



Chatbot in Roeselare



CHATBOT 'BERTJE' – DIGITAL EMPLOYEE OF ROESELARE

The Like! project aims to improve public service delivery. One of the approaches to achieve this goal is by implementing new services and improving customer contact channels. The city of Roeselare aims to become a smart city and to be digitally relevant. Therefore, they are always looking for opportunities to support that vision. Based on the legislature 2014-2019, in which 'improving public services' was a key priority, together with the smart city research, one of the opportunities to improve public service delivery was to investigate the possibilities of a chatbot. For Roeselare, this meant creating a new contact channel where citizens could ask generic questions 24/7.

Relations to Workpackages

The idea behind the chatbot was dual. On the one hand, it was meant as a new contact channel: being able to respond to questions 24/7. Besides, the chatbot can reduce workload within the contact center by giving answers to generic questions. Delivering better and smarter services was thus the goal of this project.

Local partners

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This Case Study Paper is produced by Kimberley Van Luchem.

About LIKE!

Local governments, citizens, universities and SMEs come together to co-create smarter, more efficient and more innovative services through 9 transnational pilots that cover 3 core themes:



What's a chatbot?

For a good understanding of this use case, it is necessary to define what a chatbot is. A chatbot, for the city of Roeselare, is a combination of chat and robot mechanisms. It is an automated computer programme that engages in online conversations. It gives an answer to a question based on artificial intelligence (AI).

The trigger

One of the strategic goals of Roeselare is the improvement of public service delivery. Roeselare has a multichannel services concept for the civilians, tourists and entrepreneurs. We launched '1788', our very own contact center. That's the general number to call the city in case of questions, complaints and notifications. 1788 is a brand for mail, telephone and the website: number 1788, email 1788@roeselare.be or website www.1788.be. Next to that we also have a digital counter where people can download their birth certificate and other important documents online. One of the slogans of the services concept is 'preferably digital, unless ...'.

In 2016-2017 Roeselare was guided by Imec to define the vision and the possibilities of smart city on the scale of Roeselare. Roeselare wants to be digitally relevant and is always looking for good opportunities to do so. Different recommendations were made to the city council. One of those recommendations was to implement a chatbot, because it fitted with the strategy of the services concept and it's also an emerging technology in private and public organisations.

In 2016 we joined the Like! project. When all these different trajectories came together, we saw an opportunity of experimenting with a chatbot within the Like! project and work together with experiences from other partners.

An opportunity to improve the services. In order to develop a chatbot, we first needed to know which suppliers had experience with this. After some research we found our external partner: Arinti. They launched the idea of a chatbot for public services, because they saw that every city displays the same kind of information on their website. They scanned several hundreds of typical questions that an inhabitant or visitor of a

city might ask and they noticed that these questions don't differ a lot. About 80% of the questions have turned out to be the same for almost any city in Flanders. On the other hand, the answers to these questions are often hard to find on complicated web or FAQ pages. While citizens are getting more and more used to being able to use 'natural language' and 'conversational flows' to ask their questions and research for information. After seeing the research of Arinti, we connected all the dots and saw the opportunity. For Roeselare, this could mean the creation of a new contact channel where citizens could ask generic questions 24/7. We thought a pilot like this could be a great opportunity for any city that wants to bridge the digital gap between the civil servants and anyone looking for information about a city.

Bertje, het digitale hulpje van Stad Roeselare X

- ✓ Antwoordt op algemene vragen over producten of diensten van de Stad
- ✓ Maakt je wegwijs op onze website
- ✗ Geeft geen antwoord op specifieke vragen (bv. over dossiers, personen,...)

Chat

Hallo, mijn naam is Bertje. Misschien kan ik je helpen?

[Ik wil iets melden](#)

[Ik heb een vraag](#)

Bertje om 20:35:14

waar woon je

Ik

Ik ben een robot en heb dus geen verblijfplaats. Als ik toch ergens kon wonen, dan zou dat zeker in Roeselare zijn!

Bertje om 20:40:30



Why do it?

Before we started of with the chatbot project, we looked first at the positives and the negatives of a chatbot (research). After we did some research, we had the kick-off in October 2017 together with our external partner Arinti (one of the subpartners of the Cronos Group).

