
Chatting about data - A conversational interface for meal tracking

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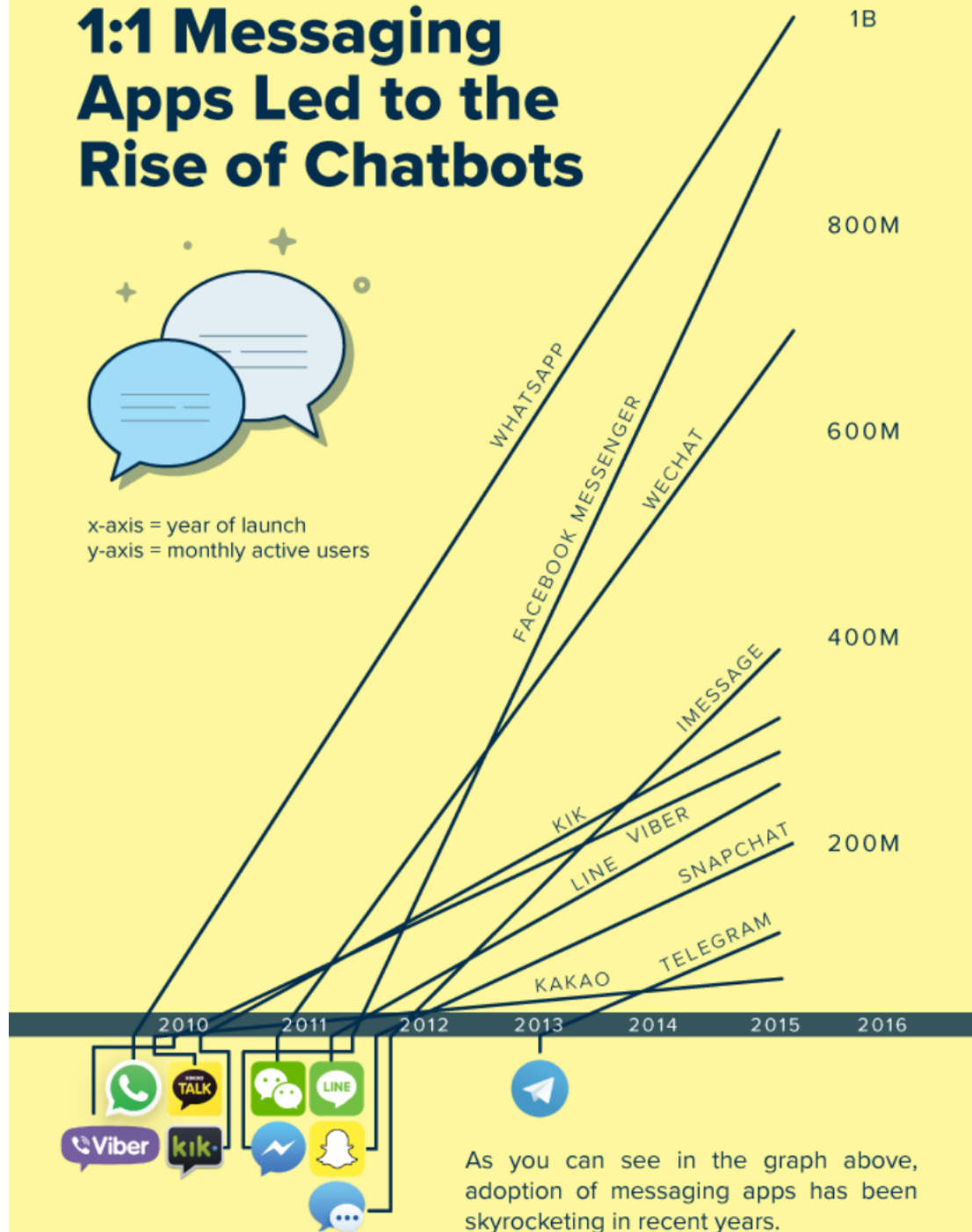
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How the Rise of 1:1 Messaging Apps Led to the Rise of Chatbots



x-axis = year of launch
y-axis = monthly active users



Advantages of chatbots as interface

- Advances in NLP help simulate a conversation with a customer assistant
- Integrated within existing chat applications
- Does not require learning different UI elements for each application
- Include both text and rich menus
- Highly personalisable
- Can initiate conversation and seamlessly switch over to human agent
- Synchronous medium makes user feel *more productive*
- Personality can make conversation more engaging

