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WHITE PAPER

From Eliza to Alexa: Chatbots and the Future of Customer Experience

Thanks, that helped!

By: Megan M. Hard
Market Analyst, MindTouch

Chatbots are all the rage. But the truth is, they've been here for most of our lifetimes...

...with the first having been invented in the 60s and now serving as the basis for modern bots. What's different is that they're being cast into new platforms like Facebook Messenger, Slack, Outlook, and Skype, and augmented more and more with artificial intelligence and machine learning. Chatbots – or chatterbots – used to be exclusively embedded into smart devices, but can now be expanded across mediums, whether chat or voice based. The emphasis on business use cases that dominated the spotlight in the Spring of 2016[1] has awakened more and more businesses (and developers, some 10,000 and counting) to the opportunity.[2]

You can find every opinion under the sun on chatbots: claiming that they are the wave of the future, that chatbots will replace apps and make the 800 number obsolete, chatbots make life easier, or that chatbots aren't making some things easier and apps are better for certain tasks... Certainly they will revolutionize search, and reduce not only wait times to reach a human but the cost of the workforce needed to serve the customer, with a side of novelty. They can be designed for anything from automated customer support to e-commerce, interactive experiences, and entertainment. They are continuously being revamped to streamline the customer experience and meet the hastening human need for speed. Bots can, among many other tasks:

- check shipping orders
- order food, a car, or flowers
- check weather and traffic
- give you the news
- access product info
- help you shop
- manage your calendar
- play your favorite music
- give answers to questions depending on the span of their vocabulary
- book travel and hotels...

This is clearly a wave that will not subside in the near future, but what is the best way forward? What do chatbots need to be successful?

What businesses are trying to do with Facebook's one billion users is to reach their customers en masse in new ways to not only enable self-service, but to do so within interaction venues that Millenials are innately comfortable with

Hi, I'm a bot. How can I help you today?

and use on a daily basis and that Gen Xers and Boomers have become accustomed to. But any new method by business to communicate with customers should be for the customers' benefit and to improve both customer success and the customer relationship. Ever since In Search of Excellence came out 30 years ago there is no dispute that the customer is the most important focus of your business, perhaps even rivaling innovation. Customers want to be served swiftly and accurately, so while the evolution of chatbots has been colorful, in general they still have a quite a way to go.

What is especially significant though is that no longer are bots pretending to be human as they have for decades, now they are being presented as simply what they are: and humans are okay with that. There has been a shift in society where we are comfortable with talking to a machine, knowing we are talking to a machine, and to a large extent accepting that machine's limitations. And it's a relief, because a by-product of the charade was that expectations were too high, resulting in frustration when service fell short and we were either misunderstood, not understood at all, or served up the wrong content.

Now we almost assume when we seek help on a website, via chat or email, that we are talking to a bot – which in itself helps reduce disillusionment. When once they were alienating, because bots have now come clean as a UI, expectations have been adjusted. So now, rather than expect performance matching our own human experience from a bot masquerading as a human (and be disappointed), we know that we will not get human capability. And there's an added curiosity as to how much the bot can actually do. Some even help you along with that, saying things like, "Here are some things you can ask me."

The floodgates are open

The innovations in machine learning incorporating deep neural networks and artificial intelligence are advancing chatbot technology by leaps and bounds.[4] In essence chatbots are able to be programmed for a very wide variety of queries through "supervised learning,"[5] with myriad possible answers – but their vocabulary is still limited. To a certain extent they can extrapolate their existing knowledge based on past interactions to draw conclusions on data points they have never seen before, but the further away they get from the data set they were trained on, the more likely mistakes will be made.

Some chatbots are even dipping into the Internet of Things – linking to lights, electrical switches, and thermostats. But the collective wisdom that's developing alongside the bots available today is that they shouldn't be programmed to do everything; that the more restrained their specialization, the more successful they'll be.