From a development point of view

Customizable smart city chatbot

The first thing we did, was looking at the prototype of Arinti. They ran us through a demo of chatbot 'Stewie'. This chatbot could be seen as the personal city employee of the user. This digital employee is able to be available 24/7. The positive thing about chatbot Stewie is that this is a concept. You can make it tailor-made to the specific needs of your city.

The chatbot could be altered on four different levels:

- Lay-out: profile picture, branding and colours.
- Chat flow: welcome-message and buttons.
- Channels: chatbot Stewie is multichannel. It can be made available on the city's website, via an app or through preferred messaging platforms (for example Facebook Messenger or Microsoft Teams).
- Personality: name, personal questions about the bot, etc.

So the conclusion was that the chatbot could be altered to our preferences. Together with the Communication department we made an analysis of what to do on the four levels.

Technical specifications

The chatbot is developed by Arinti with components of the Microsoft Bot Framework.

In this platform, they can plan, build, test, publish connect and evaluate chatbots, all in one place. On top of the platform, Arinti developed a few custom components for

Roeselare. A good example is the integration with the Google Places API, in order to serve the customer live and always up-to-date opening hours of specific Point of Interests in the city (city services, museum and library).

The positive thing about the chatbot is that it's self-learning. There is traceability of what questions are being asked and what answers are being given by the chatbot. Based on that there is a form of continuous learning.

+		-	
Benefits for the customer (citizens, tourists, entrepreneurs,...)		External risks	
<ul style="list-style-type: none">• Complementary/extra contact channel (next to all others)• Available 24/7• Increases the quality of service in general• Information is easily available• Quicker reference to the right information on the website• Source of generic information: one platform• No queues: direct information• Increases the digital DNA of the users		<ul style="list-style-type: none">• Knowledge of the bot is not endless (usefulness, completeness of scope, correctness of the answers)• Stability of the bot: cannot always be guaranteed• Too high expectations of users• Not used in a correct manner (abuse, jokes,...)• Utilisation rates are too low (ROI)• Willingness to talk to a chatbot	
Benefits for the city of Roeselare		Internal risks	
<ul style="list-style-type: none">• Workload of contact center 1788 decreases: generic information can be given by the chatbot + more time for complex questions (improvement of quality of service)• Shows deficits on the website (chatbot works with linkages)• Chatbot is tailor-made for RSL		<ul style="list-style-type: none">• No engagement internally to feed the bot• Outdated information• Workload vs. ROI• Security, GDPR	



How it works

The chatbot is smart by using AI. There are three main specifications to this:

1. Languages analysis

The chatbot uses natural language processing (NLP). This means that the chatbot first tries to recognise the intention of the user and after that tries to analyse the context and retrieve relevant details.

An example

Question: 'Is the city hall open?'

- Intention: is something open?
- Relevant details: city hall

2. Built-in search engine

The chatbot is retrieving its knowledge out of a knowledge database. In this knowledge database, questions and answers (comparison to FAQ's) can be modified, added or deleted constantly through the database management portal (knowledge portal). The chatbot uses Azure Search for advanced search capabilities in this knowledge base. Azure Search is a component of the Microsoft Azure Cloud Platform providing indexing and querying capabilities.

3. Learning capabilities

During testing, the chatbot trained itself. In the testing phase a functionality was added to confirm whether an answer was correct or not. This was used by the bot's algorithms to improve the question and answer matching. After each answer was given, the test team could give the bot feedback:

- Correct answer
- Not the correct answer

As such, we could train the bot ourselves. The self-learning part than happened for instance once we clicked the 'correct' button, the confidence score of the chatbot rose. When we clicked the 'not correct' button, the chatbot would not give the same question the false answer again. The number of questions the bot can answer and the relevance of the answers improves day by day.

We always compared the chatbot to a toddler. A small toddler also needs to be pointed at his mistakes. Sometimes from a toddler it takes a long time to learn something, and the same goes for a chatbot. It's a trial and error process.

