



Chatbots for financial inclusion

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ABSTRACT

Chatbots can be seamlessly integrated with help support sectors and customer service for banks, insurance companies, stock indexes and investment houses as well as hedge funds. It can also bridge the gap for people looking for financial guidance, where a chatbot can prove to be a financial advisor. Businesses spend \$1.3 trillion on 265 billion customer service calls each year. Chatbots can help businesses save on customer service costs by speeding up response times, freeing up agents for more challenging work, and answering up to 80% of routine questions.

Keywords— Machine Learning, Deep Learning, Chatbots, Financial inclusion, Customer support, Natural language processing

1. DESCRIPTION OF CHATBOTS

A chatbot in layman terms is a program that can have a meaningful “chat” or conversation with the end user. It uses various concepts of Machine Learning, Deep Learning and Natural Language Processing such as convolutional neural networks, autoencoders and various NLU (Natural Language Understanding) and NLG (Natural Language Generation) algorithms. A Chatbot can converse with the user through a self-embedded messaging platform like Facebook Messenger or through various flagship Assistants such as Google Assistant, Siri or Amazon Alexa.

2. WORKING OF CHATBOTS

A chatbot that functions through machine learning has an artificial neural network inspired by the neural nodes of the human brain. The bot is programmed to self-learn as it is introduced to new dialogues and words. In effect, as a chatbot receives new voice or textual dialogues, the number of inquiries that it can reply and the accuracy of each response it gives increases. Facebook has a machine learning chatbot that creates a platform for companies to interact with their consumers through the Facebook Messenger application.

There is a flowchart showcased down below indicating the lifecycle of a conversation between the end user and the chatbot.

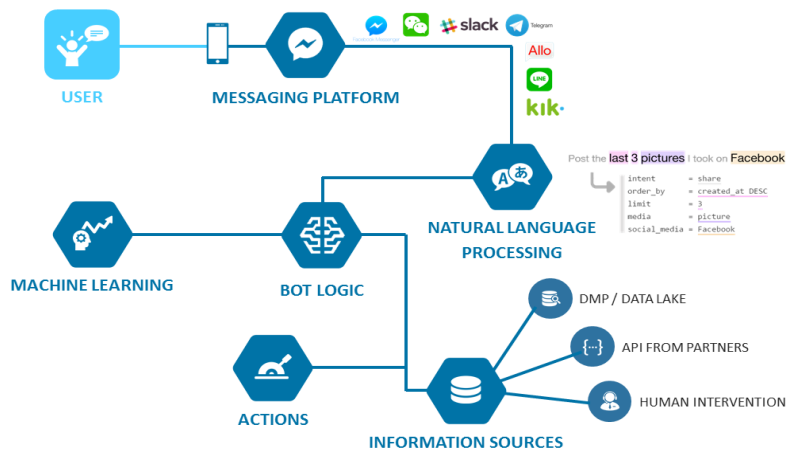


Fig. 1: Working of chatbot

3. ECONOMIC AND BUSINESS SCOPE FOR CHATBOTS

Chatbots can be seamlessly integrated with help support sectors and customer service for banks, insurance companies, stock indexes and investment houses as well as hedge funds. It can also bridge the gap for people looking for financial guidance, where a chatbot can prove to be a financial advisor. Businesses spend \$1.3 trillion on 265 billion customer service calls each year. Chatbots can help businesses save on customer service costs by speeding up response times, freeing up agents for more challenging work, and answering up to 80% of routine questions.

4. A SHORT CASE STUDY ON AUTODESK

Autodesk, a global leader in 3D computer-aided design, has a customer service chatbot, AVA that responds to queries around the clock. Any time of day, any day of the year, a customer can get help with routine Tier 1 query like address changes, login issues, payment issues, and other frequently asked questions.

The Watson Conversation platform enabled Autodesk to build this virtual agent that delivers significant productivity and efficiency gains, including:

- A 99% improvement in response times: Cutting resolution from 38 hours to 5.4 minutes for most Tier 1 inquiries
- A drop in per-query cost from \$15-\$200 (human agents) to \$1 (virtual agents)
- A virtual agent that answers and resolves an average of 30,000+ customer support queries per month
- A virtual agent that recognizes 40+ distinct use cases to quickly resolve simple requests

According to IBM, by 2020, 85% of all customer interactions will be conducted through a chatbot.

5. TYPES OF BUSINESS CHATBOTS

5.1 Support chatbots

Support chatbots are built to master a single domain, like knowledge about a company. Support chatbots need to have personality, multi-turn capability, and context awareness. They should be able to walk a user through any major business processes and answer a wide range of FAQ-type questions.

5.2 Skills chatbots

Skills chatbots are typically more single-turn-type bots that do not require a lot of contextual awareness. They have set commands that are intended to make life easier: “Turn on my living room lights,” for example. Speech functionality is recommended for this type of chatbot so the user does not need to turn on a device or click any buttons. They should be able to follow commands quickly so that users can multitask while engaging with the bot.

5.3 Assistant chatbots

Assistant chatbots are more or less a middle ground between the two bots above. They work best when they know a little bit about a variety of topics. Many people envision these bots will someday become navigators of all other bots that are out there now. Want to pay a bill? Ask your assistant bot to talk to the support bot for your bank. Assistant chatbots need to be conversational and respond to just about anything while being as entertaining as possible. Siri is a good, current example – while she only does so much, people continually ask her for things simply because even when she cannot perform the command, the response she gives tends to be amusing.

6. CHATBOTS FOR FINANCIAL INCLUSION

Chatbots can be easily integrated with many financial products to deeply impact the human-driven sectors in the industry such as customer care and customer support. It lowers down the capital spent on the inclusion of these facilities in one’s business by almost 80%. Rather than keeping a different member to do night shifts, a chatbot complies with the end user 24/7 * 365. Chatbots can directly impact these sectors:

- Checking financial markets
- Getting info about businesses and organizations
- Finding financial services
- Checking account balances
- Managing investments
- Tracking self-business performance
- Finding a credit card
- Managing payments and transfers
- Checking credit score
- Tracking expenses
- Filing taxes
- Checking product prices

A chatbot is completely capable of abridging this void in the financial realm. There are a lot of chatbots for these sectors in the “Business and Finance” Google Assistant Actions page. The Google Assistant currently serves up to 400 million users and the number is growing significantly every day. With a high number of users coming to this chatbot market, developers are guaranteed to serve this ever-increasing user base. Down below is a graph stating how astronomically the app base is increasing for the assistant and this is just one platform.

7. DOWNSIDE OF CHATBOTS

7.1 Multi-Lingual Setbacks

Most chatbots are programmed to converse in English and appeal to an English first market. Out of 7.7 billion people, 3.2 billion are online and English only caters to about 20% of them. Since machine translation is coping up using various Gradient descent methods, this void may be filled but only in about 10 - 15 years.

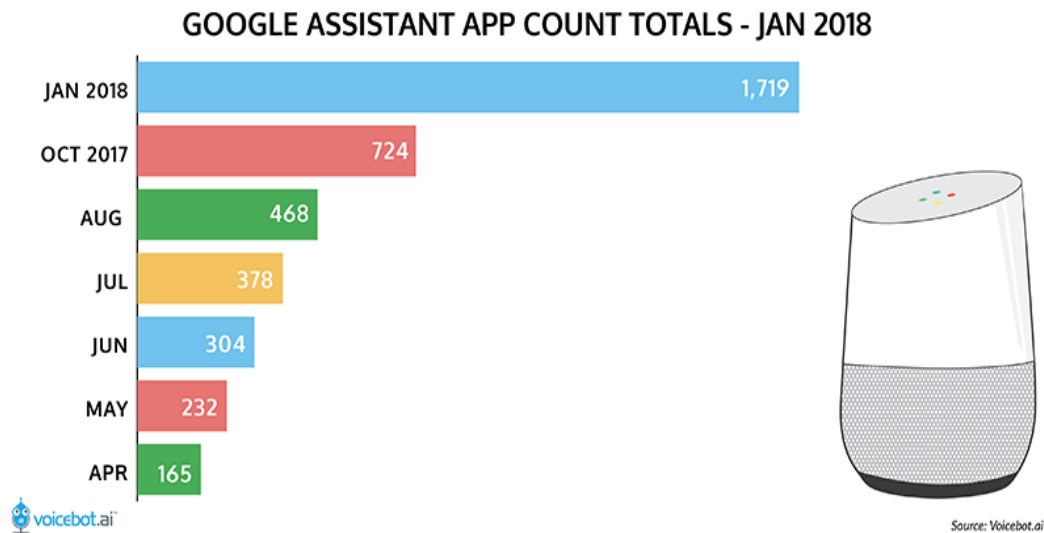


Fig. 1: Google assistant app count

7.2 Not completely dependent

Conventional chatbots “respond” with pre-written responses. So even if they understand your question, they may not have an answer. So it’s basically like an else statement which is triggered when a chatbot may not be aware of the context of the conversation. This is a problem which seldom occurs in humans as the brain is programmed in such a way that a conversation may be turned by the contact or support team.