Per the illustration on the next page, bots are programmed for a specific purpose to answer anticipated, level one customer service inquiries (the first stop when users contact customer support agents). These are easy to map out. The bot's confidence in those responses goes up or down based on whether there was a successful outcome that satisfied the customer, raising or lowering the rankings assigned to the answers, and the bot then knows the most effective response to give in the future when the same query is presented. This is called positive and negative reinforcement, and is at the heart of what is referred to as "unsupervised learning."[6]

Unsupervised learning is the only way bots can evolve beyond their original knowledge capability – unless there is a continuous feedback loop, bots cannot advance and be refined to help the customer in the

SUPERVISED LEARNING

DEVELOPERS — *Let's design a chatbot.*

CHATBOT — *Chatbot programmed with specialized vocabulary.*

CUSTOMER — *Hi! Can you help me with something?*

TROUBLESHOOTING
PRODUCT INFO
TUTORIAL

Sure – Here's what I've got for you.

CUSTOMER

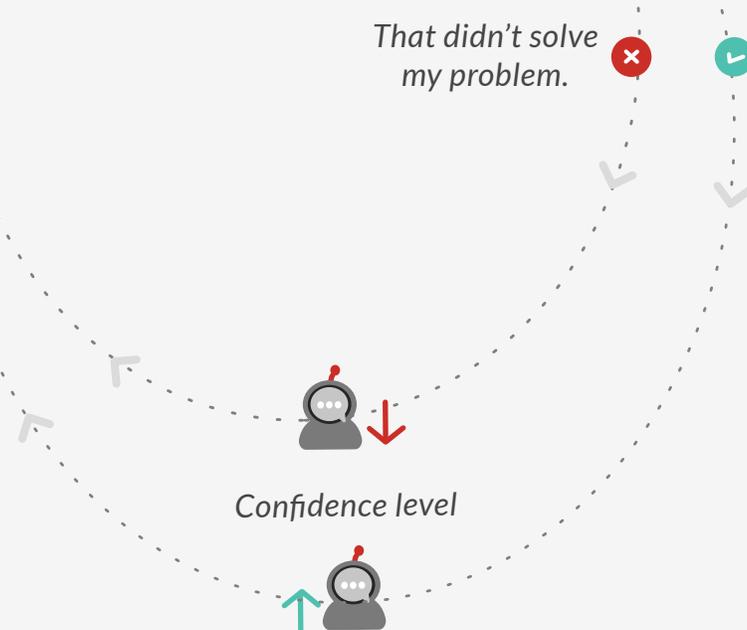UNSUPERVISED LEARNING

PRODUCT MGR.

That didn't solve my problem.

Thanks, that helped!

Confidence level

best possible way. Unsupervised learning involves recognition of common human responses like, "Thanks, that was helpful," or "No that did not solve my problem." Data on those exchanges can be fed to a product manager who analyzes the effectiveness of all of the bot's answers to different questions, classifies them, and then teaches it more vocabulary.

Nuance, the creator behind Viv (Siri 2.0 if you will), is working on perfecting a richer dialogue and illustrating context. Viv can recognize follow-up questions as a refinement of the previous question, for example. A bot like Alexa may know 50,000 words and may be able to apply them to a few hundred circumstances.[7] By no means can chatbots converse at this point – this isn't Iron Man, even though a Jarvis does exist that can remind you to do things.[8]

Current limitations notwithstanding, the upside in general is that bots can understand simple commands, perform tasks, and deliver help content within their own specialization. This has added benefits, like eliminating the need to surf for, download, and register with apps. In fact there is even research that shows people are using far fewer apps than they download.[9] With 2 million apps available and thousands more submitted every day, humans are feeling app fatigue.[10]

Chatbots still cannot expect the unexpected. Yet. And part of the shift in our understanding is that if we are giving up the human-to-human communication style and we accept talking to a machine with inherently limited ability, we should be getting something in return. That is, a heightened level of knowledge about us and an instantaneous recollection of our query history as well as information on our habits, preferences, and recurring instances. Bots have their own intelligence level in their little microworld that they understand. They are not sentient beings, they are looking for markers to classify interactions as good or bad, so in the future they do more of the good and less of the bad. The best bots will

Hi, Slackbot here!