From a city's point of view

Scope

The first thing we needed to do, was to choose the scope of the project. The goal of the chatbot is to be able to answer generic questions. Within the Like! project several chatbot projects were set-up with a different scope. As a city, the choice needs to be made between: going broad (all products & services) or going in depth (extensive questions about one topic). Roeselare chose to create a chatbot which could answer a broad range of questions, but not get too much into depth. Next to the questions about the city itself, we also selected some other subjects of conversation:

- Small talk & personality questions
- I.e. what the chatbot can or can't do, answers to questions like 'Where do you live?', 'How old are you?', 'What's the weather like?', 'Who made you?'
- Handle insults & curses
- Jokes

Objectives

The objectives for the chatbot were set-up as follows:

- Answers general questions from citizens on topics like education, well-being, sports infrastructure, traffic, work, tourism, housing and civil affairs.
- Wayfinding on the website
- As an extra function on the general website

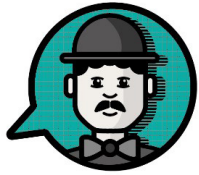
So the objective for chatbot Bertje is to become the single point of contact for all generic questions citizens or visitors tend to ask Roeselare.

Tailor-made story

Personality

We chose to give our chatbot a name that fitted the DNA of the city of Roeselare. We named our chatbot 'Bertje', after the famous writer Albrecht Rodenbach.

We also tried to give personality to the bot by answering personal questions like 'Where do you live?' and 'How old are you?' in a nice manner. Chatbot Bertje is thus able to see the difference between personal questions and city-related (relevant) questions.



Lay-out

The lay-out of the chatbot needed to fit the lay-out of the website, so we used the same branding and colour patterns. We did this in the full screen as in the profile picture.

In first instance, we created a logo that fitted the character of Albrecht Rodenbach. Later on in the project, when we started testing, we got the feedback that the profile picture didn't meet the innovativeness and looked too old. So we changed the look and feel of the profile picture into something that could meet the expectations of the users better.

Chat flow

The chat flow already starts with the very first message from the bot, by leading people to the right channel.

People are directly steered into two options: asking a question or reporting a notification. The reason for that is because we don't want people to make notifications in the chatbot. For that, they are immediately directed to the 1788 form on the website.


We also have some in depth chat flows, where the bot automatically asks a follow-up question. There aren't many chat flows like this, we chose to do it for the most frequently asked questions like the ones about identity cards.

At the end of a conversation, there is also an automatic feedback form flow. When people say goodbye to the bot, they instantly get the feedback form. Whether or not to fill this is, is their choice.

We wanted to include this feedback form, in order to get an objective view on the satisfaction rate of the users, and the amount of time the chatbot saves our contact center, by asking users the question if they would have called the contact center if the chatbot wouldn't exist.

Channels

We chose to put chatbot Bertje on the homepage of the website. As the chatbot is also a wayfinding on the website, we decided this was the best place of integrating it. The chatbot can be found on www.roeselare.be.

**Bertje, het digitale hulpje van Stad Roeselare** ✕

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✓ Maakt je wegwijs op onze website

✗ Geeft geen antwoord op specifieke vragen (bv. over dossiers, personen,...)

Chat

Bertje

Identiteitskaart

Ik

Ok! En had je graag meer informatie hierover gekregen of wil je een identiteitskaart aanvragen?

Meer informatie

Aanvragen

Bertje

Aanvragen

Ik

Voor de aanvraag van een identiteitskaart dien je persoonlijk langs te komen bij de dienst Burgerzaken (Botermarkt 2, 8800 Roeselare). Meer informatie hierover kun je terugvinden via volgende link: <https://www.roeselare.be/wonen-en-leven/identiteit/identiteitskaart/identiteitskaart>

Bertje om 20:46:06

Typ je bericht...

Disclaimer | Feedback

Chatbot Bertje – the new digital employee of the city of Roeselare

Questions and answers

The project kicked-off in October 2019. Because the project was innovative (technical) but also about using the right language (communication), we set up a very diverse project team. One person as a coordinator (Strategic department), to overlook all settings involved (service delivery, communication and ICT), and some thematic employees of communication.

We decided on the scope and objectives and made the first action plan. In October 2017 we had the ambition of going live in April 2018. To hit that target, the first milestone was delivering the information the chatbot needed.

Arinti already selected a database of several hundred (± 500) of generic questions based on their earlier research. In November and December 2017 we worked on the Excel list we got from Arinti. By January 2018 we delivered the first set of answers. During the first development phase, we already tested the bot within the project team.