7.3 Lack of Trust: customers don’t like chatbots

- Research by IT Profound that 80% of customers don’t trust chatbots. The simple reason comes from the first point: if you need to provide your response using chatbot-friendly phrasing, then why not just use the search filter on a FAQ?
- Chatbots have over-promised and under-delivered, so now we have work to regain public confidence. The first step is to deploy a chatbot that can write dynamic text while applying your corporate expertise. The system doesn’t have to pass the Turing Test, but it does need to be able to ask intelligent questions, offer personalized responses, and provide a satisfactory online Customer Experience.

7.4 Complex chatbots could cost more

- Complex chatbots that solve some of the problems described above can cost more than simple ones. In some cases, these artificial intelligence chatbots cost thousands more. That defeats part of the purpose of a chatbot, which is to save money.
- Setting up AI is expensive due to the hours of work and testing involved. Sure, they can learn, but it still takes time.

7.5 Customers could become frustrated

- Because many chatbots work from a limited database, they can’t improvise. In other words, if they get confused, the conversation could run in a circle. That can lead to customers who become frustrated.
- Slang and sarcasm are lost on a chatbot. Customers who use may not get the results they were hoping for and needing.

8. UPSIDE OF CHATBOTS

8.1 It’s a one time investment

A mainstream way to establish a customer service facility at a financial firm is to outsource a call centre. A Level One Tech Support Agent working in Dallas, Texas will cost his employer about \$30USD per hour, loaded. As his employer, you pay 100% of that hour. With an outsourced call center model, using a productivity projection of 85%, that same agent will cost you **\$25.50** per hour. Whilst an average Facebook Messenger chatbot for small business marketing purposes costs from \$3,000 to \$5,000. Companies spend upwards of \$50,000 for a chatbot, but these big firms (100 million revenue +) only have to make a one-time investment, and 50k is nothing for what they’re getting.

8.2 Faster customer Service

One advantage of using bots is that they help you provide faster customer service. If you have a business, they can provide customer service on your website 24 hours a day. What’s more, they don’t need weekends, holidays, vacations, or sick days off. When online customers have questions, all they have to do is ask the bot on your website. There’s no waiting on a human to look it up because the answers are a few keystrokes away

8.3 Lower labor costs

Using chatbots gives you an advantage when you are trying to keep costs down. Since you don’t have to pay for employee benefits, they may cost less than you’d pay an employee. Of course, lower labor costs translate into increased profits for your business. In the end, that means more money in your pocket.

9. SYNOPSES OF 10 CHATBOTS

9.1 Fin ChatBot

About the company: Text-based conversation has become the new medium connecting businesses with customers. With FinChatBot, financial businesses can now engage in real time with their audience through their preferred communication channel.

- **Page:** <https://finchatbot.com>
- **Country Base:** Johannesburg, South Africa
- **Business Model:** B2B (Business to Business), Client Based
- **Platform:** Cross Platform; integrated into the user code base
- **Stock Price:** Not Traded

9.2 HDFC securities

About the chatbot: We at HDFC securities are on a digital excellence journey and presence on Google Assistant and Google Home is a part of it. We would want to enable customers to reach to us through any medium of their liking. This skill would enable you to get personalized investment recommendations and also allow you to open an account with us. We will enable transactional use cases in our coming releases.

About the company: HDFC Bank Limited is an Indian banking and financial services company headquartered in Mumbai, Maharashtra. It has 88,253 permanent employees as on 31 March 2018 and has a presence in Bahrain, Hong Kong and Dubai. HDFC Bank is India's largest private sector lender by assets.

- **Page:** <https://assistant.google.com/services/a/uid/000000bfd6016472?hl=en-GB>
- **Company Website:** <https://www.hdfcbank.com/>
- **Financial Service:** Personal Banking
- **Country Base:** Mumbai, India
- **Business Model:** A2B (Customer to Business)
- **Platform:** Google Assistant
- **Stock price:** HDFCBANK (NSE) ₹ 2,002.80 +27.65 (+1.40%)

9.3 Bajaj Finance

About the chatbot: Bajaj Finserv assistant to inquire about new offers and customer service. It offers details about financial products and branches in cities in India

About the Company: Bajaj Finserv, a part of Bajaj Holdings and Investments Limited, is an Indian financial services company focused on lending, asset management, wealth management and insurance.