You can ask me simple questions about how Slack works, or just type a few keywords. For example: **Can I edit a message I've posted?** Or simply: **edit message**.

I'm only a bot, but I'll do my best to answer! If I don't understand, I'll search the Help Center.

absorb the knowledge gained from past history and incorporate it into the feedback that's used to teach it; further what they should be able to do is recognize that time has passed and circumstances might be different even though the query may be the same. And if they're really on the cutting edge, they can predict what you need.

Alexa, for example, can't do this yet – Echo is supervised learning only so far. And while Facebook Messenger has a whole bucket for search results labeled "BOTS," its bot engine doesn't use deep learning.[11] It is on an AI platform, but businesses will need to consider how their bots can evolve based on past interactions to better serve their customers.

In short, talking to a bot instead of a human is a tradeoff we're willing to make, but with the implicit understanding that the bot learns about us and retains that information. We seldom get to experience that with human support agents, so in that sense we will be much better served by bots than we are now by humans. The likelihood of customer satisfaction and a positive experience potentially increases since we have expectations that are more likely to be met.

Context will satisfy a customer, and that is where bots can add real value. Providing context in responding to customer needs will result

in a more pleasant experience than dealing with a human and having to explain your backstory or hope they have a log of it somewhere. Context can be what we get back in return for accepting bots. And the feedback that is generated by the user's verbal reaction to a given answer will inform the chatbot's responses from then on as it builds knowledge. What most chatbots do is assess the customer's state, then provide content. It then assesses state again – that is, whether it has helped or not – and then provides content. And on and on until the query is resolved, whether the customer seeks help with an issue, more information about a product or service, or even a tutorial. And it all can be delivered with a quick reply, without having to take up your full attention with a phone call. Even better – where businesses are concerned, capability should be embedded in the bot to recognize when it cannot help the customer, and send that person to a human for those higher level situations. By the same token, if the bot's confidence in the answer it's providing is high enough, it knows there is no need to send the customer to an agent.

As long as businesses incorporate the feedback with programming that recognizes positive and negative outcomes, enabling the right content to be delivered, bots will become more and more ingrained in our daily lives. At the moment this feedback system is still being honed by developers. But the user has to be the central focus of bots' evolution, not the gimmick, and customer success the ultimate goal.

Microcontent:
The secret sauce

To deliver that content though, chatbots need to be able to access the right content at the right time, quickly and accurately. They need to keep step with the micro-moments that make up our lives.[12] What drastically improves this ability is what MindTouch calls SMART content: breaking content into small bites – microcontent – and making it semantically rich. With SMART content, all of the information customers seek that can be found in help content, product documentation, and user manuals is structured hierarchically, which is the way the mind works. This creates an easily navigated decision tree that can lead to the best problem-solving information and heightened customer success.

WHAT IS SMART CONTENT?

