

Planbot

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Planbot is a chatbot developed by a team consisting of two University of Reading graduates. It aims to provide users of different levels of experience with easily accessible property information and documents, with a current focus on planning. This white paper outlines how and why Planbot was developed, while also presenting an image of how its future may look.

The motivation behind a property-based chatbot

Planbot came about through a mutual passion for both technology and property. On the one hand, there exists impending wide-scale automation through rapid development in technologies such as machine learning and blockchain, and on the other, a property industry with a planning system largely playing catch up. The first thought, and indeed the first iteration of Planbot, was a natural language chatbot that could infer meaning from user sentences; a chatbot that had the ability to converse with its users about property and inform them of the planning system. The problem with this quickly became an issue of complexity.

By and large, the user requires accurate information and most likely wishes to consume that information as quickly as possible whilst minimising frustration. The choice became apparent during the development process that a shift in thinking was required. The following sections will draw upon this shift further.

With that said, the two 'hands' outlined above still remain firmly in mind. Nobody can be sure of the impact of automation on job losses: each week a new report is released detailing potential losses of 40%, 60%, 80%. Nor is the future of artificial intelligence and impending singularity set in stone, just as distributed ledger technology needs to overcome various difficulties. These technologies, however, should be embraced. The ability to use advanced statistics to predict actions based on large datasets lends itself well to chatbots. The immutable, open and distributed data that blockchain technology provides potential access to, allows for the use of far greater amounts of data. Planbot, therefore, moves forward with these technologies in mind.

Planbot aims to appeal to a wide range of users: planners, developers and self-builders. The chatbot aims to provide these users with a tool for quickly finding information about definitions and planning mechanisms while also, (perhaps the main draw) being able to request various documents pertinent to planning. This is believed to be a solid foundation from which Planbot can grow in the future. Our approach to Planbot was one of transparency: ease of access to open information. Planbot therefore acts as a front-end user interface to an open source of data, which is also accessible via a public-facing API.

What is a Chatbot?

A chatbot is an interactive computer program designed to mimic (to various extents) human conversation. They are often used to provide 24/7 customer service, though general purpose chatbots have been developed in the past and will continue to be in the future. They most often take form on instant messaging platforms and as such require quick responses to user queries, usually with a character limit for each message. Chatbots can either be rules-based where the program listens for triggers and uses them to run an appropriate function on the 'back-end', or else they can use Natural Language Processing (NLP) to learn from conversations as more recent experiments like Microsoft's 'Tay' and 'Zo' have shown (with differing levels of success).

Current functions of Planbot

Planbot releases with three core functions which aim to entice professionals into beginning to understand and conceptually apply automated processes to roles within their fields. The three functions are:

- **Definitions:** The user can ask for definitions to a wide range of key terms often found in planning and property. Currently there are over 750 definitions a user can ask for, sourced from the Planning Portal and the Lexicon of PRS, BtR and Property by Richard Berridge.
- **Information:** Planbot can find a user information on two planning mechanisms: use classes and permitted development. A user might ask for further details on the C3 use class or whether planning permission is needed for extensions, for example. The information here is also sourced from Planning Portal.
- **Documents:** Three types of documents can be asked for:
 - **Policy & Legislation:** Statutory documents, such as the Planning Act 2008, or national/regional policy, such as the National Planning Policy Framework, can be asked for by the user.
 - **Local Plans:** By inputting a local planning authority, or alternatively a post-code, Planbot will find the local plan (or extant local development framework) for that area and send a link for the relevant PDF or webpage to the user.

How Planbot works

Planbot has been built using the Python programming language. Python was used for a variety of reasons: its syntax makes it faster to write than a number of other languages and, in turn, hopefully easier to understand for those coming into the project. The language also has a wide range of 3rd party libraries available which extend its

default capabilities. Some of the libraries used in the project include spaCy, a NLP framework, and Bottle, a lightweight web application framework. This means that the majority of the Planbot infrastructure can be built upon Python with relative ease. Python has been used to build a range of other websites and web apps, including for instance, social media sites Reddit and Instagram.

The NLP module, spaCy, allows Planbot to parse meaning from the user's query more successfully. Early in testing, it was discovered that though there exist, for instance, a myriad of possible definitions a user can ask for, unless the user knows with certainty the exact string or substring that points to that definition, the bot will not return it. Broadly speaking, an algorithm comprised of sentiment analysis, least distance matching and substring matching is used to maximise the ability of the bot to answer a user's query, or at the very least present the user with a range of options to select from.

Planbot did use the wit.ai API early on, which uses NLP to parse context and intents from user queries. This allows, for instance, the user to say 'Can you find me the definition for green infrastructure', which will be broken down into an intent of 'find me a definition' and a context of 'green infrastructure'. The problem with this becomes apparent when 1) trying to communicate what can and can't be achieved through the chatbot, 2) increasing its complexity by adding further lines of enquiry to the chatbot and, 3) predicting responses between similar questions which should garner different outcomes. Simply put, to ask a question and be given a completely disparate response was never the goal with Planbot.

As a result of the above, there was a shift in design philosophy to a more structured approach, where the user is given quick reply options and responses are centred around one or two word answers, to communicate the bot's capabilities more transparently. In line with Facebook Messenger's bot guidelines, menus were incorporated which make it much easier to manage context through conversation branches on our end. Having developed a deterministic, but (hopefully) scalable bot engine for selecting responses to user queries, we have far greater license over the chatbot than using a bot framework with NLP logic stored on a different server.

Last but certainly not least, it was decided that Planbot would be open source early on in the project. With the source code being free to modify, the potential for collaborators to join the project increases, while the license chosen, the GNU General Public Licence version 3, dictates that any resulting projects should also be open source. With one of the goals of the project being increased transparency, we believe that the choice of GPLv3 meets this criteria.

Current limitations and future developments

There are several elements of the project that can and will be improved upon in the future. One key point to make is that of managing expectations. This is not solely concerned with our chatbot, but with chatbots more generally. It is possible that Microsoft's 'