Council Chatbots

ROI Analysis and Market Summary

Summary of key findings from research into chatbots for councils

Contents

1. Introduction

1.1. Quick Links

This document is one of several related outputs from a research programme into the feasibility of implementing chatbots within councils in England. This document in particular focuses on quantifying the costs and potential savings of implementing such technologies. In several places throughout this report, reference is made to other strands of research and analysis carried out within this project, including the overarching project report, "Can chatbots and AI help solve service design problems?".

Please refer to our individual reports for more focussed insights and information:

- Technology Landscape Review | April 2019 | Council Chatbots | Torchbox
- Example Shared Conversational AI Architecture | April 2019 | Council Chatbots | Torchbox
- User Research Summary Report | April 2019 | Council Chatbots | Torchbox
- Case Studies | April 2019 | Council Chatbots | Torchbox

A blog has been published by the project lead, Neil Lawrence of Oxford City Council. To read articles covering each stage of the project please visit the blog:

- https://localdigitalchatbots.github.io

1.2. Context

This Return on Investment (ROI) report provides an overview of findings from research into how chatbots and conversational artificial intelligence (AI) can help councils and their users avoid making unnecessary telephone calls. In particular, this report seeks to address the following project aim:

> **Deliver a methodology for evaluating the suitability or otherwise of a particular application for developing into a chatbot or AI product**

It is important to acknowledge from the outset that our research defines "unnecessary calls" as situations where the user could satisfactorily complete their intended task through online self-service, rather than making a telephone call. A stated motive for this project is to explore opportunities for cost-saving through reducing inbound calls to contact centres. As a result, when assessing current levels of expenditure within these services, we are primarily considering the costs of provisioning call centre resources. This approach can be illustrated by considering average cost-per-serve figures from council data:

Example costs of provisioning services via existing channels (Redditch & Bromsgrove)

Our research does not presuppose that *all* telephone calls to councils are unnecessary, nor does it assume that a chatbot or conversational AI is a suitable replacement for human contact in all (or any particular) circumstances.

This research includes findings from the project data survey, the individual councils' Google Analytics set-up, as well as observations derived through interviews with stakeholders from across all 13 councils involved in the project.

2. Methodology

In order to forecast any potential return on investment from a new chatbot or AI technology, it is important to first consider the current costs faced by councils to provide existing services through call centres. We analysed data made available by participating councils, taking the following steps to derive a figure for current service costs:

1. **Call Volume Costs**: a comparison of the total number of inbound calls received across the four service areas researched during this project. This gives initial figures representing call volume costs, and quantifies the total opportunity size for replacing inbound calls within a particular service area.
2. **Resolution Rate**: an analysis of the proportion of calls that can be resolved by a first-line call centre agents, as opposed to requiring transfer to a service team or other follow-up. Are the enquiries either basic information requests or tasks that can be handled by a first-line agent, or conversely do they require complex, human conversation with a member of the specific service team?
3. **Chatbot Target Value:** this calculation quantifies the value of those calls that can be handled by a first-line agent. In other words, the target value is the potential value to be saved by implementing a chatbot.
4. **Exemplar Council:** by calculating averages of all available council data, we are able to create an exemplar council, which can serve as a proxy for a 'typical' council.
5. **Scale to All Councils:** by taking the exemplar council figures and scaling across all English councils by a factor relating to population size, we are able to create a total opportunity value for a particular service area.

3. Quantifying the Opportunity

Using the methodology outlined in Chapter 2, we can follow these steps to produce figures representing the potential cost savings across the four services.

3.1. Call Volume Costs

Torchbox distributed a data survey to all participating councils in order to establish the call volumes across each of the four council service areas. Key figures to gather at this stage are:

- Total number of calls to the call centre per annum
- Number of calls per annum for each of the four service areas
- Recognised cost-per-call

For example, if a council receives 200,000 total calls per year, and 3.5% of these are for the Planning service, then, with a cost-per-call of £5.00, the initial volume cost for Planning can be quantified at £35,000.

3.2. Resolution Rates

Next, we consider the first-line agents' ability to resolve customer enquiries for the particular service (as opposed to referring the call to a service team or scheduling a call back). The following figures represent average resolution rates based on the data shared by the councils[1]:

Service Area	Resolution Rate
Planning	43%
Waste and Recycling	98%
Revenues and Benefits	33%
Highways	64%

[1] Note, the ability for first-line call centre agents to resolve calls is dependant both on the nature of the enquiry, and upon operational structure within call centres for handling particular services

3.3. Chatbot Target Value

By aggregating the call volume cost figures with the stated resolution rates, we can derive a target value for a particular service - a monetary value representing potential savings that could be addressed by a chatbot or conversational AI.