Testing, testing, testing – training, training, training

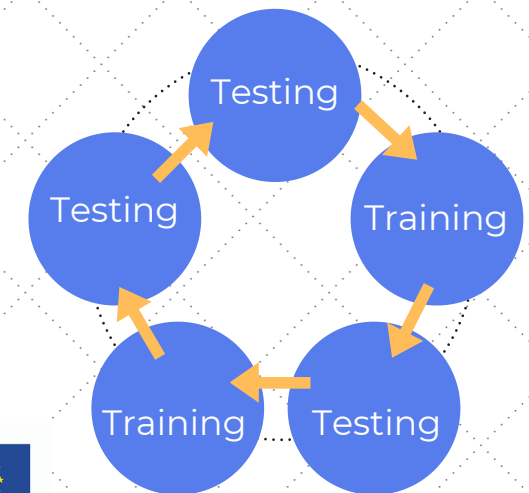
In February 2018 we did a first internal test. The test team were people from the project team and some carefully selected employees who worked in departments that have a lot of customer contacts. The result of the first testing was that the bot wasn't mature enough. So after that, we knew that we needed to test the bot more intensively. A second internal test run was then done by the end of March 2018. The same people were asked to test the bot again. The test team noticed a slight improvement, but it was still not good enough to launch it on the website. By that time we already knew that the timing would not be met. The action plan needed to be adapted.

Good to know: when answering the questions, you need to think about the bot language. Our bot is more informal, because formal doesn't match with chat language. We also chose to use answers containing [hyperlinks](#) most of the time, because static information needs to be adapted more often.

In June 2018 we held an internal masterclass about chatbots. The reason for doing that was first of all to learn employees what a chatbot was, but also to have a moment where a lot of employees could test simultaneously. The information session went well, everyone was very enthusiastic about the concept of chatbots. Unfortunately, the testing session failed. The chatbot wasn't able to handle the amount of testers on the same time. This structural problem needed to be solved, so Arinti took an extensive work period to improve the chatbot.

Chatbot Bertje

Testing Cycle



Interreg
North Sea Region
Like!

European Regional Development Fund



EUROPEAN UNION



The making of chatbot Bertje

By October 2018, the extensive work from Arinti was done and the chatbot was ready for a new testing period. Because a lot of work had been done by Arinti, we launched a big internal testing period. Different employees were contacted to help test the bot (people who don't have customer contacts, people who do,...). People saw that the bot improved quite a lot in comparison to the previous test. Some questions still lacked stability, so Arinti took it even further.

In January 2019 we had a setback. Microsoft launched a new bot framework. In order to solve our problems, our chatbot needed to be updated to the new version of the bot framework. Also some new functionalities were added to the bot framework to improve the bot even further. It took about two months to adapt the framework and do some further internal testing. Next to the adaptation of the framework, we did an update of all questions and answers which already were in the bot. By the end of March 2019 we saw that all the hard work paid off and that the bot was ready for the first external testing. After the validation of the city council, we reached out to some civilians that also gave feedback on the services concept. We wanted to know their first opinion of the bot. In May 2019 we collected the information of the first external trial. People were very positive about the bot. They gave us some contact suggestions, but also one on lay-out. They didn't like the profile picture of Bertje: it looked too old in comparison to the new technology. So we adjusted the branding, because we got this feedback often. After the adaptations, we did a second limited external test. This test was more negative than the previous one. After that, we decided to further train the bot together with Arinti.

After all the hard work, we could finally go live at the beginning of October 2019 for a trial period of three months.

Good to know: some cities in Flanders also launched a chatbot, but with a different scope (mostly limited to one topic). We, as Roeselare, were the first city to launch a chatbot with this kind of scope. Our efforts were also recognised in the market: the project received the 'AI Cup 2019' award, recognising the best AI project in Belgium.

Knowledge portal

Knowledge database




During the different testing phases, we needed to feed the bot with more content. In the beginning, we did that by handing over Excel sheets. During the lifetime of the project (parallel in comparison to testing/training), Arinti also developed the knowledge portal. In the period June – September 2018 we started to learn to work with it. First we had a short training and after that we could adapt, add and delete questions and answers ourselves. We didn't have to work with the Excel sheets anymore. The advantage of this was that we could respond more quickly concerning content issues. Also the fact that we did the same job twice, was over.

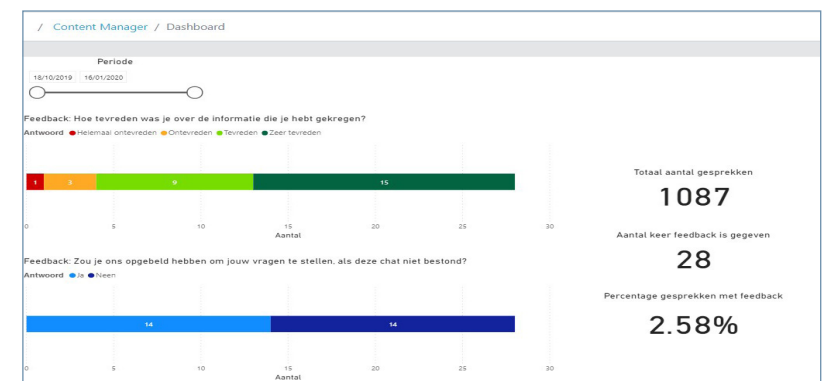
Log files

In the log files we can see which conversations took place. There we can find out what went wrong, what questions were mostly asked. This serves as an important source for additional content.

Statistics

In the statistics page, we can see in one overview how many messages were sent, how many chats took place and how feedback forms were handled.

Bertje Knowledgebase			
Total Amount of Questions 767			
<input type="text" value="Search"/> <input type="button" value="Unanswered"/> <input type="button" value="Search"/> <input type="button" value="Back to Full List"/>			
 Add	Question	Alternative Questions	Answer
 	Aan welke normen moet een pasfoto voldoen?	Waarom moet een pasfoto voldoen? Wat is een goede pasfoto? wat zijn de vereisten voor een pasfoto?	Informatie over de gestelde kwaliteitsnormen voor een pasfoto vind je via volgende link: [https://www.roeselare.be/sites/default/files/bijlage/fotomatrix%202016.pdf] [https://www.roeselare.be/sites/default/files/bijlage/fotomatrix%202016.pdf]





Timeline

Below, you can find the real-life action plan that we adapted along the way.

Milestone	Timing	Task/delivery
1	October 2017	Kick-off of the project
2	November –December 2017	Delivering information to feed the chatbot – first sets
3	February 2018	First internal testing
4	End of March 2018	Second internal testing
5	June 2018	Third internal testing
6	June – September 2018	Development of knowledge portal
7	October – December 2018	Extensive internal testing
8	January 2019	New version of the bot framework
9	May 2019	External testing
10	October – December 2019	Go Live chatbot <u>Bertie</u>
11	January 2020	Evaluation first trial period

Evaluation

First weeks of going Live

At the beginning of the launch, the chatbot was able to answer 650 questions. We noticed in the first few weeks that a lot of new content questions were collected based on the usage. The easy questions were answered very correctly, but the exceptions stayed hard to answer. By the end of the trial period of three months, the database had grown to 765 questions. We collected 400 potential new questions within eight weeks' time. The hard part was selecting what questions we wanted to see answered and which ones we didn't. This was a hard trade-off for some.

Usage of the bot

The first few weeks we had about 160-170 chats with the bot. One chat is a person's full conversation from beginning till end. A chat can thus exist out of multiple messages. After week 6 we saw a trend of decline.