- **Page :** https://www.amazon.in/Yellow-Messenger-Bajaj-Finance/dp/B079ZTL5FB/ref=sr_1_6?s=digital-skills&ie=UTF8&qid=1542531881&sr=1-6&keywords=finance
- **Company Website :** <https://www.bajajfinserv.in/>
- **Country Base :** Pune, India
- **Platform :** Amazon Alexa, Google Assistant
- **Business Model :** A2B (Customer to Business)
- **Stock price:** BAJAJFINSV (NSE) ₹ 5,710.00 +112.90 (+2.02%)

9.4 Credit card helper by Starbutter AI

About The Company: Credit Card Helper is built by Starbutter AI, the world's expert on interactive conversational agents for credit cards, banks, mortgages, insurance, and personal finance.

About the chatbot: Caz helps you find the best credit cards for cash back, rewards, travel, and building credit. He finds the best cards on the market. Caz looks at card features, analyzes millions of customer reviews and complaints, reads the fine print and terms of service, and looks up Consumer Reports and the Consumer Financial Protection Bureau data sets. People love Caz because he helps them figure out which credit card to get quickly and how to avoid traps, bad companies, and fees. Caz is a credit card geek and prefers credit cards that give you the biggest bang for your buck and don't ding you in the long run. You can look for Visa credit cards and MasterCard's, or secured or starter credit cards.

- **Page:** <https://assistant.google.com/services/a/uid/000000d2ba5a15de?hl=en-GB>
- **Company Website:** www.starbutter.com
- **Platform:** Google Assistant and Amazon Alexa
- **Country Base:** Berkeley, United States of America
- **Portfolio Page:** <https://www.starbutter.com/voice-bots-1>
- **Financial Service:** Finding Credit Cards
- **Business Model:** A2B (Customer to Business)

9.5 AGL

About The company: AGL Energy Ltd is an Australian listed public company involved in both the generation and retailing of electricity and gas for residential and commercial use.

About the chatbot: With the AGL Action, AGL customers can check their current account balances, bill due dates and switch to monthly billing or e-billing. Customers with a digital meter can also get an estimate of their current and projected electricity costs for their upcoming electricity bill. Should you need some extra time to make a payment, you could ask AGL to extend your bill due date.

- **Stock price:** AGL (ASX) A\$ 18.56 +0.12 (+0.65%)
- **Page:** <https://assistant.google.com/services/a/uid/00000093109f012f?hl=en-GB>
- **Company Website:** <https://www.agl.com.au/>
- **Platform:** Google Assistant
- **Country Base:** Sydney, Australia
- **Business Model:** A2B (Customer to Business)

9.6 Mortgage Calculators by Starbutter AI

About the chatbot: Max has all your Mortgage Calculators. He answers any questions about what you can afford and will be your mortgage calculator for payments, PITI calculators, refi calculators, and fee calculators. Max came up with his calculators after talking to dozens of mortgage agents and consumers who wanted just the facts. Max has multiple mortgage calculators to help you figure out monthly payments, how much you should put down, how much house you can afford, taxes, insurance, and PM

About the company: Mortgage Helper is built by Star butter AI, the world's expert on interactive conversational agents for credit cards, banks, mortgages, insurance, and personal finance.

- **Page:** <https://assistant.google.com/services/a/uid/0000009165f83cca?hl=en-GB>
- **Company Website:** www.starbutter.com
- **Platform:** Google Assistant
- **Country Base:** Berkeley, United States of America
- **Financial Service:** Calculating Mortgage
- **Business Model:** A2B (Customer to Business)

9.7 Rate Supermarket

About the chatbot: Find the lowest mortgage rate on Ratesuprmarket.ca and calculate your mortgage payment.

About the company: RateSupermarket.ca is an independent information source where consumers can get free, up to date information on the latest personal finance offers, guides, tips and informative articles presented in an easy to understand way on products that tend to be quite complicated.

- **Page:** <https://assistant.google.com/services/a/uid/000000b7113dc740?hl=en-GB>
- **Company Website:** <https://www.ratesupermarket.ca>
- **Platform:** Google Assistant
- **Country Base:** Ontario, Canada
- **Financial Service:** Mortgage rates
- **Business Model:** A2B (Customer to Business)

9.8 Plum

About the Chatbot: Plum is the little savings butler you've been waiting for. It monitors your spending, automatically sets money aside for you and is always available on Facebook Messenger. Simple, stress-free savings.Plum analyses your transactions every day. It learns about your income, expenses and spending patterns and uses this knowledge to calculate how much to save. Every week Plum will transfer a small amount of money into your Plum savings, ready for you to access anytime, but safe from your #Yolo moments.