Call volume value **x** First-line resolution rate **=** Chatbot target value

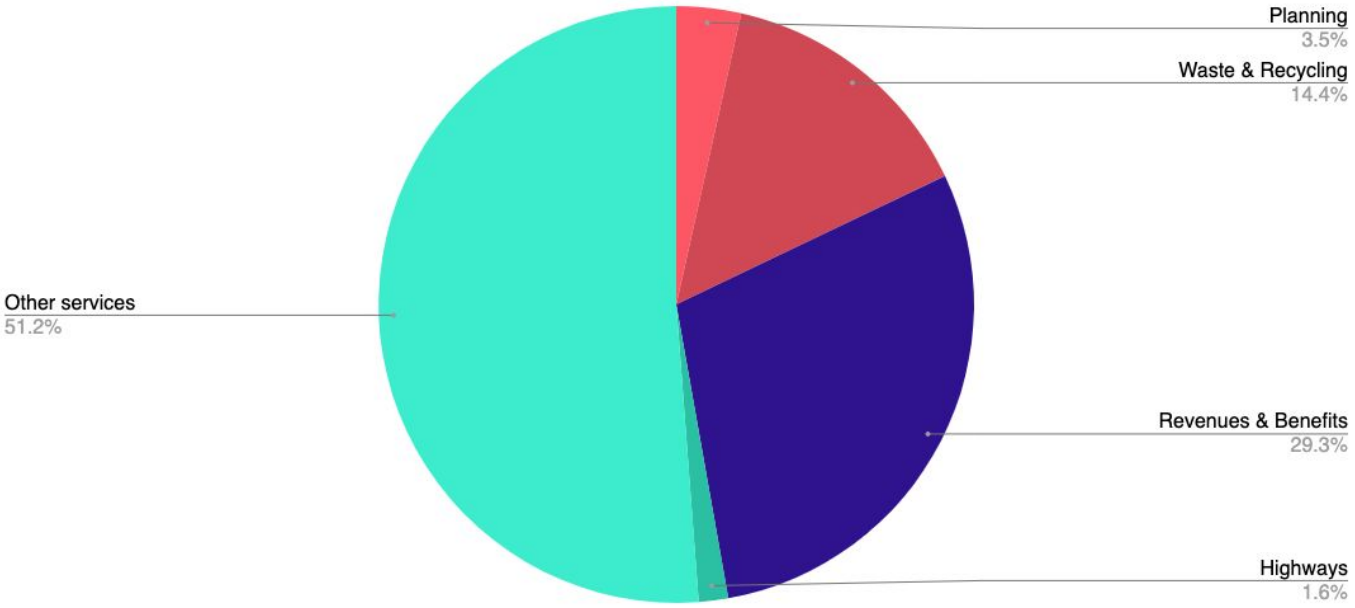
Using the hypothetical figures from 3.1 above, with Planning call volumes worth £35,000, then with a resolution rate for Planning of 43%, the target value within a single council is £15,050.

3.4. Exemplar Council

Using data provided via the survey, we are able to take averages across the four services to create a model for an exemplar council:

Population	170,612
Calls per resident	1.52
Annual call centre volume	259,330
Cost per call	£4.08
Total call centre expenditure (annual)	£1.06m

Similarly, by taking the call-volumes for each service area from across the participating councils, we can derive equivalent figures for our exemplar council showing the share of calls across the various services:



This in turn allows us to project approximate costs of serving calls within a specific service area for an exemplar council:

Service Area	Number of calls	Value of call volumes
Planning	8,999	£37,032
Waste and Recycling	37,344	£152,362
Revenues and Benefits	76,113	£310,013
Highways	4,149	£16,929

3.5. Scale to All Councils

We are able to quantify the costs of provisioning these services throughout England by extrapolating the figures derived for the exemplar council, and scaling according to the number and population of councils that offer the particular service:

Service Area	Value of Call Volumes (English Councils[2])
Planning	£12,062,480
Waste and Recycling	£49,866,947
Revenues and Benefits	£101,411,429
Highways	£5,463,485

3.6. Target Value for All Councils

At face value, services exhibiting high call volumes could be interpreted as being strong candidates for chatbots. However, we've also observed the importance of considering the rate at which first-line agents are able to resolve enquiries, based on the reason for calling being a simple information request or transaction, as opposed to requiring referral to a back-office service team[3].