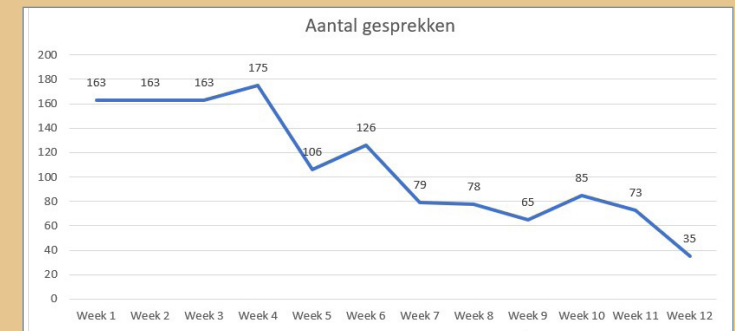


Figure 1: period 01/10/2019-22/12/2019

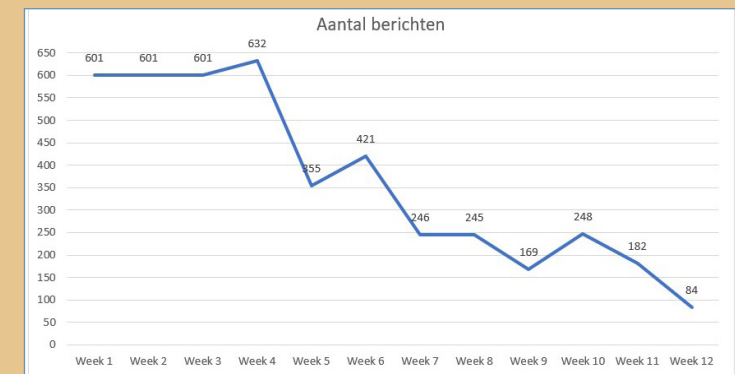


Figure 2: period 01/10/2019-22/12/2019

A message is a person asking a question to the bot. The amount of messages as seen in the graph are just the messages to the bot, not from the bot to the users.

Here, we see the same kind of graph as the previous one. The conclusion about the usage is that there are strong fluctuations over time, but that there is a trend of decline.

Over the period of 01/10/2019 till 18/12/2019 there were 1.332 conversations, good for 4.455 messages to the bot. So this means that by average there were 3,34 messages per conversation.

A remark that needs to be made, is that we haven't done a lot of marketing for it. This could be one of the reasons for the declining usage. The traffic that is generated by the chatbot today is purely organically, a marketing campaign could get more traffic into the bot.

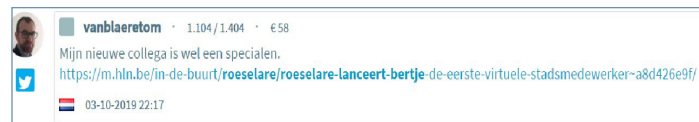
Frequently asked questions

We also analyzed which types of questions were most posted in the bot:

- Opening hours
- Contact details of departments
- Information about road works
- Information about organizing events
- Touristic information
- Personality questions
- Parking spaces
- Vacancies
- Certificates
- Price of some products and services
- Public toilets
- Identity cards
- Driver's license
- Trash day
- Activities in the near future
- Thematic questions about Christmas and new year (ice track, Christmas chalets, ...)

Social media

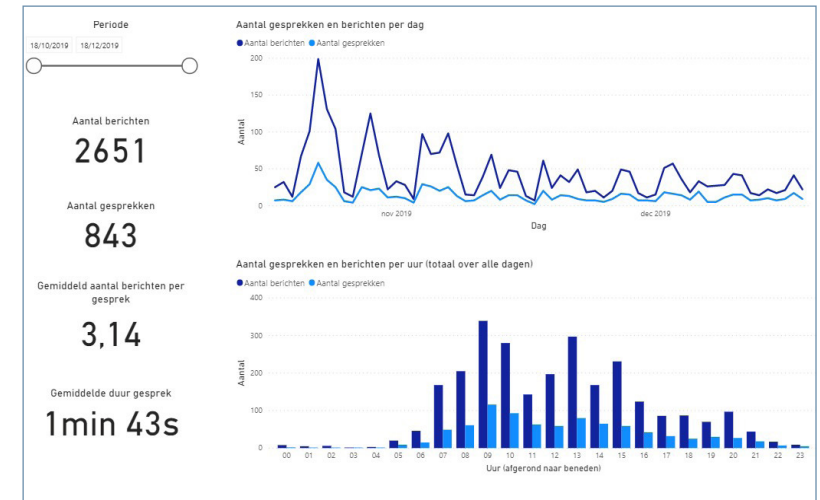
We also monitored social media. A lot was said about our chatbot. Luckily it was always positive. It was even noticed by the VVSG, the national association for Flemish cities.