- **Platform:** Facebook Messenger
- **Page:** <https://chatbottle.co/bots/plum-1>
- **Company Website:** No website associated
- **Financial Service:** Expenditure Monitoring
- **Business Model:** A2B

9.9 Akron Real Estate by Voiceter Pro

About the Chatbot: Dayton Real Estate has two major components. You can use it to begin your listing process by finding out an estimated home value as well as search for listings in your area. The home value track will give you no-obligation estimated home value. Check back in as often as you like to hear how your home value estimate changes over time and to feel the market pulse. The home buying track will verbally walk you through criteria that will help you narrow down what you're looking for in your next home. Then, it will read you the top results and email the list directly to your inbox. Akron Real Estate is brought to you by Berkshire Hathaway Home Services Professional Realty, a leading full-service real estate brokerage in Ohio and Northern Kentucky.

About the company: Voiceter Pro, Inc. is the conversational search company that brings businesses and consumers together through voice-driven interactions with Amazon's Alexa and Google Home. Voiceter Pro's real world, voice-powered skills are revolutionizing artificial intelligence-assisted searches in real estate and other markets.

- **Company Website:** <https://www.voiceterpro.com>
- **Page:** <https://assistant.google.com/services/a/uid/0000006963b577b5?hl=en-GB>
- **Platform:** Google Assistant
- **Financial Service:** Real Estate Listings
- **Country Base:** New York, United States of America
- **Business Model:** A2B (Customer to Business)

9.10 Vertifi Software

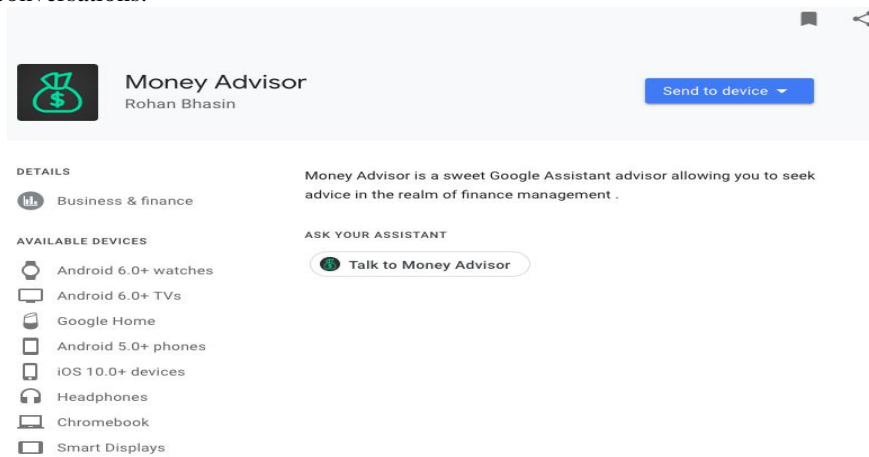
About the chatbot: Vertifi Software Banking action lets you get your account balance information and allows you to calculate your monthly payments for loan products offered by Vertifi. This action requires account linking.

About the company: Vertifi is an example of how a company with a deep understanding of payment systems technology can yield powerful, market-changing solutions, reduce costs, accelerate collection, and reduce risk. Financial institutions put their trust in Vertifi to deliver the best, most pragmatic software and services available today. And we earn that trust by consistently exceeding their highest expectations. Vertifi is the creator of DeposZip®, the first commercial remote deposit capture program for consumers. Vertifi also built the first commercial mobile deposit capture program for smartphones and tablets, DeposZip® Mobile, and leads the industry with its patented on-device technology.

- **Platform:** Amazon Alexa and Google Assistant
- **Page:** <https://assistant.google.com/services/a/uid/000000b89cb612f6?hl=en-GB>
- **Company Website:** <https://www.vertifi.com/>
- **Business Model:** A2B (Customer to Business)
- **Country Base:** Burlington, United States of America
- **Financial Service:** Banking

10. MY EXPERIENCE OF BUILDING A CHATBOT

The reason I took this task because I was familiar with this segment. I built an action for the Google Assistant called “Money Advisor”; a financial advisory tool, using Diagram flow’s API and Python. I created an intent that triggered a tip for the end user and a Quit function to help the user exit the intent. The action currently has 4.6-star rating on the Google Assistant Actions Store with over 100 monthly conversations.



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