Throughout the research, we have seen strong contrasts regarding the extent to which first-line call centre staff are able to resolve inbound calls, either due to

[2] Methodology for establishing figures for all English councils: Take actual figures for the population of each District Council across England. Use the average call-per-person to derive estimated total calls annually for each Council. Then using the Exemplar Council figures for % share of total calls for each service area, derive estimated annual calls for each service area. Highways figures exclude councils that are not a Highways Authority and are also not within a Highways Authority County Council in order to avoid potential double counting.

[3] For further consideration of the most suitable types of query for a chatbot to handle, please review the Introduction to Chatbots chapter within the Project Summary Report.

the subject area or decisions by the council in the operational model for its contact centre. Factoring in these resolution rates has a significant influence on potential chatbot target value:

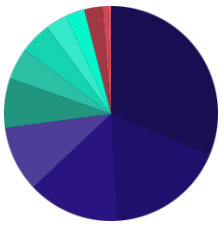
Service Area	First-line Resolution Rate	Chatbot target value (English councils)
Planning	43%	£5,186,866
Waste and Recycling	98%	£48,869,608
Revenues and Benefits	33%	£33,465,711
Highways	64%	£3,496,630

4. Service Complexity

Beyond looking simply at call volumes for a particular service area, it is important to consider the complexity of each service, and the number of distinct query categories that fall within each service area. Something that stood out during our conversations with stakeholders and subsequent data analysis was the extent to which services differ in terms of reasons for calling, as categorised by the participating councils:

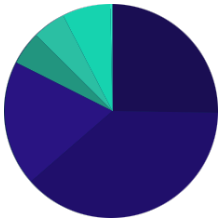
REVS & BENS

Council tax queries	**31.2%**
Council tax payments and refunds	**18.0%**
Benefits Queries	**13.9%**
Benefit changes	**9.9%**
Moving house	**7.5%**
Chasing progress	4.8%
Council tax recovery action	4.8%
Council tax discounts	3.3%
Benefits - applications for CT or HT	2.9%
Benefits Overpayments	2.8%
Back Office	0.9%
Universal Credit	0.3%
Benefits - Fraud referral	0.1%



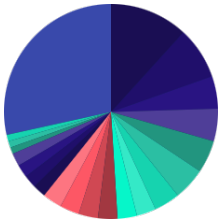
WASTE & RECYCLING

Report Missed Collection	**25%**
Report Dumped Rubbish	**38%**
Arrange Bulky Collection	**18.6%**
Info on Recycling centre	5%
Commercial collection	4.90%
Damaged Lid	7.20%
Request new bin	0.30%



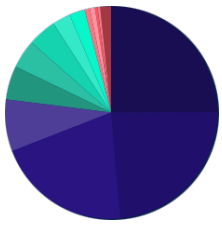
HIGHWAYS

Roadworks – Carriageway and Footway - Scheme enquiry	**12%**
Pothole	**8%**
Trees & Vegetation	**5%**
Claim Enquiry – Insurance claim enquiry	**5%**
Condition of Carriage Way	**5%**
Vegetation – Tree or vegetation enquiry	**5%**
Streetworks – enquiry	**4%**
Street Light – Enquiry or Issue	**3%**
Carriageway condition – Carriageway enquiry	**3%**
Parking – enquiry	**3%**
Pavement	**3%**
Carriageway and Footway – Crossover enquiry	**3%**
Parking restrictions enquiry	**3%**
Road safety enquiry	**2%**
Ironwork	**2%**
Blocked Drain	**2%**
Permits and Licences – Crossover application	**2%**
Pavement Defect or Enquiry – Footway enquiry	**1%**
Carriageway and Footway –Gully enquiry	**1%**
Vegetation – Grass verge enquiry	**1%**
Others	29%



PLANNING

Application already submitted	**24.90%**
Proposal Permission	**23.70%**
Speak to named officer	**20.50%**
Fee	**7.90%**
Information	**5.14%**
How to....	4.35%
Meeting	4.35%
Appointment & Fee	2.77%
Variation	2.37%
Enforcement	0.79%
Committee	0.79%
Public Realm	0.40%
Files	0.40%
Other	1.64%



Title number of reasons required to capture 80% of enquiries

To illustrate this discrepancy between the different services, consider the two extremes:

- In Waste and Recycling, all calls can be categorised into seven reasons for calling
- In Highways, there are more than 30 distinct reasons for calling

The best use cases for chatbots are those where there is a relatively narrow domain of enquiries. In other words, the best services to consider for chatbots are those with a small number of reasons for contact, and where the various enquiries share similarity in terms of vocabulary set. For a more detailed explanation of domain considerations, see the chapter entitled Use Case Selection within the Technology Landscape Report.