Answered versus unanswered

About 50% of all questions are answered in first response. This means that 50% of the answers were given with a confidence score of more than 70%. The reasons for the unanswered questions are not always that the bot didn't know the answer:

- New questions: bot didn't know the answer
- Same questions as existing ones: needed to be linked within the bot
- Questions we don't want to give an answer to
- Abuse Dashboard



In the feedback figure above, we see that from the one's who do give feedback, the mere of them are very positive. The amount of people who answer the feedback form is rather low, but not uncommon when we make a comparison to other chatbots.

When we look at the impact on the 1788 contact channel, we see no direct correlation. We could conclude that the chatbot is mostly used as a better search function (next to the existing one on the website).

Good to know: the chatbot project won the AI Cup 2019 award on October 22, 2019.

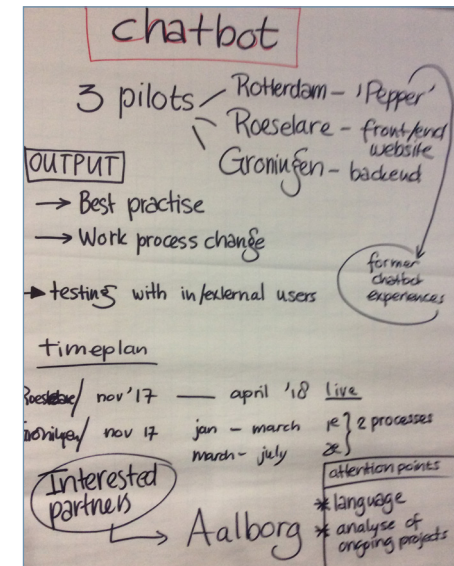
Next steps

We will do an extra trial period with more communication, to see whether or not the usage increases. After that period we will make a decision to keep the chatbot online or not.



Pilot Lessons

- The choice of scope determines the length of the process. Because we did a very broad scope, we took a lot longer than other chatbot projects to go live.
- It's an AI project, but there is still a lot of manual work to be done in order to make the bot mature enough. We believe that in the future this will decrease, when the technology further improves.
- When you choose to work with hyperlinks to the website in your bot's answers, the chatbot project is also an analysis of the website, which can be seen as an extra quality check. We could solve some deficits on the website by doing this project.
- As for every chatbot initiative, a pilot project is needed to get the bot filled with the right answers and to train him on correctness, completeness and relevance of answers.
- The users (internal and external) must be willing to accept a low accurateness of the bot during the first days/weeks of the pilot, without immediately questioning the viability of the project.



Lessons Learned

Some Lessons Learned from Roeselare:

- **Don't try to impersonate humans.**
 - People still need to know that they are talking to a chatbot. This doesn't mean you can't answer personal questions. It's always good to add some personal questions who are answered in a fun manner.
- **Manage the expectations of the users.**
 - We did this by informing people what to ask and what not to ask to the bot. We put this at the top of the screen.
- **Connect them through in case of no response.**
 - If the chatbot can't respond on different questions in the same conversation, chatbot Bertje gave them the answer they could connect to an employee of the city by telephone, mail or the notification form on the website.
 - We set the bar at 3. If three questions in a row couldn't be answered, we gave them the advice to contact the city in another way so that they could be helped.
- **Capture feedback**
 - Important to capture the feedback from users. When people say good bye, by adding a feedback button at the bottom of the chat screen for instance.

Value for Like!

The pilot Roeselare did had a very broad scope and was unique for Like! in this respect. When comparing different websites of cities and towns and linked organisations in Flanders, Arinti noticed that 80% of the available information is similar. Often, information about the city and its organisations is spread over different websites. Still, citizens always have the same questions: so the pilot is representative for other cities in Flanders and elsewhere.

Based on this generic information, Arinti built a database with common questions, equal for all cities. This database was used as input for the Roeselare city chatbot, and was linked to the right answers. Roeselare specific questions were added during the pilot phase. Others could do the same.

Once the chatbot works for one city, the model is easily replicable to other Flemish cities, later with some translation work to French speaking Belgian cities, and in a second phase to European cities. So there is also the transnational representation.

We believe that citizens in Europa all cope with an equal search for information, and that a common database of frequently asked questions is a great accelerator towards a successful project.