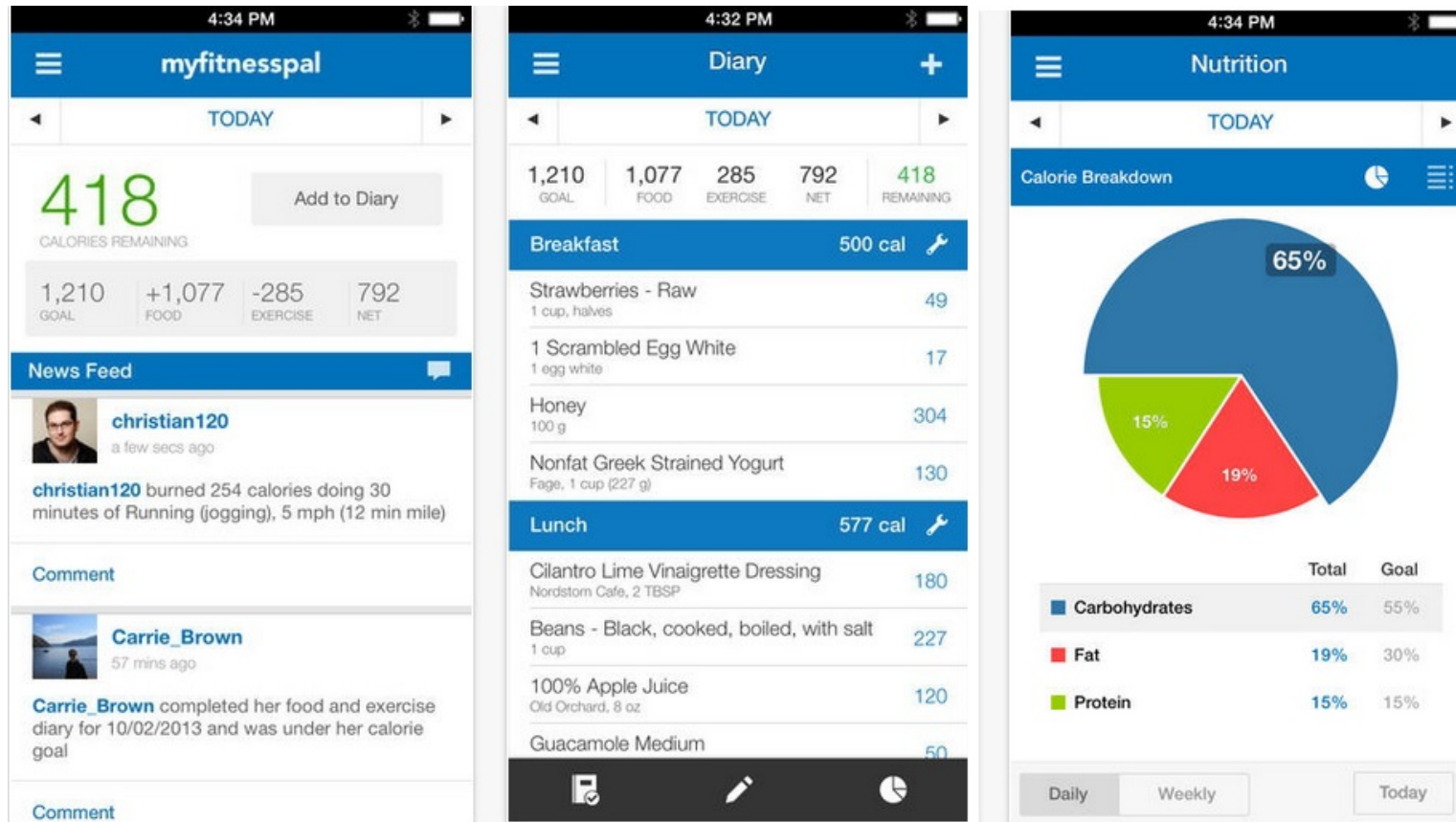
Quantified self

Rivera-Pelayo et al. (2012)'s three activities of self logging:

- Tracking (Hardware or Software)
- Sensing (Active or Passive)
- Recalling

Using an app provides an improvement over paper tracking, but UX needs to be improved

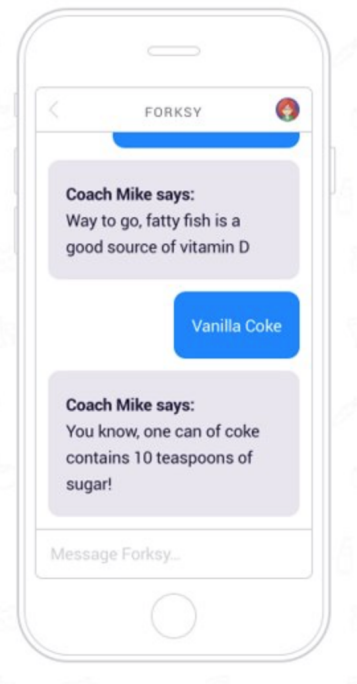
MyFitnessPal



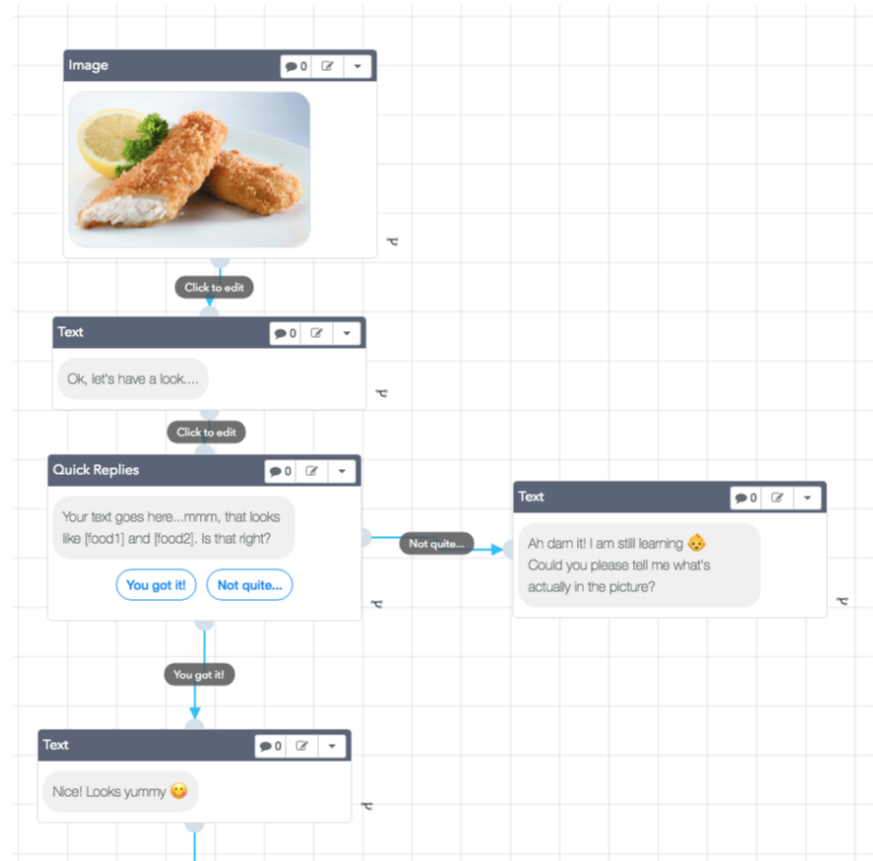
Making a smart chatbot

Intervention effectiveness and user experience features that would take advantage of Machine Learning

- Encoding nutritional knowledge to give appropriate advice
- Leveraging social connections to motivate/shame into following it
- Image recognition to aid input