As expressed above, Waste and Recycling is categorised by a small number of reasons for contact:

> **80% of calls within Waste and Recycling can be categorised into three specific reasons for contact**

This lack of complexity makes it the most appropriate service area to carry forward for considering chatbot implementation costs.

While Revenues and Benefits exhibits a high volume of calls, together with a relatively small number of reasons for contact, the diversity of the most common types of enquiry[4] limit the opportunity of a narrow-domain chatbot. Furthermore, we also learned through user research that the sensitive nature of the enquiries within this service area, and the need for sensitive human contact, makes it a less appropriate domain for chatbot consideration.

[4] Council Tax enquiries, Council Tax payments, Benefits Enquiries

We have seen that by considering call volume costs and resolution rates there is a strong basis for considering a chatbot within the Waste and Recycling service. In the next chapter we explore estimated cost benefits of collaboratively developing a chatbot for this area.

5. Estimated Cost of Implementing a Waste and Recycling Chatbot

Based on the evidence outlined in the preceding chapters, the strongest candidate among the four services to consider for a chatbot or conversational AI is Waste and Recycling. In summary, this position is justified by the following criteria:

- Large volume of calls
- Strong ability for first-line agents to resolve
- High target value and cost savings
- Lack of complexity / few reasons for contact

Next, we can consider figures for implementing a Waste and Recycling chatbot. Based on the stated project objectives, a council considering chatbots should see contact deflection as a KPI for cost reduction[5] — we therefore recommend adopting a thorough contact deflection strategy along side the implementation of the AI system, to encourage users to move from phone channels towards AI enabled messaging channels that are significantly cheaper to serve. This can be achieved in a number of ways, such as by making the chatbot prominent within key user journeys on the council websites, or by recommending via telephone IVRs[6] that customers can bypass call centre queues by using the chatbot. Individual councils would need to determine how aggressively they pursued this benefit case based on how firmly they would encourage and prompt users from the traditional channels to the new one.

[5] Aligned with the stated project goal of reducing unnecessary calls into council call centres
[6] Interactive voice response systems, whereby users select an option which triages their call to the appropriate service

Understanding deflection rates

One of the key success factors for deploying any chatbot is its deflection rate, or the extent to which inbound queries can be "deflected" from live, human agents (e.g. first-line call-centre agents). A service's deflection rate is a function of two key measures:

- **Chatbot intent coverage**: the extent to which a chatbot can handle all the different questions that users ask within a particular service area
- **Knowledge success rate:** the rate at which a bot usually understands the user and goes on to solve a customer's stated problem

Typically, with chatbots of the kind considered within this research project, we'd expect to see deflection rates between 30% and 70%[7]. The higher the deflection rate, the more contacts we'd expect to be adequately handled by a chatbot.

Taking the Waste and Recycling as a whole, we'd expect to see a high deflection rate due to:

- User research demonstrating it is an area where AI based help on a messaging channel is likely to be accepted
- Evidence demonstrating a small number of user intents
- Narrow domain of enquiries implies strong likelihood of chatbot having good knowledge coverage
- Small number of distinct reasons for contact requiring a limited vocabulary set
- Expressly stated motivation from councils to implement a chatbot as a direct way of reducing call centre contacts.

[7] Deflection rate bandings for guidance: 10-20%: projects with little advertising or direct deflection | 30%: significant project with banding, but no direct deflection measures away from existing channels | 50% projects with moderate deflection away from existing channels | 70% projects with strong prominence of chatbot, advertising, and active deflection away from existing channels.

In reality, it is difficult to produce an accurate deflection rate figure prior to implementing a chatbot prototype. However, given the data available within Waste and Recycling, and the justification provided above, if matched up to a firm deflection strategy from the traditional channels to the new channel we'd expect a strong deflection rate which for the purposes of this forecast we estimate at 70%[8].

