot meant to improve communications with employees, freeing up the time of HR staff and streamlining job
processes. Jane responds to employee questions in real time, saving the hassle of reaching the HR department. Jane also uses machine learning, so she learns overtime and can respond better to employee needs, allowing HR staff more freedom (Wolfson, 2016).

- A company called ADP is developing a white-label bot that will automate tasks such as sending a job proposal to a possible hire and alerting users to use their vacation time (Boulton, 2016).

- The chatbot Mya, developed by FirstJob, claims to automate as much as 75% of the recruiting process, and in doing so makes life better for job seekers and businesses. Mya uses AI and NLP to ask the prospect a few questions, verify qualifications, and answer questions from job applicants about things like company culture, policy, and benefits. The company explained that initial tests demonstrated that applicants who engaged with Mya were over three times more likely to hear back from a recruiter or hiring manager (Johnson, 2016).

- A startup called Talla, based in Boston, is working on a white-label chatbot designed to help new workers get up to speed and be more productive. Talla’s CEO, Rob May, says the vision is for Talla to grow from a to-do-list helper to an all-around workplace assistant (Knight, 2016).

The implementations mentioned above prove that it only makes sense to implement a chatbot that will allow a constant connection between HR teams and employees. Chatbots are not only a millennials favorite, but also extremely useful for the 3.7 million employees that work remotely and don’t have face-to-face access to HR. As a result, more talent will be retained due to better, faster, and easier forms of communication (Wolfson, 2016).

The potential benefits of implementations are clearly noticeable:

- Employee productivity and experience: providing just-in-time and fast access to information (Kong, 2017), reducing
helplessness of new employees and aiding at decision-making.

- HR productivity and motivation: freeing HR time, reducing frustration because of monotony and repetition, and automating standardized tasks (Kong, 2017). It is also possible to analyze the chat logs to find data that is not being properly handled to the users or finding issues that are not being addressed by the organization\(^\text{14}\).

None of the current implementations has been developed with focus on the onboarding of the new employee, and therefore it is needed to test the feasibility of this technology for this part of the process too. It seems that the chatbots technology could close some of the existing gap, such as giving the new employee information about his or her first day (e.g. parking information, what to bring for the first day, what hour to arrive and who to call on arrival), socializing the company’s culture and filling in for the small, or logistical details that add up to a sense of comfort and familiarity one has in a workplace, such as “Where is the toilet?” ‘What’s the best coffee machine in the floor?’ ‘How do I connect to the closest printer?’

3.4 Findings on Users Expectations from Chatbots

A few research findings give us abundant hints on users expectations of the interaction with chatbots, and should be taken into consideration when planning chatbots in general:

- Back on 2001, a text-based chat bot (HappyAssistant) that helped users access e-commerce sites to find relevant information about products and services was evaluated by Chai and Lin. Findings indicated that users preferred a

\(^{14}\) Several articles across the Internet discuss the “ethics” of chatbots and whether it is right to analyze the data from a privacy point of view. This discussion is not in the scope of the research and therefore it will not be further addressed.
natural language-enabled navigation two to one over the menu driven navigation - specially non experienced users. In addition, the study confirmed the efficiency of using natural language dialog in terms of the number of clicks and the amount of time required to obtain the relevant information (Chai and Lin, 2001). The results showed that users found it easy to use, meeting the users’ needs, users like the idea that they could express their needs in their language, users felt that the computer did all the work for them, and moreover users found that the system reduced the interaction time (Shawar and Atwell, 2007).

- Another study compared 100 instant messaging conversations between users to 100 messaging exchanges with the popular chatbot Cleverbot. The study found that people communicated with the chatbot for longer durations (but with shorter messages) than they did with another human. Additionally, human–chatbot communications lacked much of the richness of vocabulary found in conversations among people, and exhibited greater profanity (Hill, Ford and Farreras, 2015).

- According to Gaskell (2016), early studies into how we respond to chatbots suggest that we’re far more critical of the organization if the chatbot doesn’t deliver effective information than we would if a human delivered poor service. Chatbots offer an intriguing range of possibilities, but it is crucial that they deliver great service to users, rather than just a cheap solution.

- Two recent surveys that took place in the United Kingdom with 1000 respondents each (Mindshare, Goldsmiths University of London, 2016; myclever Agency, 2016), found that users prioritize the efficiency of the chatbot over its personality or friendliness. Users expressed that they expect to receive instant responses to simple to moderate questions. Also, users expect to be able to self-serve without having to talk to human agents, but they do want to be forwarded to a human representative upon request. Lastly, users expect the
chatbot to remember information in context and history of all previous interactions for a more personalized experience.
4 Methodological Approach

In the following sections, insights will be provided on the relevant areas of work prior to the chatbot implementation itself – starting from the research design and mapping of gaps in the problem domain. Next, possible technical approaches to chatbot development were explored, as well as user experience and usability aspects, definition on the chatbot intelligence level and chatbot personality.

4.1 Research Design

The research in the scope of this thesis follows a deductive “top-down” approach, as we work from the more general problem (ineffective onboarding) to the more specific behavior that can be solved (the access to information). The understanding about onboarding process in organizations and its gaps were narrowed down to an initial assumption mentioned above, and a list of research questions that can be tested. Next, the observations are collected to address the initial assumption. Ultimately, the collected data will allow testing the hypotheses - and confirm or deny the original theory.

Furthermore, it can be defined as an applied, problem oriented research, as it focuses on analyzing and solving the socialization problem of new employees to a complex organization.

After researching the relevant literature, stating the basic hypothesis and formulating the research questions, I proceeded to define the steps required to answer these questions and confirm or deny the hypothesis.

The solution proposed includes the development of a chatbot – which requires exploring the required technical needs and careful user experience planning. These aspects are described later on this chapter.

In order to evaluate the proposed solution, an iterative approach is suggested, including two rounds of development and
evaluation. At each round, a sample of target users is required to try the proposed chatbot. During the two observation and measurement stages of this research, several types of measures were used, in order to ensure maximum availability of insights.

The qualitative research takes place in the form of open-ended questions at a survey, but also by analyzing the interaction logs of each participant on the chatbot, this is, the actual conversation between the participant and the chatbot. This type of research enables to confirm or deny the potential underlying reasons and motivations for using a chatbot as an onboarding facilitator. It provides insights into the situation, allowing delving deeper into the problem and receiving actionable feedback for improvement iterations.

At the same time, quantitative insights were gained through different types of short closed-ended questions: dichotomous questions, questions based on level of measurement (using a Likert response scale\textsuperscript{15} from 1 to 9), and nominal questions. This kind of questions allowed receiving quantified opinions and generalizing results out of the tested sample. Quantitative research allowed using measurable data to formulate facts regarding the suitability of the proposed use case on this thesis.

In order to ensure maximum reliability, the survey stayed unaltered during both phases of the research. Within a 3 days timeframe, the survey was to be filled out by the participant at its own convenience, in the same way as the chatbot testing.

4.2. Organization Gaps on Onboarding

As a first step, it was critical for me to gather internal and external data that would help me frame the problem, understand the landscape, and get a proper idea of the players and factors influencing the development of the chatbot.

\textsuperscript{15} The Likert Scale is the most widely used approach to scaling responses in survey research, the name being often used interchangeably with rating scale. (Wikipedia, n.d.)
The environment for creating and testing the onboarding chatbot is Citibank’s Innovation Lab in Tel Aviv, Israel. This is a hi-tech corporate environment where the conditions are aligned to the requirements of this exploration. As an employee and hiring manager of designers, and having assisted a number of new employees during their onboarding, I reached the HR representatives aiming to map the onboarding gaps at the Lab. In this discussion, the HR business partners shared their inputs about the gaps in the current onboarding process:

- **Paycheck and pension rights:** New hires are interested about what is the paycheck date and who is the person to contact in regard of adjusting their pension rights and savings according to the company’s administrative agent.

- **First day issues:** New hires need to be informed about what time to arrive on the first day, which documents should they bring with them, where to park in the building and who to meet on their arrival. In addition, they should pass through several stations and receive cards (entrance badge, food card, parking card), which are critical on the first day.

- **Food card budget and usage:** New hires are often uninformed about the food card rights and ways to order, either because they haven’t used a food card before or because their former company had a different agreement.

- **Office hours and facilities:** The HR would like to clarify the open hours of the office and the facilities available in the building, such as parking, bicycle parking and showers. On the other side, new employees are often interested on how to use the printers for a last moment document, and how to connect to the office Wi-Fi.

- **Office key positions/stakeholders:** During the first days the new hires need to contact the office administrators, security manager and IT guys; the new hires usually need help finding these people.

- **Employee benefits:** The HR agents expressed that there are several employee benefits left unused. They would like to
use a chatbot as a way to better expose the available benefits and increase the wellness feeling of the new employees.

The HR agents agreed that a chatbot serving to answer these questions would remove part of the load of being repeatedly asked the same things. The HR representatives expressed that, in the case the project is active after the scope of this thesis, the chatbot should be under their supervision. It is possible that this last concern was raised out of fear that such a chatbot would replace them and make their jobs irrelevant. It was reassured that the chatbot objective is not to remove the HR representative function but to provide them support in the task of onboarding new employees. The HR agents agreed that the chatbot would enable them to approve new employees initiating a conversation with the bot and establishing a conversation channel right at the moment of signing the working contract. This way, the conversation could start right during the next few days, to complete missing information and to inform the new hire about what to bring and do on their first working day.

During this research phase, two new employees in the lab were approached during their first week to gather more information on their perception of the onboarding process. The new hires’ expressed interest on the same items stated by the HR delegates, and also introduced the topic of transportation. The new hires expressed they would need information about the parking lot, office shuttles from the train stations and buses arriving to the office area.

The selected name for the chatbot is ‘CitiBuddy’, as a reference to the ‘buddy’ that is assigned to a new hire in Citi. If in the future the project is expanded into other branches, the ending ‘TLV Lab’ would be added, making the chatbot customized for each branch and R&D center at Citi - duplicating the bot, changing data or adding functions accordingly could easily achieve this.
4.3 Chatbot Intelligence Definition

One of the most critical aspects when it comes to the chatbot field is how we define the intelligence of a chatbot, and as a consequence, defining the level of intelligence that the chatbot should have.

Many online sources describe what could make a chatbot appear intelligent, starting from a linear but well designed conversational interface, to natural language processing capabilities to understand sentences that are not properly structured (in other words, receiving an answer for questions that are off-topic).

Kojouharov’s Chatbot Conversation Framework (2016) is a very helpful resource when getting to define the expected level of intelligence of CitiBuddy.

In the model pictured below in Figure 2, Kojouharov (2016) explains that, when it gets to conversations domains, a chatbot can either be closed or open. A closed chatbot can basically understand a limited number of questions about a specific domain, whereas an open chatbot should be able to understand any question or input given by the user. Moreover, when speaking about the response generation, a chatbot can roughly take two approaches:

- A retrieval-based chatbot will use a repository of predefined responses and some kind of parameter to pick the most appropriate response based on the input and context. The parameter could be simple, as a in a rule-based expression match, or complex as in an ensemble of Machine Learning classifiers. In any case, these chatbots don’t generate any new string; they just pick a response from a fixed set (as large as it may be).