Design



Tools



Dialogflow

clarifai



heroku



express



nutritionix



mongoDB®

Features

Onboarding message to explain functionality

- Text logging - always asks for size clarification
- Photographic logging - displays multiple choice when size clarification is needed
- Food sizes can be stored in absolute (100g, 2 liters) and relative (more, less, same as usual) terms
- Look back on what was eaten on a certain date
- Periodic reminders to resume logging or for missing out on nutritious food

Nutritional Analysis

Lacking comprehensive nutritional knowledge, we handcrafted some simple rules:

- If more than 10 foods are logged in a day, with at least one consumed in large quantities and less than $\frac{2}{3}$ in small quantities, we warn about overeating
- If more than $\frac{2}{3}$ foods are a small portion, or less than 3 foods have been logged, we warn about undereating
- If no leafy green vegetable was eaten in the past three days

Reminders are staggered at increasing intervals to minimise frustration

Roadblocks

- Instagram integration to sync new and existing food pictures: after login was implemented, app was blocked from the website
- Finding a complete enumeration of all foods; resorted to wildcard option
- Grouping foods into distinctive nutritional categories is impossible based on just nutritional values

Evaluation

- 9 day user trial among 11 University students
- Week-long control group using MyFitnessPal
- Both groups were asked to answer a survey after completing the trial
- Kept track of users' conversation during trial by examining transcripts and logging any important events to server
- Still managed to miss major bug in reminders functionality!

Performance issues

- Catchall approach to food identification produced too many false positives
- Parsing quantities was not always successful - had to update dictionary during trial
- Reminders bugs caused no messages to be sent - except to our test account
- Clarifai never identified any picture with “enough” certainty (only one guess over 97%)

Nice, keep it going!

Cheers!

Nice! Could you tell me how much you had, or if it's more, less, or about the same as you usually do?

Lunch is half a bowl of chilli and a slice of bread with butter

Nice! Could you tell me how much you had, or if it's more, less, or about the same as you usually do?

I already did robot dude!

Nice! Could you tell me how much you had, or if it's more, less, or about the same as you usually do?

Responses

- Only 9 students responded to the Chatbot survey, and 7 to the MFP
- Some respondents ignored entire sections, and no openended question was answered by all participants
- Small sample sizes doesn't give us external validity, but relative homogenous population makes comparisons possible without taking into account how demographics affect responses

Where the chatbot succeeded...

- Chatbot was rated as more pleasant to use than MFP
- Conversational interface was well received, despite many implementation issues
- Interface is less “slow” than MFP
- Relative measurement units were well received
- Image recognition deemed useful
- Reminders were extremely effective: 100% re-engagement rate even after several days

...or not quite

A bit more than usual but when I get nauseous from travel I need to eat more!

Nice, keep it going!

- People don't read long messages!
- Not enough feedback for users who *already eat a healthy diet*
- NLP is not good enough to understand user emotions, and generally clumsy
- *Short term memory* (Names, meals) and inconsistent responses
- Late night or duplicate reminders



I am Healthbot. I will be your personal diet assistant

You can tell me what you are eating and how much, or send me a picture of your food, and I will record it so we can try to understand how you eat better!

After that, whenever you want to think back about what you have been eating, just ask me to tell you what you had on any date!

Got it ☒ BTW, you can order an expert review of your food diary. Tap 'Get your report' 📌



Add food



Search food



Calorie limit



Edit last meal



Diary



Some possible additional features

- Retroactive meal log
- Barcode scanner
- New forms of communications: GIFs, emojis, stickers
- Recurring meals
- Recipes suggestions
- Advice about specific food
- Track sleep, mood, stress, exercise and water intake
- Group chat integration
- Fitness challenges
- Social networking integrations
- Nutritionist handover

Privacy issues

Users tend to have some expectations of privacy, especially with medical data
Current chatbot architecture leaks entire plaintext or partial conversations to:

- Messaging platform
- NLP toolkit
- Database provider
- Server (or serverless) provider
- APIs used
- The developer (us)



End-to-end encryption is a solution, but whoever controls the chatbot can still read the conversation