Calculating chatbot costs

In order to derive anticipated costs for developing and maintaining a new chatbot, we consider three sets of related data:

1) Cost of overall setup and initial chatbot training
2) Cost to serve each query
3) Continuous improvement / chatbot training

Waste and Recycling chatbot - projected costs

1) Based on prior experience of organisations first investigative chatbot projects, a reasonable assumption for the costs to build and invest in an initial chatbot with a narrow domain of knowledge can be estimated at £50,000.
2) Typically, the software costs per user enquiry falls within a range of £0.01 to £0.10, depending on the complexity of the target domain and the technologies used to support it. In the case of Waste and Recycling, we'd anticipate this to be in the region of £0.05 per user enquiry. Our exemplar

[8] Any selected service area would need to go into a detailed level of analysis of the outcomes that would be supported by the chatbot, together with their likely satisfaction rate, and coverage of the service area, in order to produce a scientifically based equation for the deflection rate. With the information uncovered during user research, together with the data concerning reasons for contact, and knowledge of the performance of other conversational AI systems, we are able to anticipate a best-efforts approximate deflection rate of 70%.

council receives 37,344 Waste and Recycling calls per year, and a contact deflection rate of 70% means we should consider the costs of 26,140 chatbot serves per year. This equates to an annual cost of £1,307.

3) A chatbot is only as good as the data it is provided and the level of investment in ongoing training[9]. As a result, it is essential to consider the costs of continually improving the chatbot over time. A reasonable level of costs for continuous improvement and for supporting the underlying platform, again based on past projects within a similar narrow domain of knowledge, is £5,000 per month.

Based on the above calculation, anticipated first-year costs for a single council investing in a Waste and Recycling chatbot would be £111,307. Our exemplar council had a chatbot target value of £149,314[10], meaning there is potential for annual savings of £38,000 for a single council developing their own chatbot if they could fully cover the domain area with this level of investment.
In generally however investments of this size whilst often proving the case for a chatbot, only cover a limited part of the knowledge domain and tend to result in a limited achievement of the anticipated benefits. By collaborating as a larger set of councils a much more thorough implementation of the domain might be achieved.

[9] Investment in ongoing training is essential if the chatbot is going to address user needs. User utterance reactions tend to be different from design assumptions and require iteration in a controlled release. User expectations are rapidly evolving, once customers start using a service they assume it does more than it does, and this behaviour needs to be adapted to. Local changes to service provision, environment, or 3rd-party suppliers can also have significant impacts on what users are saying, and these need to be monitored and adapted too.
[10] Based of the 98% resolution rate on calls valued at £152,362

Justifying collaboration in chatbots

If every council built their own Waste and Recycling chatbot in isolation, then while potential savings exist, any return on investment will be limited. We would end up with a fragmented council ecosystem and enormous duplication of effort. Given the similarity of user needs across multiple councils in this service area, we should consider the costs (and returns) of developing a chatbot that can serve multiple councils. Potentially this is a route to ensuring a far greater return on investment.

Building a chatbot that serves multiple councils would be more expensive than a single-council chatbot. This is due to, for example, building a vocabulary set that can cater to a wider range of dialects and regional vernacular. However, the expected economies of scale gained through collaboration means that a shared approach should derive significantly better return on investment than a single-council approach. In our experience, building a chatbot for 20 councils with a thoroughly implemented common scope would only cost approximately seven times[11] the cost of building a chatbot for one. The benefits of such collaboration in terms of ROI is clear:

- The initial one-year investment of building a chatbot shared by 20 councils would be £779,149[12]
- Splitting this investment across the 20 participating council means that the per-council cost of collaborative chatbot implementation is only £38,957 per year, compared to £111,307 if developed individually.

[11] Estimated based on previous collaborative chatbot projects. Note, this is not an estimate for an Alpha chatbot, but rather a high-level, annual estimate for a fully developed chatbot supporting 20 councils. It would be possible to produce an Alpha prototype for significantly less than this, depending on the objectives and scope of the Alpha project

[12] Seven times the cost of implementing a chatbot for a single council

- Returning to our exemplar council, if they embarked on a Waste and Recycling chatbot project with 19 other councils, they could reasonably expect to save £110,357 per year

If 20 councils collaborated on a chatbot, estimated savings across all 20 councils would be £2.2m

- The amount saved per council is nearly four times as much as it would be if councils developed their own chatbot in isolation

6. Summary

While our main conclusions from this research project are summarised in the Project Summary document, there are some clear conclusions to be drawn from this report considering costs and return on investment:

- **Choose Waste and Recycling:** Of all the service areas, Waste and Recycling exhibits the largest target value, while simultaneously being relatively non-complex in terms of number of distinct reasons why people get in contact. Other service areas with high call volumes are characterised by a greater level of complexity, a lower rate of first-line resolution, or user needs that exhibit a high propensity for subjectivity, complexity, or emotional subject matter best reserve for human agents to resolve.
- **Collaborate on building a chatbot:** The costs per council of implementing a chatbot are dramatically reduced when councils collaborate on a technical solution. Other ancillary benefits include lower-costs for ongoing training and maintenance, together with a more consistent technology stack being shared across councils
- **Invest over time:** a customer support chatbot doesn't function autonomously. Someone needs to maintain and improve it and the ongoing training costs are an essential investment if the chatbot is to continue to meet user needs.