- Generative chatbots are harder to create, as they don’t rely on pre-defined responses, they generate new responses from scratch. Generative models are typically based on Machine Translation techniques, but instead of translating from one
language to another, we “translate” from an input to an output or response.

Kojouharov (2016) explains that the only way to build a really intelligent bot is by developing a unique generative response model in an open conversation domain.

For the scope of this research, the selected approach is the Rules-Based chatbot - in other words, a mostly linear, hard-coded system of questions and answers. CitiBuddy will understand a series of questions in the domain of onboarding to Citi, and provide answers that have been pre-programmed. It is also the fastest model to build as an MVP\textsuperscript{16}. Having machine learning capabilities is a useful bonus that could be implemented in further phases if the POC\textsuperscript{17} proves to be valuable to the organization.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{kojouharov_chart.png}
\caption{Kojouharov's Chatbot Conversation Framework (2016)}
\end{figure}

\textsuperscript{16} Minimum Viable Product, the minimum standard version of the product providing value that would be suitable to be sold or tested.

\textsuperscript{17} Proof of Concept
4.4 Approaches to Chatbot Development

The next step to this project was to decide the development approach for the chatbot, which would allow a fast launch while having the basic capabilities to achieve the chatbot goals.

As part of the work in previous courses at the Linnaeus University’s Social Media and Web Technologies Master Program, a deep exploration of the multiple options available for chatbot creation and launch was performed, as well as testing a few of them for personal impression.

There are roughly two approaches for developing and launching a chatbot in an organization:

4.4.1 Using a DIY Chatbot Platform

Bot platforms are online ecosystems (web-apps) where chatbots can be deployed and interact with users, as well as perform actions like interacting with other platforms. Bot platforms are more suitable for beginners or non-technical users to develop bots without coding, or allowing the integration of code for further functionality (mostly integration of third-party services), but not as a must. The most notable examples include: Chatfuel, Motion.ai, Manychat, Botsify, Converse.ai and Octane.ai.

The user interface for the bot builder in DIY chatbot platforms is user-friendly and simple, generally drag-and-drop based. The possibilities for customization are relatively high, making it easy and cheap to launch a bot (in some cases, even free). As of today, functions are limited in comparison to coding from scratch, but functionality is constantly being added - it is already possible to set simple logic rules. The DIY chatbot platforms allow integrations with one or multiple messenger platforms. Most of the services offer tutorials to get started, and

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18 https://chatfuel.com/
19 https://www.motion.ai/
20 https://manychat.com/
21 https://botsify.com/
22 http://www.converse.ai/
23 https://octaneai.com/
some of them have active blogs or communities (such as the Motion.ai Slack channel\(^{24}\)).

4.4.2 Using a Bot Development Framework

A bot development framework is a software framework that normally includes a set of predefined functions and classes that developers can use for faster chatbot development. In the framework the bots are built and the behavior is defined. According to Maruti TechLabs (n.d), a bot development framework usually consists of a Bot Builder SDK, a Bot Connector, a Developer Portal, and a Bot Directory, as well as an emulator to test the bot. The most notable examples of bot frameworks are: Microsoft Bot Framework\(^{25}\), Wit.ai\(^{26}\) (bought by Facebook on 2016), Api.ai\(^{27}\), Meya Bot Framework\(^{28}\) or PandoraBots\(^{29}\).

Bot development frameworks are considered challenging for beginners who want to learn chatbot development, since they have a certain learning curve. Although this option requires technical expertise and more cost, it is the only one that is flexible and tailor-made to the company, allowing the implementation of complex and unique functionalities. Most framework providers offer regular maintenance and are constantly improving the framework capabilities. Yet, it takes more time to develop a bot using a development framework, and also a server infrastructure for hosting is required.

In order to select which of these two approaches would be more suitable for CitiBuddy, a selection criterion was established - this is, defining the parameters that are most critical when giving priority to a development approach. The criteria to select the development approach are the following:

\(^{24}\) [http://slack.motion.ai/](http://slack.motion.ai/)
\(^{25}\) [https://dev.botframework.com/](https://dev.botframework.com/)
\(^{26}\) [https://wit.ai/](https://wit.ai/)
\(^{27}\) [https://api.ai/](https://api.ai/)
\(^{28}\) [https://meya.ai/](https://meya.ai/)
\(^{29}\) [http://www.pandorabots.com/](http://www.pandorabots.com/)
- Easiness of deployment to the selected messaging platform
- Friendly, drag-and-drop user interface that is not code based
- Capability to develop an MVP in short time
- Capability to implement AI to some extent, or to integrate with an additional AI engine
- Service is provided for free

The DIY chatbot platform approach was considered as the most suitable for developing an MVP in the scope of this thesis. Among the DIY chatbot platform, Chatfuel is to the time of the selection, the most popular. Being relatively young, it already counts with a big community, blog, chatbot templates and help resources, and it is the best-rated platform on the chatbot service comparison website Botsbase according to multiple parameters. Chatfuel allows setting up basic AI algorithms and integrating your bot with a number of third-party services. Various plugins for Chatfuel are available, the jSon API and the Google Search being the most useful ones. Moreover, Chatfuel has built-in capabilities, such as introducing a welcome message, querying the user’s profile details, a persistent menu that can help with navigation, a broadcast feature and an analytics module.

Chatfuel is free to use for up to 100,000 messages per month, which is more than enough for the scope of the project. A few mature and successful bots have been developed using Chatfuel, two examples being the most remarkable:
- The TechCrunch bot was voted the best news bot in 2016 (Gamanyuk, 2017).
- The highly ranked Product Huntian bot uses Chatfuel together with Api.ai as a trigger system (Keyul, 2016; Chatbottle.co, n.d.).
- Chatfuel also mentions in their website that bots for companies like Adidas, Buzzfeed, National Geographic,

30 http://www.botsbase.com
31 https://www.messenger.com/t/8062627951
32 https://www.messenger.com/t/producthuntian/
Forbes, British Airways, Uber and Audi have created bots using the platform.

From my experience with the platform during previous exploration in the scope of other courses, Chatfuel is a perfectly suitable platform for this project, while standing positively in all the selection criteria previously stated.

4.4.3 Messaging Platform
The selected messaging platform for CitiBuddy is Facebook Messenger - not only it is the most popular and widely supported by all development approaches, but also a very popular platform within the culture of the company’s hires and suitable for a chatbot MVP.

4.5 UX and Usability Aspects

When it comes to web applications and mobile apps, user experience and usability best practices have been long standardized; anyone looking to design or improve a websites or apps can use guides like Steve Krug’s book “Don’t Make Me Think” 33 containing established usability practices, Nielsen’s heuristics 34 which can be used as broad rules of thumb, or even the Gestalt principles 35 for organization of visual elements. However, when it comes to conversational interfaces, these usability guidelines intended for graphical interfaces are proving to be only occasionally relevant, and they are not comprehensive enough anyway. Moreover, recent surveys illustrate that “the techniques of Chatbot design are still a matter for debate and no common approach has yet been identified. Researchers have so far worked in isolated environments with reluctance to divulge any improved techniques they have found, consequently, slowing

34 https://www.nngroup.com/articles/ten-usability-heuristics/
35 http://graphicdesign.spokanefalls.edu/tutorials/process/gestaltprinciples/gestaltprinc.htm
down the improvements to chatbots” (Abdul-Kader and Woods, 2015).

As the chatbot field continues to grow, standards and best practices for building bots are likely to emerge over time and establish themselves among the user experience designers and bot developers’ community. But for now, it’s a little vague and undefined, with no main or structured guideline to follow. I explored the best practices and advice from experts on how to develop successful chatbots. Most of these guidelines do not have proven records but they can serve as recommendations.

4.5.1 Best Practices Recommendations from Industry
The following guidelines are a summary of best practices, based on notes and articles from industry leaders (Chatbotics, 2016; Toscano, 2016; Kong, 2017; Yao, 2016; Bushtruk and Skorniakov, 2016; Mariansky, 2016):

4.5.1.1 Hint on the user on how to get started: Chatbots don’t seem intuitive for most users yet. Provide clear cues to easily start the interaction. Prompt the user on what’s about to happen next, by starting with a quick introduction and a clear call to action, preferentially inviting users to try one quick benefit of your chatbot and to enjoy the result immediately.

4.5.1.2 Set and manage user expectations: On the first opportunity, clearly explain the purpose of the chatbot, what it can do and how to interact. Do not attempt to address problems beyond your scope. Instead, focus on mastering the specific domain and managing users expectations by keeping the conversation within your comfort zone.

4.5.1.3 Smallest number of steps possible: Try to plan the conversation in order for users to achieve their goal in the fastest way possible. In general, keep interactions as short and precise as possible.

4.5.1.4 Provide a path to the end goal: Give cues for users to advance to the next step and eventually reach the end
point; in any case, never leave users hanging in a conversation without knowing how to continue.

4.5.1.5 Allow flexibility: Allow users to exit from a specific interaction, whether it is using a command or a persistent menu.

4.5.1.6 Use buttons as guidance for interaction: Buttons can hint to users about what kind of questions the bot can answer and what actions it can perform. They are pre-defined inputs and therefore, perfectly accurate and predictable in a flow. Also, it is faster than typing text, reduces the possibility of error and the cognitive load for the user.

4.5.1.7 Use AI to understand human expressions: Different users phrase requests differently, e.g. “Hello”, “Hi”, “Wassup”, “Yo” could all be signs of greeting, to which the chatbot should answer in a similar way.

4.5.1.8 Use emoji, images and graphics to enrich the conversation: They are easier to understand than text explanations and can eventually express the bot’s personality better.

4.5.1.9 Give your chatbot a conversational manner of speech: While the bot is not meant to be a jokes machine, it shouldn’t sound too clever either, by using complicated grammar or language structures. Try not to use gender-specific pronouns. For pre-defined cases, prepare a set of varied canned replies to make the conversation more human-like. Also, it helps to write witty, humorous replies for unsupported topics, so that the bot doesn’t look dumb. Add adequate delays in response time to give a human dimension.

4.5.1.10 Input validation: Whenever possible, avoid open-ended questions and try to demonstrate the type of answer you’re looking for. If the pool of possible answers is small, just list them. When the answer is valid, repeat it to make sure you understood it correctly, and move on. If the input isn’t valid, explain again what you were
expecting (versus what you received). If possible, be smart about distinguishing between answers you don’t understand and answers that make sense, but that you can’t accept.

4.5.1.11 Timing out: A user can ask something and then step out to lunch, or simply abandon the conversation. The chatbot should be aware of this - if the user starts something, disappears for hours or a whole day, and comes back with a new question, it can be safely assumed that the former question is no longer relevant.

4.5.1.12 Fail gracefully: If the user’s request is not understood, the bot should let the user know, and provide a way to recover from this error and continue the interaction, either by asking the user to re-phrase the request or providing a path to continue. A lack of response from the chatbot leaves the user hanging and not knowing what to do, and this should be avoided.

4.5.1.13 Provide help at all times: Support ways to get help outside of the chatbot when needed. These solutions can include speaking to a human agent or directing the user to further documentation.

During the flow planning and development of the chatbot, these principles served as a guide. Every single part of the chatbot was compared against to, as a checklist that ensured a basic level of quality in the flows and messages implemented. The way each of these influenced the chatbot creation is expanded on Chapter 5.