- **S**EMANTIC
- **M**ICROCONTENT
- **A**LGORITHMICALLY
- **R**ESTRUCTURED
- **T**RACKED

Search engines favor semantically rich microcontent, making it highly valuable for SEO and especially ideal for mobile sites where parsing a full-length PDF user manual is simply out of the question. Microcontent enables bots that can cross platforms (like Alexa) to easily and instantly pull content directly from a company's MindTouch-powered website for the user, lowering effort, because it's the most accurate semantically rich content. (See sidebar.) Breaking out dense help content into bite-sized pieces that are structured to be searchable and machine readable is another way to make bots better. Further, user activity and inquiries can be tracked, providing rich user data to the company and informing machine learning as the bot matures. And chatbot data analytics are the holy grail for understanding your customers.
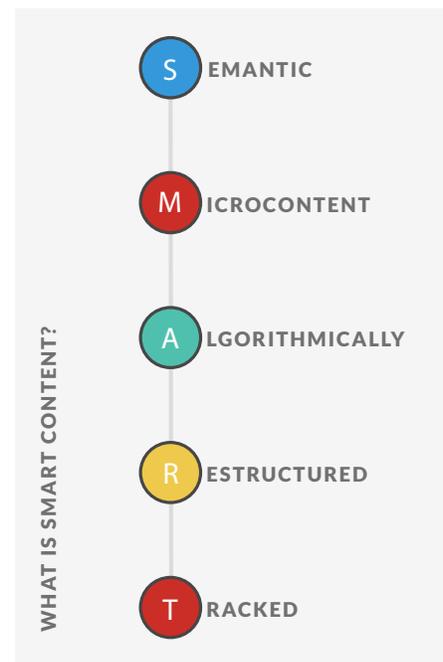
Voice recognition in itself is not that new. Eliza was the first stab at natural language processing, in the 60s. Parry came in the 70s; Alice, Cleverbot, and Jabberwacky in the 90s; then SmarterChild... and all along the way we've had the Turing Test to assess how good those bots were at fooling people into believing they were human, which often found significant limitations in the pre-determined responses.[13] To date no chatbot has passed it with flying colors. There have even been bots that deny being bots and try to convince you they are human. To imitate human capability though is fruitless – machines have nothing on us. They may be super fast, but machines are inherently stupid. Humans on the other hand may have a ridiculously slow CPU in our brains, but we have 100 billion neurons and 100 trillion synapses all performing operations simultaneously and multiple points of input that inform our awareness. We do so many computations and don't even realize it – the reality is there is no comparison between humans and chatbots. Technology has gotten better at replicating real-world exchanges, but the delta is still vast. And maybe chatbots aren't supposed to exactly be human after all.

TURING TEST
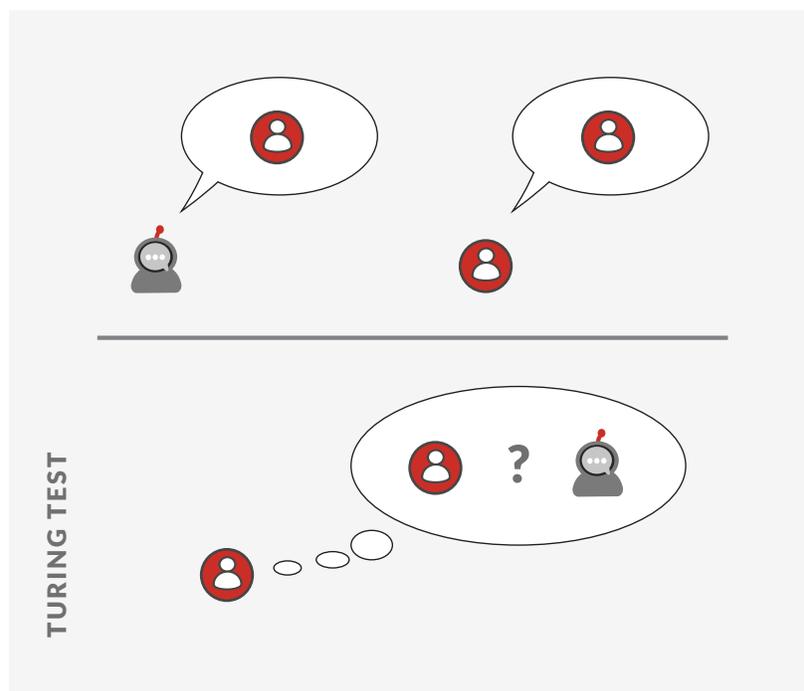
Potential TBD

We've been living in the uncanny valley – that netherworld where bots have been so close to being human it's eerie, but not close enough to be useful and natural. Now we have Siri, Alexa, Viv, Cortana, Watson, Tara, Jarvis, and Google Assistant among many others, which are basically an extension of virtual personal assistants, that have broken into that uncanny valley. By virtue of their blatant existence as bots, we have a different relationship with them – and are less likely to be freaked out by the interactions if they don't understand some basic things, though at the same time with the developing expectation that they will remember us. And if they don't remember us, they're probably

STRAIGHT TO THE FIX

Alexa can now deliver the answer, in response to a query about a Whirlpool product for example, via software that MindTouch has written that goes and fetches content based on the sentence the customer used. Algorithms connect all of the questions posed by the customers that our current customers serve to all of the answers that we host. These answers are searchable by bots just as they are searchable for search engines, and are compatible with mobile sites. All of this allows companies to reach their customers more directly.