Appendix

Market Summary

Highlights from stakeholder research and analysis into each of the four service areas:

Planning

- Planning makes up a comparatively small proportion of total calls (3.5%).
- Less than half of all calls (43%) can be resolved by a first-line agent. The remainder need to be referred to Planning teams.
- A high number of calls (~20%) are for a specific named planning officer.
- The ability to digitally query an existing planning application is a prerequisite for meaningful AI in this area. However, in the case of at least one council, this information is not available without consulting a physical file or the specific planning officer responsible.

Waste and Recycling

- The vast majority (98%) of Waste and Recycling calls can be handled and resolved by a first-line agent.
- Waste and Recycling makes up a significant proportion of calls: 14.4% on average.
- Users would like to self-serve, but in several cases the councils did not offer a full range of services through online self-service, which may result in calls. As a first step towards reducing inbound calls, offering all services through online self-service is an obvious first step.
- Some councils have real-time data available from waste collections teams, while others are still developing this integration. This kind of data is

powerful to enhancing self-service, and meaningful chatbot collaboration would depend on participating councils having a similar level of real-time data available.
- Pre-empting customer needs (e.g. proactively informing them if a bin falls into the back of a lorry) is an obvious way to reduce the need for users to make contact.

Revenues and Benefits

- The majority of Revenues and Benefits calls require follow-up (via telephone, email or in person). Only a relatively small proportion (33% on average, based on the available data) can be resolved by the first-line agent.
- The ability for customers to self-serve is limited, as not all councils have a full range of Revenues and Benefits tasks available to complete online (e.g. Change of Circumstances, View Council Tax Balance, etc.)
- Within Revenues and Benefits, the conversational subject matter is highly sensitive, emotional and, in nearly every case, unique. As such, the risk for confusion and frustration with a chatbot is high.
- A lot of user journeys involve referral to third-party services, including Citizens Advice, Step Change, Healthy Minds, etc.

Highways

- Importantly, the status of Highways service provision is nuanced. The vast majority of councils are not highways authorities, and so do not provide services to handle Highways enquiries.
- The result of the above observation is that the potential for collaboration on chatbots is restricted to a much smaller set of participating councils.

- Within the lead council for Highways, Surrey County Council, the majority (73%) of issues are already reported online through self-service. There has been a deliberate effort to encourage users to self-serve online, reflected in a 10% increase in self-service rates over the past 12 months.
- Within Highways, there is a large number of different reasons for contacting the council (see diagram 'Reasons for Contact' diagram above). This reduces the opportunity for a narrow-domain chatbot compared to other service areas with fewer distinct reasons for contact.
- Members of the public are confused by the two-tier authority system, whereby some services are provided at a county level, while others fall under the remit of a local borough or district.
- There is a large number of contractors and subcontractors provisioning services within Highways. In many cases, the supplier operates their own distinct CRM or issue reporting workflow, which in a lot of cases does not integrate with the council CRM. This significantly limits the ability for a central council system to efficiently handle all queries.
- There is a strong opportunity to use conversational AI in certain areas, e.g. visual classification of potholes, reporting issues, providing proactive updates on reported issues, etc.

Limitations

There are limitations to the analysis, which should caveat any decision:

- Few councils are Highways authorities, meaning that they do not experience a high volume of calls in this area. As a result, there is less opportunity to scale all the findings from Surrey County Council.
- Our calculations within this document are based on the data made available by the councils during this project. In some cases, data was incomplete, or certain metrics (such as resolution rates) were not available from all councils. We have made every effort to ensure that our calculations are based on a sound methodology.
- The precise costs of any potential chatbot would be more accurately assessed through a dedicated scoping exercise for a specific chatbot technology and delivery. Due to the restricted remit of this research, we've had to make cost assumptions based on the typical investment organisations are typically willing to make in an initial chatbot projects, and then the cost benefits potentially available if then scaling this up to a significant number of councils