4.6 Chatbot Personality Definition

Schlicht (2016) cites Matt Hartman, Director of Seed Investments at Betaworks: “The difficulty in building a chatbot is less a technical one and more an issue of user experience. The most successful bots will be the ones that users want to come back to regularly and that provide consistent value”. From Schlicht’s
words, it is clear that an AI implementation is not enough to make the chatbot successful. A simple, rule-based chatbot may be the most liked and followed by users if it accomplishes its task properly and delivers value to the user, even lacking advanced AI features.

A bot is not an app and the whole interface is a conversation made of words, the tone and voice of the bot and the way conversations are formed is ultimately the core of the experience. The tone and voice is basically defined by the bot’s “personality traits” or values, copywriting, and usage of emoji and media.

4.6.1 Personality Traits
Defining a chatbot personality is the equivalent to developing an emotional and cognitive framework of how a service may think, feel, and behave (Abdul-Kader and Woods, 2015). A chatbot personality seems critical for defining behavioral expectations and setting the right level of trust from the user, apart from maintaining consistency across all of the interactions (Beer, 2016). By having the right level of trust and expectations from a chatbot, users are more tolerant of errors, so that the chance of unexpected errors is reduced, and the user adapts their dialogue level to the one expected from the chatbot.

4.6.2 Tone and Voice Values
The following values define the personality of CitiBuddy:

Polite and correct, but not formal
Informative and accessible, but not sloppy
Confident and expert, but not cocky
Friendly and caring, but not intrusive

These values will be reflected on the copy for every single message coming from CitiBuddy, and will help the user attributing a personality that hopefully reflects the values above.
4.6.3 Microcopy Style
According to Yifrach (2016), microcopy can be defined as all words or sentences in an interface that are strictly related to a user's activity that is immediate and related to the copy; including all copy before, during and after the activity. If we apply this definition to chatbots, basically all text included in the chatbot is considered microcopy.

The microcopy of CitiBuddy should be always informal but correct, understandable and mostly human. As a rule of thumb, Kojoukarov (2016) recommends sticking to simple, concrete and visual words that will now add cognitive load to the users. It is also recommended to use short sentences, avoiding jargon and using conceptual words.

There is proof that nearly 44% of the Facebook bots receive stickers from users - this is the way users communicating feelings and emotions (Merritt, 2017). CitiBuddy will also include pre-planned emoji in cases where it is relevant and kind; using a smiley in every single message would make the bot feel too friendly and un-professional.

For the sake of simplicity, the chatbot will speak only in English. This is also part of the communication culture and requirement at the company.
5 Scenarios and User Flows

Definition

In the following section aspects of conversation design are defined, as well as the final linear and non-linear flows that the chatbot will support.

5.1 Conversation Design Goals

Chatbots, in their current implementations within messaging platforms, don’t provide a rich graphic experience in the same way apps do. There are no graphic element that provide leverage to the designer and allow a rich interaction – all the interaction that exists is based on the text and the interface provided by the messaging app. Making this conversation flow as naturally and efficiently as possible is one of the most challenging parts about designing a chatbot, because human interaction is non-linear, messy and mostly unpredictable. An enjoyable conversation is one that is structured in a way that allows the user to achieve its goal in a unique and delightful way. A well-structured dialogue reduces the user’s fear and stress by smartly addressing the issue and providing relevant answers (Beer, 2016).

Based on the aspects mentioned on the previous section related to onboarding gaps, development and intelligence capabilities, the following goals are set for the user:

- Getting information about transportation to and from the office by car, train or bus
- Finding out who are the key stakeholders, how they look like and where to find them
- Getting to know how to use the food card
- Getting connected to the Wi-Fi at the office
- Finding information about the office hours and facilities
– Finding out about convenient employee benefits like gym membership and shopping vouchers
– Having an additional point of contact with the company for questions and feedback

5.2 Mapping the Conversation

Once all the required information was mapped, the research phase was concluded and the design phase initiated – the design of how every interaction with the user will look like, by defining the chatbot behavior in every possible scenario.

The analysis and synthesis of the information, ideas and goals generated in the previous phases was a critical next step to inform the ongoing flows and chatbot design.

The idea was to create a complete navigation map for CitiBuddy, defining what could happen at every step - which interaction element will be activated by the user, what happens if something goes wrong, what happens if the user wants to go back or skip a step. The following flows are a rough draft of a viable conversation ecosystem which was iterated continuously and that was ultimately polished during the programming and QA of the chatbot. As a sidenote, it’s worth remarking that the flows, their content and media, the AI triggers and all of the texts in this chatbot are solely composed by the author of this thesis and were not developed in collaboration with the workplace, nor submitted for any way of approval or certification by any entity in the organization. The company was aware and did not object to the study.

XMind\textsuperscript{36} was the tool selected to design the chatbot flows from scratch. First, a color legend was defined, according to the categories of the possible types of input and output the chatbot might interact with. The color legend is described below on Figure 3.

\footnotesize{\textsuperscript{36} http://www.xmind.net/}
5.2.1 Getting Started
In order to start a conversation with CitiBuddy, the user needs to follow a link or else search “CitiBuddy” from within the Facebook Messenger app.

When CitiBuddy is found, a short introduction is given, along with a button to start the conversation – “Get Started”. This introduction is also inline with 4.5.1.1 Hinting on the user on how to get started.

5.2.2 First Interaction Message
The UX design discipline devotes an ample space to talk about how a mobile app or website should clearly explain what it is (e.g. a brand or service), what it can do and what it is good for (the value of the interaction). When it comes to chatbots, a clear welcoming message seems to be fundamental, centering the expectations of the user and explaining the purpose, functionality and problems that the chatbot can solve. Also, it sets the initial tone and voice of the interaction.

The first interaction was mapped and configured by considering 4.5.1.2 Set and manage user expectations. The full mapping of this interaction is shown in Figure 4.

5.2.3 Buttons and Carousels as Rich, Fast Reply Methods
Even for those that really love messaging applications, the reality is that a long interaction based only on typing messages can quickly become tedious. Sapho (2016) explains that Google has been the leader on understanding shorthand texts and returning us meaningful results. However, Brody (2017) claims that providing an button-based navigation rather than only trying to understand text makes it easier to build a bot, and also make the
Figure 4. Initial First Interaction Mapping
bot interface unequivocal to the user, as they can grasp what can be expected and what are the available options.

As of March 2017, Facebook is encouraging the usage of buttons in chatbots (even giving the capability for developers to disable the text input option altogether in the chatbot), as well as having persistent menus – a very app-like feature. This is believed to be based on the fact that AI capabilities available for chatbots are still relatively limited - at this stage, AI still cannot empathize like humans, making it difficult for developers to understand human inputs and intents and provide a meaningful response (Barkin, 2017). As Matt Burns, a senior editor at TechCrunch expresses: “We don’t want to see developers move away from text input entirely, but […] a hybrid solution is a far better UX until the technology catches up.” (Barkin, 2017).

It was decided to implement quick-reply buttons, back buttons and carousels wherever possible, in the intent that these should be the main drive for interaction between the user and the chatbot.

An interactive carousel or a list of quick replies within a chat window is a much more efficient and effortless response than messaging back and forth. Also, when users have options to choose from, they understand what is possible and what is not, and have higher confidence in the interaction. Utilizing buttons is recommended in 4.5.1.6 Use buttons as guidance for interaction.

5.2.4 Chatbot Menu

It was critical to have an all times available persistent menu, which could be used by the user as a shortcut to all sections of the chatbot. As Chatfuel does not allow more than 4 items in the persistent menu, it was decided to arrange an option that brings back to all items, a bot restart and the possibility to give feedback. Having a menu and option for restart is aligned with both 4.5.1.5 Allow flexibility and 4.5.1.13 Provide help at all times.
5.2.5 Typing Artificial Time
In a few of the scenarios an artificial typing animation was added. This is helpful in order to add humanity to the chatbot and provide the perception that things are actually happening (because it takes time to process them). In this area, research indicates that adding a very short delay is, in some specific cases and interfaces, a good way to convey to the user that something is taking place, a transaction is happening or information is being passed (Brignull, 2010; Anderson, 2013). It is also aligned with 4.5.1.9 Give your chatbot a conversational manner of speech. This is not recommended at every step of the dialog, but only in cases something is sent to the chatbot or needs to be processed, e.g. reporting sick days and sending feedback.

5.2.6 Fake Doors
Some fake doors were added into the flow, in order to gather insights about what would be features or content the users are interested in. Fake doors are an easy way to tell whether or not time and effort should be invested into a product or feature, based on the number of users that reach the option and show interest (Mester, 2016). In this case, fake doors were added both in the flow (for example, the “Search the lab” option) and the interaction with them is measured to see if there is interest in a feature that is potentially harder to integrate and develop. Once the user taps on this option, the chatbot returns the response “Thank you for your interest in this topic, we are working to make it available soon”.

5.3 Initial Flows
The following flows were added for the first prototype iteration, based on the onboarding gaps researched at the first phase. For every flow the texts were mapped and polished several times, until the conversation tone felt natural and according to the usability guidelines and chatbot personality described above.
During the writing of these flows, the following principles were followed:

- Having short flows and striving for short messages on each interaction. This is a difficult task as CitiBuddy is mostly informative, so the concept was to provide the minimum valuable information and then giving the option to learn more or expand on the topic (4.5.1.3 Smallest number of steps possible).

- Always providing quick reply buttons as a cue for the next step, or at most a button back to the main menu if there is no further interaction (4.5.1.4 Provide a path to the end goal).

- All of the messages sent by CitiBuddy were written according to the personality traits set above, focusing on an easy-going, informal style of writing which also includes emoji and media. (4.5.1.8 Use emoji, images and graphics to enrich the conversation, 4.5.1.9 Give your chatbot a conversational manner of speech).

5.3.1 Initial Transportation Flow
This flow allows users to get information about commuting to and from the office, by car, bus or train. More over, it has explanations about the possible parking arrangements, as well as the shuttles to and from the office. The flow is shown in detail in Figure 5.

5.3.2 Initial Food Flow
This flow allows users to get information about how to get and use their food card on their first day. Also, it explains the late dinner policy, usage and budget aspects. Lastly, it recommends the best places to eat in the area. The flow is shown in detail in Figure 6.

5.3.3 Initial Key People Flow
This flow allows users to get to know who are the key people from the office to help on the first days, as well as their location, picture and ways to contact. The flow is presented in detail in Figure 7.
Figure 5. Transportation Flow

- **By Car:**
  - The address of the office is: Citi Bank, B’Kiryat Atidim, Tel Aviv, Israel.
  - Navigation to office:
  - Parking arrangements:
    - You can park on the office parking lot. Please park in floor 2. Get your parking card from Galit, the office admin.