While we structure help content as semantically rich microcontent so that it is easily retrievable and able to show up first in a Google search, now a chatbot doesn't even have to go through Google – rather than ask Google, it can ask Whirlpool through MindTouch. Alexa is her own search engine, and MindTouch has curated all of the best answers from the manufacturers' product documentation and help content so that the customer gets the answer they seek. Alexa can even hold the MindTouch answer for you so that it is available on demand.

Computations are done based on the success of the responses, and that data not only enables machine learning but can aid in anticipating customers' questions. And when those analytics are processed by MindTouch, any instance where an answer is not available is reported to Whirlpool, whose product team then generates the needed content and makes it live on the web. So now that Whirlpool knows your unanswered question exists, you and everyone else can get the answer.

still in that uncanny valley. Many chatbots are just the next generation of virtual personal assistants. Virtual private assistants are all about predicting your needs based on past behavior, so chatbots should do the same, and then some. Right now they are light years better than a phone tree or interactive voice response (IVR), but chatbots don't know how to act naturally; there is no perfect use case yet. There is surely another way of doing it, developers just haven't cracked it.

What bots can do is continuously learn to serve the customer better, with the right content – access to which is enabled by microcontent that is semantically rich – and provide context to interactions with users. They should be able to query all bots simultaneously, understand your general question and know exactly where to go for the answer – across apps, across engines, across sites, across information sources. Microcontent makes this possible. At the moment we are still in the uncanny valley of reconciling the usability of bots to perform tasks and resolve queries.

> **What bots CAN do is continuously learn to serve the customer better, with the right content. Microcontent makes this possible.**

There are plenty of bots that demo well, but the jury is still out on how useful they are on an everyday basis. If they don't recognize the sentence structure, they don't understand the query. And having to feed a bot exactly the right language it would understand to be able to get the result you're looking for, having to know the magic words, is a road to nowhere. There is as mentioned a ton of benefit from bot interactions, despite their friction points. Eventually those will be overcome and bots will reach true mass adoption as GAFA (otherwise known as Google, Ap-

ple, Facebook, and Amazon – the juggernauts of Silicon Valley) is anticipating, but we aren't there yet and no one knows when we will be. AI is informing the next wave of bots, but the current incarnation is still in its infancy, though IBM's Watson at the forefront is surely one to watch. According to Aspect Consumer Index, 40 percent of consumers would prefer to use a messaging app than make a phone call.[14] And at this rate of development, that number is poised to go way up.

So is 2016 the year of the bot? There's certainly a lot of hype surrounding them, and the advancement of bots in the last few years has sped up exponentially when you consider that the first bot was invented in the 1960s and there were only very few since then relatively until the landscape exploded a few years ago. There are thousands of chatbots, and soon maybe even a bot store on Facebook Messenger.[15] It's a case of everything old is new again – just with expanded domains, increased vocabulary, deep learning, and AI. Time will tell whether the chatbots of tomorrow will fulfill the vast potential they've been invested with. Some will succeed and many will fail. A hundred different companies will do it a hundred different ways – one of them will nail it and get that competitive advantage.

Still, if the past is any indication of the future, what the industry thinks is the next big thing (or in this case, that the next big thing has arrived), often turns out very differently. Someone will always come along with an "aha" moment realization, a new twist, that will change everything.

Endnotes

1. Mark Zuckerberg announced April 12, 2016 that Facebook Messenger was launching a platform for developers to build chatbots so that people could message businesses as they would their friends, which was music to the ears of the 50 million businesses active on Messenger. Most companies don't have the capability to create their own, so Facebook provides the application program interface (API) and the bot engine wit.ai, "ai" standing for artificial intelligence. The news went down at Facebook's F8 summit in San Francisco, its annual conference for software developers, and generated massive buzz before, during, and after the announcement from dozens of media outlets.