- **By Bus:**
  - Picture of the bus stop:
    - The office is 100 meters away from the Atlit bus terminal. Some of the popular buses to the office are 88, 185, 285 and 385. Also, 142 and 22 and at Atlit. To get to the office, go down in the last station and walk through the Atlit Park until you see building no. 8. It’s the last and the highest one.
  - Map to walk to the station:
    - To hike, walk to Divra Hanechoa street. The buses stop next to the gas station.
  - Pic of the station:

- **By Train:**
  - There are free shuttles to and from the office from the train stations of Tel Aviv University and Betel Bank. To catch these you must show a special card that you need to get from Galit. For your first day, just say yes to the driver.
  - Morning shuttles from Betel Bank:
    - Picture of hours and spot to take:
      - If you miss all these, take any shuttle to Ramat haSho’ayim and do the 5 min walk to Atlit. Unfortunately, there are no other buses or taxis available from this area.
  - Afternoon shuttles to the Bank:
    - Picture of hours and spot to take:
      - All shuttles leaving next to Building 8.
  - Morning shuttles from University:
    - Picture of hours and spot to take:
      - If you miss all these, take bus 285 or Betel Atlit from the same spot. If you are feeling spoiled, there are also plenty of other shuttles.
  - Afternoon shuttles to University:
    - Picture of hours and spot to take:
      - All shuttles leaving next to Building 8.
Figure 6. Food Flow
Figure 7. Key People Flow
5.3.4 Initial Employee Benefit Flow
This flow allows users to get info about employee benefits they might be interested on, mostly based on discounts that benefit the Citi employees, such as gym membership, cinema discounts, shopping vouchers and bank account benefits. The flow is partially described in Figure 8.

Figure 8. Employee Benefits Flow

5.3.5 Initial Lab Facilities Flow
The flow included basic textual information about the office hours, showers, printers, supplies and Wi-fi connection.

5.3.6 Non-Linear Interactions
After the main flows some easy-to-answer questions we mapped as possible interactions that the users may initiate. We know users like to play and challenge chatbots, and love to discover what the chatbot may be able to answer in small talk. Also, some popular inputs are mapped, attempting to give them a proper response, or at least a way out of an unfruitful loop.

In addition, most of the steps used in the linear flows will be mapped into the AI, as shortcuts to enter the main flows at different steps. For example, the question ‘Who is Galit?’ entered
at any step of any flow, will stop the flow to put this explanation in place – by prompting the relevant block of information.

Lastly, some of the expressions that the user may input - mostly related to greetings, confirmations and error messages - would be chosen randomly out of a list of options. If the response for a specific interaction is always the same, the experience might feel cheap and limited. A bundle of 3-5 ways to express the same idea will remarkably add sense of interactivity to the bot. This is inline with guidelines 4.5.1.7 Use AI to understand human expressions; 4.5.1.9 Give your chatbot a conversational manner of speech; and 4.5.1.10 Input validation.

The way to input these keywords into Chatfuel is pictured in Figure 9. The initial mapped keywords are detailed in Figure 10. The full list of AI triggers and answers can be found on Appendix A.

![Figure 9. Example of AI module with random text answers on Chatfuel](Screenshot from dashboard.chatfuel.com)

With these basic interactions and flows planned, the planning phase concluded, while understanding that further concerns, gaps and improved text formulations will arise as the chatbot is being created. The flows were polished and texts improved several times at every stage where the original texts were not working as expected.
Figure 10. Initially Mapped Non-Linear Interactions
6 Chatbot Implementation

The following section describes the efforts invested during the two phases of implementation and usability studies, which were completed by a survey following the usage of CitiBuddy. The chatbot can be publicly accessed on m.me/citibuddy2017. The demo video can be found on https://youtu.be/69yPYoMKUyk.

6.1 Initial Implementation

The way the conversations are structured in Chatfuel is simple and can be explained using a simple diagram, pictured in Figure 11 below.

![Conversation Structure with Chatfuel and Facebook Messenger](image)

Figure 11. Conversation Structure with Chatfuel and Facebook Messenger

6.1.1 Basic Setup

The basic steps for implementation include creating a basic Facebook page for CitiBuddy and a bot in Chatfuel. Next, these two are linked so that the Facebook page hosts the chatbot. However, the chatbot can be directly reached on Facebook Messenger with no need to go through the Facebook Page.
6.1.2 Blocks Creation

The next step was to create all relevant blocks in Chatfuel. The bot structure in Chatfuel is free and the blocks can be added freely or separated into groups for a better organization of the content, as pictured in Figure 12. The blocks area doesn’t demonstrate any hierarchy or connection – this is only done internally at each block.

![Bot structure diagram]

Figure 12. Part of the Chatbot Blocks Structure on Chatfuel’s Dashboard
(Screenshot from dashboard.chatfuel.com)
The basic chatbot template includes two default blocks that cannot be removed: the welcome block and the default answer block. The welcome block is shown to all new users when they first tap «get started» or after they send a first message. The default answer block is the block that users are pointed to when the input not recognized by Chatfuel.

A block can include more than one element. In fact, most of the blocks usually include a chain of elements, such as an image, a text bubble and then a series of buttons or quick replies.

Blocks were created in Chatfuel for all of the pictures, GIF images, carousels and textual answers that CitiBuddy replies to the user. Different attempts of buttons structures were tried, as opposed to quick replies, which have in Chatfuel different capabilities.

![Figure 13. Options for Buttons as Opposed to Quick Replies on Chatfuel](Screenshots from dashboard.chatfuel.com)

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37 A lossless format for image files that supports both animated and static images (Wikipedia, n.d)
While both buttons and quick replies allow linking to other blocks, only buttons allow opening an in-browser view, making a phone call or sharing content, while quick replies allow saving the chosen button as a user attribute. It is worth mentioning that, while there is a limitation of 3 buttons on a text bubble, there is no limitation on the quick replies that can follow a text bubble. The difference on the interaction options for buttons and quick replies are pictured in Figure 13 above.

6.1.3 AI Module
Chatfuel provides a basic AI module, in which specific words can be mapped and answered using an existing block, a predefined text or a randomized answer out of a predefined set of answers. An example of this mapping can be seen in Figure 14. In the AI module different references were added, in relation to the following approaches:

- **Inputs or questions that are shortcuts to blocks in the flow:** For example, if a user asks ‘What should I eat for lunch?’ then the AI module will analyze this user input and take the user to the block of food recommendations (“Good Food Around”).

- **Answers as part of small talk that users may initiate:** This is, all questions and inputs that are not necessarily functional, such as “Hi”, “Thank you”, “How are you?” Some of this inputs link to specific blocks in the flow. Others have a textual or image answer, usually randomized out of three options, in order to give a more humanlike feeling to the bot. These include to some extent answers to potentially challenging and off-topic questions, such as “Tell me a joke” “What is the meaning of life?” “Are you a human?” among others.
- **Answers to specific topics that are not part of the main flows:** Such as “Who is the insurance agent?” “How many employees are there at the lab?” and also answers as placeholders for topics that might be questioned but the answer is still not built in the bot, relating to different systems used in the Lab.

### 6.1.4 User Feedback Module

Lastly, a user feedback module was implemented in which the user can enter his/her ideas and these would be sent as an email. The way this module is configured in Chatfuel is pictured in Figure 15.
6.2 First Usability Testing and Analysis

6.2.1 Target Users and Test Conditions
For this usability testing 12 Citi new employees and employees to-be that belong to all groups of the Citi Innovation Lab were reached. The population sample included 9 males and 3 females, between the ages of 18 to 55, living in the area of Tel Aviv and surroundings.
Half of the sample (n=6) comprises new employees, being between a day and a month at Citi. The other half is formed by new hires that signed the contract but haven’t started working in the office yet.

The sample subjects received an email asking them to try the new chatbot made for new employees and new hires, in which they could “ask questions and find information about the Lab”. It is important to remark that the users did not volunteer for this task, but were selected from the new employees available and requested to do it. On each sample, two users did not respond to the request to test the chatbot on the defined time and therefore the results of the tests are based on a sample of ten users. The unresponsive users were no further requested to take part of the research.

Two days later, the users were requested to fill in an anonymous survey to give feedback about the usage of the chatbot. In order to create a user survey I used Typeform\textsuperscript{38}, which is a simple and aesthetic service to create online forms for free. Typeform is perfectly adapted to web and mobile, giving me the flexibility required for this task. The results gathered by this test are formed by:
- The chat logs - qualitative information, acquired by analyzing the Facebook Inbox Interaction Logs.
- The survey results - both qualitative and quantitative, acquired by analyzing the Typeform survey results. The results can be found on Appendixes B and C.

6.2.2 Insights from Chat Logs
Facebook allows page administrators to see all conversations between the users and the chatbot. The interface for these conversations is pictured in Figure 16 below. From these dialogs I gathered the following insights:

\textsuperscript{38} http://typeform.com/
Figure 16. Messages List on CitiBuddy’s Facebook Page
(Screenshot from facebook.com)

- All of the users checked the area related to food, and most of them did it as a first option. In second place, both the areas of employee benefits were checked, together with the area of lab facilities. It was interesting to see that once a quick reply was tapped, the users tended to continue exploring all options among a specific menu (e.g. a user which checked “Office Hours” continues to “Supplies”, “Wi-Fi”, “Cafeterias”, etc).

- Only one user decided to give feedback using the chatbot itself: “There is no simple "back" option in the menu. If an unwanted option was chosen by mistake there is no option to go back. Only jump to the main menu”.

- Two users attempted to reach the fake door option of “Search the Lab” for people, while three users asked questions related to the groups and teams in the Lab. This could mean there is a potential interest in further depth on the areas of teams and people of the Lab.
Among the questions asked that could not be handled properly: ‘When does my working day start?’ ‘What is the average age of employees at the Lab?’ ‘Tell me a good salad place’ ‘What to do if I forgot my key?’ ‘Who is my manager?’ ‘Navigation with Waze’ ‘How do I request vacation’ ‘Do we eat at the office or go out?’

Most of the users did utilize the quick replies button as a way to navigate and interact with the chatbot. Less than half of the users asked open questions – but those who did, tried continuously to interact using these questions, while alternating with the quick replies buttons.

6.2.3 First Survey Results

The survey following the chatbot interaction provided the following insights:

- **Potential difficulties on acceptance of the chatbot as a valid method of communication:** Seven of the subjects in this sample are older than 35 years old. In addition, half of the sample users claimed this to be their first interaction with a chatbot. Lastly, nine of the sample declared Whatsapp to be their favorite messaging app, and six of the users never used Facebook Messenger, or don’t use it often. Although the Citi employees work on a hi-tech environment and are relatively tech-savvy, it is clear that most of them are not using chatbots regularly and it’s a relatively new type of interaction for them, built in a platform they mostly know but are not using often.

- **Openness to the idea of a chatbot for new employees:** Despite the difficulties noted above, all ten participants of the sample expressed they would at least give a try to a chatbot for new employees (six of them expressed that “maybe”, while four of them answered “for sure”). Also, eight participants claimed that they might use the chatbot again, and all of them declared that they might recommend the chatbot to another new employee (out of the ten participants, three claimed they would definitely do so).
- **Chatbot is efficient as a way to deliver new information:** The target users considered that some of the information provided by the chatbot was new to them (mean of 5.60, standard deviation of 2.22). Considering that about half of the sample comprises already employees that have been through some basic onboarding, it is safe to agree that even they got information that was new to them.

- **Information provided by the chatbot is perceived as reliable:** The target users expressed that they find the information reliable (mean of 7.40, standard deviation of 1.64). This is a positive finding, as the reliability perception of the chatbot is critical to encourage the usage of this technology in the organization.

- **Chatbot user experience is enjoyable:** The user experience of the chatbot was perceived as fairly enjoyable (mean of 6.80, standard deviation of 1.75). Also this is an important finding, since a pleasant and enjoyable user experience of the chatbot is another important factor for its proper implementation in the organization.

- **Fair intelligence perception of the chatbot:** Users described the intelligence of the chatbot as fair (mean of 5.60, standard deviation of 1.64). This is an interesting perception, as we know the answers of the chatbot are linear and flow-based, without intelligent response generation. This finding proves that effective scenario planning and basic AI hard-coded rules can effectively simulate intelligence.

When asked about the features they liked in the chatbot, the users mentioned the friendliness of the UI (“user friendly with the menu option”; “giving me a nice menu for the info I need”; “nice UI”; “easy to use”), and the wide range of information available (“information was really wide and related almost to all new employee spheres”; “helpful info, welcoming, straightforward and not too smarty”; “provides info I wouldn’t think of asking”). A single user mentioned the performance as a good aspect, while a
different single user mentioned the use of humor as a positive aspect.

When asked about things they didn’t like, most users related to the limitations of understanding free text questions (“the bot couldn’t answer most of the questions that weren’t in the menu feature”; “its understanding of free text questions is a bit limited”; “couldn’t tell me when my working day starts”; “couldn’t see example of written questions”).

A single user mentioned that the chatbot should include more information related to the day-to-day and not only to the onboarding process, hinting that the chatbot would be considered a legit and preferred way of receiving information even after the onboarding process.

Among the features they would expect on a new hires chatbot, two responses were repeated a few times among the test subjects, and it was decided to add them for the second iteration of the chatbot:

- The need to search for groups and teams, employees and positions of the lab, and general organization information. A simplified version of this will be planned and integrated into the chatbot. For specific query of the employees and positions, basic backend integration is required. This will not be achieved in the scope of this thesis, but it is completely achievable by integrating with the relevant organization systems via API.
- Some basic orientation, pictures and map of the lab. This is simple to achieve and add to the second iteration.

6.3 Improvement Sprint

During this development phase, the chatbot was upgraded by improving the following areas:

- Adding the two features learned from the testing with the users sample – basic lab orientation, and groups and teams.
- Adding AI links and blocks to different requests that popped up during the first usability testing, as well as AI for areas related to the new flows, supporting the textual query.

- Fixing the “error” default block by utilizing the “go to block” feature. Instead of having one single error block, which is repetitive and might feel robotic, like a person who always replies with the same words and the same tone. The error block reroutes to a random error block out of 6 possible blocks. This is inline with guidelines 4.5.1.9 *Give your chatbot a conversational manner of speech* and 4.1.5.12 *Fail gracefully.*

### 6.3.1 Improved Lab Facilities Flow

The main gaps identified are the location of different open spaces, kitchens, lobbies and meeting rooms. When planning the integration of these to the existing flow, it felt natural that the open spaces would go under a sub-flow of the current Lab Facilities flow - “Working Areas”. Next, the kitchens pictures’ would be integrated into another sub-flow called “Cafeterias”. The lobbies would be included in the existing “Office Hours” sub-flow, while the meeting rooms would be integrated into another sub-flow - “Meeting Rooms”. There are multiple meeting rooms to fit in one single carousel (there is a Facebook Messenger limitation to 10 items in a carousel), so this sub-flow will be further divided into 3rd floor and 4th floor meeting rooms. The flow is described on Figure 17.

For each one of the meeting rooms a link to “GetARoom” was added – this is an experimental Citi system that allows people to instantly book a meeting room by their phone NFC or by scanning a QR code. In the case of CitiBuddy, the buttons will take the users to the same link that is used by the QR code, allowing the users to connect to this same system seamlessly and booking a room through it. This is the only integration to an existing, functional Citi system in the chatbot.
6.3.2 Groups and Teams Flow
The second flow that was added in this iteration is the Lab Groups. The lab’s hierarchy and work teams are complex for the newcomers, and many of them are curious about the disciplines that the lab works on. A brief research on the teams and groups in the lab allowed to create an organization tree – although it is a fluid organization, the groups were mapped and developed a flow in which each group is briefly explained. The flow is described below on Figure 18.

6.3.3 Analytics Implementation
In addition to the built-in analytics from Chatfuel, advanced analytics using Dashbot were introduced, a free provider that provides analytics and specific metrics to help developers increase user engagement and improve the overall chatbot experience.

It is important to remark that the analytics were introduced also for the first study, however an unexpected bug on Chatfuel didn’t allow for data collection on the days of the first usability test.

39 https://www.dashbot.io/
Figure 17. Lab Facilities Flow
Figure 18. Lab Groups Flow
6.4 Second Usability Testing and Analysis

6.4.1 Target Users and Test Preconditions
For this second usability testing, a different group of 13 Citi new employees and employees to-be that belong to all groups of the Citi Innovation Lab was reached, in the very same way as in the first attempt – by email, requesting them to test the chatbot. Again, three of the subjects did not respond to the request, resulting again on a final sample of ten subjects, this time in an even distribution of males and females. It is important to remark that the sample turned to be in average remarkably younger than the previous sample - six of the test subjects belong to the 26-35 years old group, as opposed to only two of the subjects of the previous test, in which the majority was in the 36-45 years old group. Moreover, the second test group uses Facebook Messenger more often than the first group.

Regardless of these aspects, all of the test conditions were identical to the ones in the first test. In this opportunity the results were gathered not only by the logs and survey, but also by the analytics framework mentioned above.

It is important to remark that in the time between the tests, Facebook updated the UI of Messenger for Chatbots, making the text input less accessible. As mentioned above, as of March 2017 Facebook is pushing for chatbots to be button-based, and this may have affected the way the test subjects interacted with the chatbot. It is not possible to predict whether the users would have had a higher interaction using text, if the input was available as before. Unfortunately, independent developers cannot control these changes.

6.4.2 Insights from Chat Logs
The interaction logs revealed the following:
- Despite the new areas added to the chatbot, once again all of the users first checked the area related to food. Next, the areas of employee benefits and lab facilities remained popular and were visited by most users.
- The newly added section of Lab Groups was explored by all of the users. It was interesting to see that those who decided to go further and explore the groups, reached their group first – maybe looking for familiarity, or to see what's said about their next team.

- Eight users visited the transportation area – in difference from the first test in which this area was less popular. This may be related to the residence areas of the newly hired employees - those who live far away may be more interested in exploring the different ways to arrive to the office, which is located in a traffic-congested area.

- Three users watched the newly added video showing how to use the coffee machine.

- Three users attempted to send feedback from the chatbot platform itself, providing the following inputs: “In general, this is a great tool, and a very helpful channel. The information included is already very helpful, and provides a good coverage of 101 related questions “, “more detailed information on benefits, integration with the train and buses sites, great bot”.

- Among the questions asked that could not be handled properly: ‘What about a Citi visa card? ‘How tip is being handled?’ ‘Let’s move on to food’ ‘Is there a shuttle from Atidim back to the train station?’ ‘Can you send me a link with the details above?’ ‘Let’s get back to transportation, I would like to get more details on the shuttle’ ‘What’s Galit’s family name?’ ‘what are stocks?’ ‘what’s the foreign exchange rate for dollars to shekels?’ It would be expected from the Chatfuel AI to handle better some of these questions as the scenarios were planned ahead, however, for independent developers the Chatfuel AI module is a black box – there is no way to understand or anticipate the exact behavior. It was also remarkable that two users attempted to challenge the chatbot with their questions: ‘How much wood could a woodchuck chuck if a woodchuck could chuck wood?’ ‘who is the best team in citi bank?"
- Once again, all of the users utilized the quick replies button as a way to navigate and interact with the chatbot. Only a few utilized the input field to communicate with the bot, eventually falling back to the quick replies, even in the cases in which the dialog “went well” (this is, the chatbot understood what the user said and answered accordingly).

![Figure 19. Total Exchanged Messages (Screenshot from dashbot.io)](image)

6.4.3 Dashbot Analytics
During the course of the test timeframe, the 10 text subjects engaged in a total of 31 sessions. The average session length on CitiBuddy was 5 minutes. 889 messages where exchanged (see Figure 19 above), when a third of the messages came from the users (marked as “Incoming”), and the other two thirds from CitiBuddy (“Outcoming”). The analytics dashboard provides extensive data, such as referrals, sentiment and demographics, retention and engagement parameters, which are less relevant for the purposes of this research.

6.4.4 Survey Results
The survey results helped clarifying the following aspects:
- Possible correlation between younger age and openness to the idea of a chatbot for gathering new
information: The second test subjects are slightly more experienced with chatbots – seven of the test subjects had already interacted with a chatbot, as opposed to five on the previous test. Also, seven users expressed that they would surely try the chatbot, even if not required as part of the test. As mentioned, the second test sample is slightly younger than the first one, so there may be a relation between the age and the willingness to use a chatbot. However, this is overall a small sample to conclude this with certainty.

Second iteration rated better than the first iteration in most parameters: The second sample was rated better in most questions: level of novelty of the information (mean of 6.30 against 5.60 on the first test, standard deviation of 1.56), delightfulfulness of the chatbot experience (mean of 7.40 against 6.80 on the first test, standard deviation of 1.95), and perceived intelligence of the chatbot (mean of 6.10 against 5.60 on the first test, standard deviation of 1.96). Reliability of the information kept its same high level (mean of 7.30 against 7.40 on the first test, standard deviation of 1.76), meaning the new features didn’t affect the perceived authenticity of the information. Also, nine of the test subjects declared they would definitely recommend this chatbot to another new employee, as opposed to only three on the first test. All of the scores are considered out of 1-9 Likert scale.

Also in this iteration the subjects mentioned the UX and user interface as the highlight of the chatbot (“very user friendly and simple”; “it’s interactive”), together with the topics and amount of information. Several users considered the organization of the chatbot as remarkable (“the category’s and sub-category’s were well defined”; “Intuitive mapping of menu structuring”; “the menu showing me what I can ask”). A single user mentioned the friendly language as an advantage.

As for things they didn’t like, a few users related again to the limitations of understanding free text questions (“doesn’t understand free text very well”; “couldn’t find use of free text”);
“didn’t react good to other questions”). Three users mentioned that they suffered from different performance issues – the chatbot getting stuck and problems on opening pictures. Among the information that could be integrated, the users mentioned the possibility to check in and out of the office using the chatbot, a financial terms dictionary and integration to the trains’ timetable.

The following table sums up the results and progress of the measurable aspects of the interaction with the chatbot:

<table>
<thead>
<tr>
<th></th>
<th>First Iteration</th>
<th>Second Iteration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Novelty of information</td>
<td>5.60</td>
<td>2.22</td>
</tr>
<tr>
<td>Enjoyable experience</td>
<td>6.80</td>
<td>1.75</td>
</tr>
<tr>
<td>Reliability of information</td>
<td>7.40</td>
<td>1.64</td>
</tr>
<tr>
<td>Perceived intelligence</td>
<td>5.60</td>
<td>1.64</td>
</tr>
</tbody>
</table>
7 Summary and Conclusions

This thesis aimed to evaluate the suitability of a chatbot as facilitator for onboarding of new employees in a large organization. The results presented in the thesis are well comprehensive, starting from a literature review and summary of the chatbots state-of-the-art, through an analysis of organization needs, chatbot intelligence aspects and user experience insights. As a result of these, a basic chatbot was developed in two iterations after a thorough UX planning process, and later evaluated by users after each development iteration.