2. Lucas Matney and Josh Constine, "Facebook says 10k+ developers are building chatbots, analytics are coming," TechCrunch, May 10, 2016, https://techcrunch.com/2016/05/10/facebook-chatbot-analytics.

3. A landmark book widely regarded to be groundbreaking in its level of influence and a standard for management and business strategy, see Tom Peters and Robert H. Waterman, Jr., In Search of Excellence: Lessons from America's Best-Run Companies (New York: Harper & Row), 1982.

4. Neural networks (i.e., artificial neural networks, one type of artificial intelligence) are a type of computation model loosely based on the human body's own biological neural networks, enabling a machine to learn by analyzing observed data patterns. A neural network can be deep or shallow, referring to the depth of the layers within the network which are made up of computation points that are akin to human neurons. This technology is used in speech recognition and natural language processing, among other things.

5. *Supervised learning*, a form of machine learning, is a system by which developers train the chatbots with an algorithm and give that algorithm a data set that produces correct answers to given queries. In other words, humans "teach" them their function and vocabulary, the chatbots "learn" to recognize the words and sentences in commands from humans that will trigger them to actually give the right answer or perform the requested action. Developers know what the inputs and outputs are, for example for a specific question, they set the chatbot to respond a certain way, and then ask the machine to come up with approximations of correct outputs. There is a control set that the chatbot is trained on, i.e., questions and answers, and once the machine knows those it is also able to predict the answer to questions it has not heard before to a certain degree of accuracy.

6. *Unsupervised learning* involves an automatic feedback cycle on the part of the chatbot, which classifies whether the interaction was successful or not, and that feedback influences future behavior.

7. Alexa is a chatbot embedded in a free-standing device by Amazon, called Amazon Echo. By calling to it with the name Alexa, a human can activate the chatbot and ask it questions or prompt it to do things like play music.

8. See product introduction at http://hellojarvis.io; see also Eric Ravencraft, "Jarvis Is a Facebook Chat Bot That Can Handle Your Reminders," *Lifehacker.com*, May 16, 2016 and Paul Morris, "Say Hello to Jarvis, a Facebook Messenger Chat Bot That Can Set Reminders for You," *Redmond Pie*, May 22, 2016.

9. See James Tiongson, *Mobile App Marketing Insights: How Consumers Really Find and Use Your Apps*, thinkwithgoogle.com and Ipsos MediaCT, May 2015.

10. See "Number of apps available in leading app stores as of June 2016," Statista.com; and "App Store Metrics," Pocketgamer.biz.

11. *Deep learning* is a branch of machine learning that focuses on building and training neural networks through analysis of patterns of data input.

12. Micro-moments are emerging as a consumer behavior phenomenon that is a result of the larger prevalence of mobile technology usage in daily life. The concept is that our lives have been segmented into hundreds of real-time micro-moments, where we consume and act on information after only glancing at our devices.

13. See "Chatterbot History: From the First Turing Tests to 2016," Doky, May 1, 2016; Chatterbot, *Wikipedia*; and Will Knight, "Tougher Turing Test Exposes Chatbots' Stupidity," *MIT Technology Review*, June 14, 2016.

14. Tracey E. Schelmetic, "Your Customers Really Don't Want to Talk to You on the Telephone," *Omni Channel Customer Engagement.com*, June 15, 2016.

15. Harish Jonnalagadda, "Why talk to a fellow human? Facebook Messenger's chatbots are much more interactive," *androidcentral.com*, July 1, 2016.

AUTHOR'S NOTE:

Megan M. Hard is a Market Analyst at MindTouch. Contributing to this report are Aaron Fulkerson, co-founder and CEO of MindTouch; Steve Bjorg, co-founder and Chief Technology Officer of MindTouch; and Adrian Drummond, release automation engineer at MindTouch.