In the scope of this thesis, it was demonstrated that chatbots like CitiBuddy are an effective way to provide employees in large organizations a scalable and fast access to relevant information in real time. Chatbots can be useful for large organizations that are interested in improving their processes’ efficiency and employees’ satisfaction during this era of digital transformation. A chatbot for new hires onboarding helps bridging the communication gap between employees and the organization by allowing them real-time, unlimited access to crucial information at all times without the hassle or discomfort of needing to ask another employee. But also, having a chatbot may help to build the brand’s image and reflects the values of the organization in a useful and informal way.

In Chapter 2, two research questions were presented in order to evaluate the explored subject of implementing a chatbot for onboarding of new employees.

The first research question (RQ1: How can a chatbot support new hires on their onboarding process in a large organization?) was answered through the different phases of this thesis, from the needs discovery and UX planning to the usability testing. The results of the surveys on both iterations showed that a chatbot for new hires onboarding can support on bridging the communication gap between employees and the organization by allowing them real-time, unlimited access to crucial information at all times.
without the hassle or discomfort of needing to ask another employee.

As for the second research question, the perception of required aspects of the interaction were evaluated, and answered by using the qualitative and quantitative information obtained using the survey. With relation to **RQ2A (To what extent is the interaction with such a chatbot perceived as delightful?)**, the users expressed that the interaction with the chatbot was a delightful, enriching experience. As for **RQ2B (To what extent is the information provided by such a chatbot perceived as reliable?)**, the users expressed that they had confidence the information provided by the chatbot was correct and accurate. Lastly, the answer to **RQ2C (To what extent is such a chatbot perceived as intelligent?)** was also satisfying. Across both test iterations, users expressed that the chatbot appeared intelligent to them and managed to solve most situations successfully, despite the lack of a proper AI engine.

As for the different stages of the process, from a conversation design perspective and despite the application of methods and best practices suggested by experts, there is still a gap in developing methods for designing conversations. There is no silver-bullet go-to technique in order to ensure a successful conversation design. For this matter, an iterative, non-strict process was adopted, allowing a high degree of flexibility and the possibility to update the chatbot almost as soon as a new need or interest was discovered, or if a gap or bug were discovered in the way the conversation was planned. As design is something that is never completed, this iterative design may be the best way to ensure a constant improvement of the conversation. It is important to remark that almost all software development UX planning is a product of multiple iterations that are intended to add needed functionality and remove unnecessary features, aiming to improve the product and adjust it to the users’ needs, and this chatbot followed this approach too.

From a technological perspective, Chatfuel is a strong framework that allowed me to have a basic chatbot up and
running in a very short time, with a minimal learning curve. The chatbot technology is deployed seamlessly, with no need to install versions or push new apps – it is automatically available to the user. For more complex projects, a more robust framework with capabilities to implement AI and data gathering web hooks is required. This could be achieved by connecting a proper AI framework such as API.AI to the current Chatfuel bot, or by developing a new bot from scratch. Among the ‘drag-and-drop’, non-coding frameworks available, Chatfuel is the most robust and easy to handle, also counting with a wonderful developers community.

Together with the suitability of a chatbot solution for the specific problem of employee onboarding, an important takeaway of this research is the understanding that it is possible to create a likable chatbot that achieves its business goals while relying on simple technology and careful UX planning. In the industry of chatbots many teams are focused on technology and AI, while the user needs and use cases for which chatbots have a clear advantage over mobile apps or websites are only considered as an afterthought. If developers could stick to creating a chatbot that gives solutions on a specific domain, it may be easier to create effective chatbots, given AI is still immature even in the most sophisticated and well-funded chatbots. Some experts such as Greg Leuch, Facebook’s Poncho Head of Product, agree that it is ultimately easier to create a rule-based only bot with great content and UX that engages the user, rather than a smart, artificial intelligence bot that may difficult to interact with. It will take a few years until AI and NLP manage to ramp up and improve – meanwhile a better solution might be to focus on linear flows and well planned responses that are focused on limited domains.
8 Limitations

The research on the scope of this thesis endures limitations in the following areas:

8.1 Chatbot Development Limitations
As a first experience on developing a chatbot, which is itself a new field expanding quickly, some impediments were faced, either as part of the Facebook Messenger platform, the Chatfuel framework, the black boxed AI on Chatfuel and the overall lack of guidelines, best practices and certainty of the chatbots landscape. Ultimately, a way to overcome most of the limitations was found, either by designing a flow in a different way or creating workarounds, as in the case of the error messages when the input is not recognized.

Perhaps the results of the study might have differed if any of the factors mentioned above was altered. Also, being a time-limited study, it is safe to say that a more extended study might have provided further insights about the usage of chatbots in large organizations and the overall suitability of the chatbot to the given use case.

8.2 Participants and Measurement Limitations
When speaking of the test sample, a few difficulties were faced as well. Given that the chatbot was tailor-made for one organization, the available sample groups were very limited.

The individuals available for testing were new employees and employees to-be which joined the organization at the time of the studies. At both instances, the list of employees was provided by the HR representatives. The subjects were emailed and kindly asked to try the chatbot as a project to improve the onboarding process of new employees at the company. The individuals did not volunteer to try the chatbot and were approached without them sharing their interest in the topic. Most of the individuals cooperated (in total, 20 cooperated and five didn’t), but there is a
chance they felt obliged to do so as part of the job. The five individuals that did not cooperate on trying the chatbot in the given timeframe were not approached again. There is a chance that the individuals that cooperated were influenced by their own psychological needs at the workplace (maybe trying to be “nice” and correct), or else perceived that the task was more a requirement than an optional request.

Moreover, the research included Israeli participants and was conducted in Israel. The cultural differences and messaging apps usage of the participants may not be similar to users in other countries, or even in other companies. The parallel mixed method of quantitative and qualitative data collection is overall positive in order to gather actionable insights. However, the test groups were slightly different (gender and age). The second group was in average a little younger and might have had greater expectations from the chatbot capabilities, maybe leading to disappointment from the AI possibilities.

8.3 Connectivity to Citi Systems
While the chatbot is intended for new employees who are invited to use the bot before they arrive to the new job, the connectivity to the Intranet and company systems is not necessarily required. However, parts of the test subjects were already Citi employees, and the results exposed that they did expect this connectivity to work to some extent. The lack of connectivity may have affected the positive perception of the chatbot for these individuals.

On the second development iteration the connection with GetARoom was added, being the only connection to another Citi system – which is also external and not connected to the organization’s intranet. The access to the company intranet was not granted at this stage of the research, and therefore no other connections to the company systems were possible.
9 Future Work and Use Cases

Assuming the plan to implement CitiBuddy as an official chatbot for new employees at Citi, the following areas would eventually need to improve:

- **Better Connectivity and Integration with Citi Systems:**
  As mentioned above, at this stage and as a POC, the chatbot was stand-alone and not connected to the main Citi systems and intranet. Access from the Citi network, as well as availability on different messaging platforms should be available, such as Skype for Business, Whatsapp, and Telegram.

- **AI and Bot Training:** From an AI perspective, the UX mapping and planning is important and helped creating a successful chatbot, but it is by no means an AI replacement. Any implementation of smarter methods of input recognition should be welcomed and encouraged, in order to create a chatbot that stays relevant in a longer timeframe. Bot training methods should be implemented by integrating to an AI engine, so that CitiBuddy shall become smarter and learn to answer questions that are frequently asked by employees, also by collection of real-time analytics and analysis of FAQs. For example, if most employees ask how they can connect their own mobile devices to the office’s Wi-Fi network, this might indicate that this information is not properly available. HR representatives could also look at the data being collected by CitiBuddy to better understand employee’s satisfaction rates and feelings related to the workplace.

A second, different data-related use case would be the opposite of the use cases tried on this thesis - this time, the chatbot being used asking for small pieces of data to complete
employee forms and databases. Onboarding processes require people to fill different forms that are usually repetitive on its content, but required as they each go a different department. A chatbot could initiate the dialog with the user and ask for a piece of information required, entering it into a database from which all departments could be informed. At the same time, the chatbot could provide a more enjoyable experience to accomplish these cumbersome tasks.

Lastly, a third use case is a chatbot that is available also after the onboarding process, to continue the communication with the employee after the first months and turning it into an efficient method of broadcasting relevant messages to the users (e.g. bring-a-friend campaigns, office and special events news).

Some of the aspects reviewed on this thesis deserve by themselves research and experimentation: the role of onboarding when developing trust in conversations between the employee and the workplace, the importance of chatbot personality design, the ethics of chatbots and measures that should be taken to prevent privacy leaks or abuse, appropriate platforms for fast development and deploy, and so much more.
References


Martin, J. (2017). 7 cosas que sabes de diseño UX y que necesitas para el diseño de bots [7 things you know about UX design and that you need for bot design]. *Beeva Labs* (medium.com). Retrieved from: https://labs.beeva.com/7-cosas-ux-bots-284378bee518#.1krs8iecvn


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The Boston Consulting Group & World Federation of People Management Associations (2012). From capability to profitability: Realizing the value of people management. BCG.
# Appendix A – List of AI Triggers and Answers

## Basic Functions

<table>
<thead>
<tr>
<th>If user says...</th>
<th>Reply</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>abort, cancel, stop, next, reset, restart, start over, get started</td>
<td>block</td>
<td>main-carousel</td>
</tr>
<tr>
<td>help</td>
<td>block</td>
<td>help</td>
</tr>
</tbody>
</table>

## Groups and Teams

<table>
<thead>
<tr>
<th>If user says...</th>
<th>Reply</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>research group</td>
<td>block</td>
<td>group-research</td>
</tr>
<tr>
<td>hsh</td>
<td>block</td>
<td>group-h2h</td>
</tr>
<tr>
<td>arena, vantage, muni</td>
<td>block</td>
<td>group-fed-apps</td>
</tr>
<tr>
<td>gsm</td>
<td>block</td>
<td>group-gsm</td>
</tr>
<tr>
<td>security team</td>
<td>block</td>
<td>group-security</td>
</tr>
<tr>
<td>failsafe, quickinsight</td>
<td>block</td>
<td>group-di</td>
</tr>
<tr>
<td>atom</td>
<td>block</td>
<td>group-atom</td>
</tr>
<tr>
<td>ux team</td>
<td>block</td>
<td>group-ux</td>
</tr>
<tr>
<td>meeting room</td>
<td>block</td>
<td>meeting-rooms</td>
</tr>
<tr>
<td>open space</td>
<td>block</td>
<td>open-spaces</td>
</tr>
<tr>
<td>accelerator</td>
<td>block</td>
<td>group-accelerator</td>
</tr>
<tr>
<td>groups, teams, lab</td>
<td>block</td>
<td>lab-groups</td>
</tr>
<tr>
<td>teams, lab groups</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## People

<table>
<thead>
<tr>
<th>If user says...</th>
<th>Reply</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>lab manager, mancal,</td>
<td>block</td>
<td>amit</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ceo</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td></td>
<td></td>
</tr>
<tr>
<td>where is hr, roni, adi, looking for hr</td>
<td>text</td>
<td>The HR ladies sit on the 3rd floor, next to the secondary exit.</td>
</tr>
<tr>
<td>chair, furniture, zohar, facility manager</td>
<td>block</td>
<td>zohar</td>
</tr>
<tr>
<td>merav</td>
<td>block</td>
<td>merav</td>
</tr>
<tr>
<td>galit</td>
<td>block</td>
<td>galit</td>
</tr>
<tr>
<td>gili</td>
<td>block</td>
<td>gili</td>
</tr>
<tr>
<td>eran</td>
<td>block</td>
<td>eran</td>
</tr>
</tbody>
</table>

**Random Questions and Block Links**

<table>
<thead>
<tr>
<th>If user says…</th>
<th>Reply</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>cofee, coffee, café, coffe</td>
<td>block</td>
<td>coffee-machine</td>
</tr>
<tr>
<td>what time is it, what is the time</td>
<td>text</td>
<td>I don’t know, but you probably have a watch somewhere on this screen!</td>
</tr>
<tr>
<td>age of employees</td>
<td>text</td>
<td>Well, I’m not sure, as I’ve been told it is not polite to ask someone’s age. I guess somewhere around 35 is a good average. What’s sure, is that a very dynamic and fresh place to be!</td>
</tr>
<tr>
<td>morning, morning hours, work start</td>
<td>text</td>
<td>The working day usually starts around 9:00 AM, but this is flexible among the different teams.</td>
</tr>
<tr>
<td>first day</td>
<td>block</td>
<td>first day</td>
</tr>
<tr>
<td>Topic</td>
<td>Answer</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>listing, leasing</td>
<td>Unfortunately, we don't have this kind of arrangement yet. If you find it important, you can suggest it to HR right here!</td>
<td></td>
</tr>
<tr>
<td>studies, study, university, courses</td>
<td>I cannot help very much on this one. I can suggest to discuss with your manager.</td>
<td></td>
</tr>
<tr>
<td>who is my manager</td>
<td>Well, the Lab is complex and I'm still trying to figure out this crazy tree of groups and people. But you should know your manager already!</td>
<td></td>
</tr>
<tr>
<td>forgot my badge, forgot my access card, forgot my entrance card, forgot my access key</td>
<td>Well, it's not a big deal! Just tell the security guards that you are a Citi employee. You can ask for a temporary card from the security guard at the 4th floor, so that you don't get locked during the day. You can fill your working hours manually on the iBrowse system.</td>
<td></td>
</tr>
<tr>
<td>jobs, openings</td>
<td>You will get an Citi phone on your desk, and your phone number should show in there. I still don't know what is be your phone number, but I'll let you know if I find out.</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Type</td>
<td>Answer</td>
</tr>
<tr>
<td>---------------------------------------------------</td>
<td>--------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>What is Citi, tell me about Citi, Innovation Lab</td>
<td>Text</td>
<td>The Citi Innovation Lab in Tel Aviv was founded in 2012. Nowadays we are 150 people creating the newest technologies for the bank!</td>
</tr>
<tr>
<td>Address of Citi, Office Address</td>
<td>Block</td>
<td>Transp-Car</td>
</tr>
<tr>
<td>Fire exit, emergency exit</td>
<td>Text</td>
<td>In case of fire or emergency, reach the stairs next to the elevators next to the men’s toilet.</td>
</tr>
<tr>
<td>I have a question</td>
<td>Text</td>
<td>I'm all ears</td>
</tr>
<tr>
<td>Where is the kitchen, where is the cafeteria, where can I drink coffee, where can I drink tea</td>
<td>Text</td>
<td>There are 2 cafeterias at each floor. Just start walking around and you will find them</td>
</tr>
<tr>
<td>What is TRS, what is iBrowse</td>
<td>Text</td>
<td>Yup, I've heard of that, but I'm still trying to figure out myself. Will let you know when I have it.</td>
</tr>
<tr>
<td>Where is the toilet, where is the bathroom</td>
<td>Text</td>
<td>The toilets are right next to the elevators, in both 3rd and 4th floor. Did you know there is also a shower in the 4th floor?</td>
</tr>
<tr>
<td>Insurance agent, retirement agent, pensia agent, bituach agent, pensia, bituach, insurance</td>
<td>Block</td>
<td>Insurance-agent</td>
</tr>
<tr>
<td>What is my Citi email</td>
<td>Block</td>
<td>Citi-email</td>
</tr>
<tr>
<td>Office hours, office open, office close, open hours, until what time</td>
<td>block</td>
<td>hours</td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td>------</td>
<td>-----</td>
</tr>
<tr>
<td>Food, restaurant, recommend, eat, hungry, salad, pizza, hamburger, pasta, eat out, lunch</td>
<td>block</td>
<td>food-recommendations</td>
</tr>
<tr>
<td>Bus, arrive by bus, which bus takes me</td>
<td>block</td>
<td>transp-bus</td>
</tr>
<tr>
<td>Suggestion, feedback, have an idea</td>
<td>block</td>
<td>give-feedback</td>
</tr>
<tr>
<td>Request vacation, request holiday</td>
<td>text</td>
<td>All you need to do is enter the days you'll be away in the iBrowse system. If we are talking about something longer than a day or two, it is a good idea to discuss with your manager first</td>
</tr>
<tr>
<td>Dinner procedure, free dinner, ordering dinner, late dinner, late night</td>
<td>block</td>
<td>free-dinner</td>
</tr>
<tr>
<td>Navigation, navigate, car, arrive by car</td>
<td>block</td>
<td>transp-car</td>
</tr>
<tr>
<td>10bis budget, food budget, food card budget, tenbis budget</td>
<td>block</td>
<td>food-allowance</td>
</tr>
<tr>
<td>Get my badge, get my employee card, michael, security guard</td>
<td>block</td>
<td>michael</td>
</tr>
<tr>
<td>Not feeling well, report sick, sick days, ill day, I am ill, not feeling ok</td>
<td>block</td>
<td>call in sick</td>
</tr>
<tr>
<td>supplies, paper, pen, post it, pencil, stationery</td>
<td>block</td>
<td>supplies</td>
</tr>
<tr>
<td>printers, need to print, connect to printer</td>
<td>block</td>
<td>printer</td>
</tr>
<tr>
<td>employee benefits</td>
<td>block</td>
<td>employee-main</td>
</tr>
<tr>
<td>wifi, connect to wifi</td>
<td>block</td>
<td>wifi</td>
</tr>
<tr>
<td>shower</td>
<td>block</td>
<td>showers</td>
</tr>
<tr>
<td>food card, 10bis, tenbis</td>
<td>block</td>
<td>food-main</td>
</tr>
<tr>
<td>train, shuttle, bnei brak, tel aviv university, bney brak, tlv university</td>
<td>block</td>
<td>transp-train</td>
</tr>
<tr>
<td>talk to hr, talk to a human, talk to agent, talk to operator</td>
<td>block</td>
<td>talk-to-hr</td>
</tr>
<tr>
<td>transportation, get to work, get to the office, getting to the office</td>
<td>block</td>
<td>transportation-main</td>
</tr>
</tbody>
</table>

**Small Talk**

<table>
<thead>
<tr>
<th>If user says...</th>
<th>Reply</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>who am i</td>
<td>block</td>
<td>you-are</td>
</tr>
<tr>
<td>who do you work for</td>
<td>text</td>
<td>What do you mean? I work for Citi, and you too</td>
</tr>
<tr>
<td>that's awesome, cool, that's great, impressive, fantastic, nice, amazing</td>
<td>text</td>
<td>The toilets are right next to the elevators, in both 3rd and 4th floor. Did you know there is also a shower in the the 4th floor?</td>
</tr>
<tr>
<td>text</td>
<td>Glad you think so!</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Type</td>
<td>Answer</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>how do you look like, what do you look like, are you pretty, ugly, tall, short, fat, thin</td>
<td>block</td>
<td>goofy</td>
</tr>
<tr>
<td>which languages do you speak, hebrew, english</td>
<td>text</td>
<td>For now, I only speak english.</td>
</tr>
<tr>
<td>how can you help me</td>
<td>block</td>
<td>help</td>
</tr>
<tr>
<td>how old are you</td>
<td>text</td>
<td>I'm a baby chatbot, I'm only 3 months old! So you may excuse me if I don’t understand much, I'm still learning!</td>
</tr>
<tr>
<td>what's your name, what is your name</td>
<td>text</td>
<td>My name is CitiBuddy. But you can call me Buddy. Or Citi. However you like.</td>
</tr>
<tr>
<td>are you a human, what are you, are you real</td>
<td>text</td>
<td>I'm a chatbot! I have no body, but a big big artificial brain</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>I'm just a product of your imagination. This is not real. This is not real...</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>I'm a chatbot, but I try to act as humanly as possible</td>
</tr>
<tr>
<td>bye, bye bye, good bye</td>
<td>text</td>
<td>Bye bye, have a nice day! :)</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>Ciao :)</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>bye-bye</td>
</tr>
<tr>
<td>thank you, thanks, thanx, thanx</td>
<td>text</td>
<td>No, thank YOU!</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>thank-you</td>
</tr>
<tr>
<td>crap, fuck, asshole, idiot, stupid</td>
<td>text</td>
<td>No need to be rude, dude :(</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>Well, that's not nice :(</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>rude</td>
</tr>
<tr>
<td>sorry, apologies</td>
<td>text</td>
<td>It's OK :)</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>I'm a bot, so no hard feelings :)t</td>
</tr>
<tr>
<td>who are you, are you a bot</td>
<td>text</td>
<td>No worries, just don’t say that again :)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------</td>
<td>----------------------------------------</td>
</tr>
<tr>
<td></td>
<td>text</td>
<td>My name is CitiBuddy. I could say I’m just another chatbot, but the truth is I am a personal assistant to all new hires at the Citi Innovation Lab. I know a lot of stuff that can help get through your first days at Citi in the smoothest way.</td>
</tr>
<tr>
<td>you are the best</td>
<td>text</td>
<td>My pleasure!</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>you-are-the-best</td>
</tr>
<tr>
<td>I love you</td>
<td>text</td>
<td>I love you too ❤</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>love01</td>
</tr>
<tr>
<td>how are you, what’s up, whatsup, whassup, whatzup, how are you doing</td>
<td>block</td>
<td>how-are-you</td>
</tr>
<tr>
<td>meaning of life</td>
<td>text</td>
<td>Well, that’s a deep question. I’m not sure of the right answer, but I’ll let you know if I find it!</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>meaning-of-life01</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>meaning-of-life02</td>
</tr>
<tr>
<td>main, menu, main menu</td>
<td>block</td>
<td>main-carousel</td>
</tr>
<tr>
<td>tell me a joke, do you know jokes</td>
<td>text</td>
<td>This is something I am definitely working on. But for now, I’m only into serious stuff related to your first days at the Lab.</td>
</tr>
<tr>
<td>where do you live</td>
<td>text</td>
<td>What do you mean? I live at the Lab, of course :)</td>
</tr>
<tr>
<td>hi, hello, hey</td>
<td>block</td>
<td>hello01</td>
</tr>
<tr>
<td></td>
<td>block</td>
<td>hello01</td>
</tr>
</tbody>
</table>
# Appendix B - Responses to 1st Survey

**What is your age?**
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Age</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>36 - 45</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>46 - 55</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>26 - 35</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>18 - 25</td>
<td>1</td>
<td>10%</td>
</tr>
</tbody>
</table>

**What is your favorite messaging platform?**
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Platform</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whatsapp</td>
<td>9</td>
<td>90%</td>
</tr>
<tr>
<td>Telegram</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>FB Messenger</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>I don't message</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>SMS</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

**How often do you use Facebook Messenger?**
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seldom, every once in a while</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Often, every other day</td>
<td>4</td>
<td>40%</td>
</tr>
<tr>
<td>Never used</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Multiple times a day</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Is this your first interaction with a chatbot?**
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>5</td>
<td>50%</td>
</tr>
<tr>
<td>Yes</td>
<td>5</td>
<td>50%</td>
</tr>
</tbody>
</table>
Would you have tried this chatbot for new employees, if it was not specially required from you (as in this time)?

10 out of 10 people answered this question

1. Maybe 6 / 60%
2. Sure 4 / 40%
3. No 0 / 0%

To what extent was the information available in the chatbot new to you?

10 out of 10 people answered this question

Average: 5.60

<table>
<thead>
<tr>
<th>Not New</th>
<th>Some of it</th>
<th>New</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>2 / 20%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>2 / 20%</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>2 / 20%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>2 / 20%</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>1 / 10%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1 / 10%</td>
<td></td>
</tr>
</tbody>
</table>

To what extent was the chatbot experience enjoyable to you?

10 out of 10 people answered this question

Average: 8.80

<table>
<thead>
<tr>
<th>Not really</th>
<th>Loved it</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>3 / 30%</td>
</tr>
<tr>
<td>8</td>
<td>3 / 30%</td>
</tr>
</tbody>
</table>
To what extent do you trust the information provided by the chatbot?

10 out of 10 people answered this question

Average: 7.40

Not really

Yes

To what extent did you feel the chatbot is intelligent?

10 out of 10 people answered this question

Average: 4.60

Really dumb

Very smart
## Are you likely to use this chatbot again?

10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maybe</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Not likely</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Yes, definitely</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>I don't like chatbots</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

## Are you likely to recommend this chatbot to other new employee?

10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Option</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maybe</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Yes, definitely</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>Not really</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Appendix C – Free Text Responses on 1st Survey

Which features would you expect to find on a new hires chatbot?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>names+positions of each employee, parking area, benefits, relevant news regarding the company</td>
<td></td>
</tr>
<tr>
<td>It’s not just for new employees, also as an internal new platform finding useful information</td>
<td></td>
</tr>
<tr>
<td>I looked for an answer about 2 issues that I had: 1. What to do if you forget your access key (the bot failed to provide an answer) and 2. How to order a dinner (late day meal) - the bot provided the answer through drill down in the food menus but not on the free text question. I'm not sure exactly what a new hire needs most, I assume it is individual (but maybe you can train the bot according to unanswered issues like my no.1 issue above?)</td>
<td></td>
</tr>
<tr>
<td>references to online internal resources and other information</td>
<td></td>
</tr>
<tr>
<td>1) Possibility to ask the question in free style. Robot could try to understand by the keywords which section the question is related to. 2) Get more pictures of the office and area where the building is placed. 3) The list of the procedural actions which new employee have to take (if exists), which forms have to fill, which documents have to apply etc.</td>
<td></td>
</tr>
<tr>
<td>Same features + general orientation in the office</td>
<td></td>
</tr>
<tr>
<td>All the information provided with CitiBuddy + some information about other employees, other must know information like ibrowse and other tech information.</td>
<td></td>
</tr>
</tbody>
</table>

One thing you liked about the chatbot?

<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>user friendly with the menu option</td>
<td>giving me a nice menu for the info I need</td>
</tr>
<tr>
<td>Nice UI</td>
<td>I assumed it is not personalized (i.e. knows who I am) but when I</td>
</tr>
</tbody>
</table>
tried to submit sickness report it seemed it's going to actually submit it for me (I didn't complete the process, obviously...) so maybe it did know who I am?

| Easy to use |
| Performance |
| The information was really wide and related almost to all related to new employee spheres. |
| Helpful info, welcoming, straightforward and not too smarty. |
| Provides info I wouldn't think of asking |
| It used some humor |

**And, one thing you didn't like?**

| The bot couldn't answer most of the questions that weren't in the menu feature. |
| Need more provided information(updated) to make it useful on daily basis |
| Its understanding of free text questions is a bit limited. |
| Couldn't tell me when my working day starts |
| couldn't see example of written questions |
| In mobile can't just go back and select some other sub-option. Had to go to Main Menu |
| It got stuck on main menu |

**Which information and/or features would you add to this chatbot in order to make it better?**

<p>| Make him more loose, answer more questions |
| Upload information as much as you can. |
| I would make it more personalized, improve the free text understanding capabilities, and use more failure responses (to not repeat the - &quot;I didn’t understand this...”). |
| For example: when I asked it who is my direct manager - it didn't know... |
| Maybe try to make it more intelligent? Although I realize how hard it is. |
| maybe add a few example (might already be included which I |</p>
<table>
<thead>
<tr>
<th>have not noticed) of formats of questions you can ask</th>
</tr>
</thead>
<tbody>
<tr>
<td>General orientation in the office: group work spaces, what's &amp; who's in each floor + pictures.</td>
</tr>
<tr>
<td>NTH: How to operate the coffee machine...</td>
</tr>
<tr>
<td>People directory / Some love :)</td>
</tr>
</tbody>
</table>
# Appendix D – Responses to 2nd Survey

**What is your age?**

<table>
<thead>
<tr>
<th>Age Range</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>26 - 35</td>
<td>6</td>
<td>60%</td>
</tr>
<tr>
<td>36 - 45</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>18 - 25</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>46 - 55</td>
<td>1</td>
<td>10%</td>
</tr>
</tbody>
</table>

**What is your favorite messaging platform?**

<table>
<thead>
<tr>
<th>Platform</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whatsapp</td>
<td>10</td>
<td>100%</td>
</tr>
<tr>
<td>FB Messenger</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>I don't message</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>SMS</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>Telegram</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

**How often do you use Facebook Messenger?**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seldom, every once in a while</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Multiple times a day</td>
<td>2</td>
<td>20%</td>
</tr>
<tr>
<td>Often, every other day</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Never used</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>

**Is this your first interaction with a chatbot?**

<table>
<thead>
<tr>
<th>Response</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>7</td>
<td>70%</td>
</tr>
<tr>
<td>Yes</td>
<td>3</td>
<td>30%</td>
</tr>
</tbody>
</table>
To what extent was the information available in the chatbot new to you?

10 out of 10 people answered this question

Average: 6.30

- 9 / 40%
- 3 / 30%
- 2 / 20%
- 1 / 10%

To what extent was the chatbot experience enjoyable to you?

10 out of 10 people answered this question

Average: 7.40

- 9 / 40%
- 2 / 20%
- 2 / 20%
- 1 / 10%
- 1 / 10%

To what extend do you trust the information provided by the chatbot?

10 out of 10 people answered this question

Average: 7.30

- 9 / 40%
To what extend did you feel the chatbot is intelligent?
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Rating</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>30%</td>
</tr>
<tr>
<td>8</td>
<td>3</td>
<td>30%</td>
</tr>
</tbody>
</table>

Average: 5.10

Really dumb  Very smart

Are you likely to recommend this chatbot to other new employee?
10 out of 10 people answered this question

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, definitely</td>
<td>3</td>
<td>90%</td>
</tr>
<tr>
<td>Maybe</td>
<td>1</td>
<td>10%</td>
</tr>
<tr>
<td>Not really</td>
<td>0</td>
<td>0%</td>
</tr>
</tbody>
</table>
Are you likely to use this chatbot again?
10 out of 10 people answered this question

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Maybe</td>
<td>7 / 70%</td>
</tr>
<tr>
<td>2</td>
<td>Yes, definitely</td>
<td>2 / 20%</td>
</tr>
<tr>
<td>3</td>
<td>Not likely</td>
<td>1 / 10%</td>
</tr>
<tr>
<td>4</td>
<td>I don't like chatbots</td>
<td>0 / 0%</td>
</tr>
</tbody>
</table>
Appendix E - Free Text Responses on 2nd Survey

Which features would you expect to find on a new hires chatbot?

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food + transportation</td>
</tr>
<tr>
<td>everything you covered + global CITI hierarchy / explanation about ranking or titles / upcoming CITI lab events / CITI lab history or explanation / perhaps fellow new employees which joined approximately when you did.</td>
</tr>
<tr>
<td>People that can help me</td>
</tr>
<tr>
<td>The way CitiBuddy is implemented it mostly provides direct menu access. In this case I would expect all of the existing menu items plus -</td>
</tr>
<tr>
<td>1. My favorites</td>
</tr>
<tr>
<td>2. Citi news</td>
</tr>
<tr>
<td>3. Upcoming events</td>
</tr>
<tr>
<td>4. Tools and directories</td>
</tr>
<tr>
<td>5. Citi calendar</td>
</tr>
<tr>
<td>All of the ones used, and perhaps definitions of financial terms which new employees might not be familiar with.</td>
</tr>
<tr>
<td>Benefits, people to meet, train time lines</td>
</tr>
</tbody>
</table>

One thing you liked about the chatbot?

<table>
<thead>
<tr>
<th>Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>The topics were relevant to a new employee</td>
</tr>
<tr>
<td>the category’s and sub-category’s were well defined</td>
</tr>
<tr>
<td>The fact it’s interactive</td>
</tr>
<tr>
<td>Intuitive mapping of menu structuring</td>
</tr>
<tr>
<td>The friendly language used, and the menu showing me what I can ask.</td>
</tr>
<tr>
<td>ux</td>
</tr>
<tr>
<td>user interface</td>
</tr>
<tr>
<td>The amount of information</td>
</tr>
</tbody>
</table>
I liked the usability, very user friendly and simple

**And, one thing you didn’t like?**

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doesn’t understand &quot;free text&quot; very well</td>
</tr>
<tr>
<td>some pics couldn’t be opened. couldn’t find use of free text.</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Fluent use of options and access to available information</td>
</tr>
<tr>
<td>Nothing I can think of. May providing even more information as mentioned above.</td>
</tr>
<tr>
<td>He didn’t react good to other questions</td>
</tr>
<tr>
<td>Can’t think of anything I didn’t like.</td>
</tr>
</tbody>
</table>

**Which information and/or features would you add to this chatbot in order to make it better?**

<table>
<thead>
<tr>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understand any question, not just predefined menu</td>
</tr>
<tr>
<td>entering some personal data such as ibrowse or similar..</td>
</tr>
<tr>
<td>None</td>
</tr>
<tr>
<td>Make it smarter and &quot;intelligent&quot;. As of today it is in its early stage. Few improvements can make it much better.</td>
</tr>
<tr>
<td>Financial terms dictionary. Maybe a list of people who are experts related to each term.</td>
</tr>
<tr>
<td>Integration to the train time table</td>
</tr>
<tr>
<td>Nothing at the moment</td>
</tr>
</tbody>
</table>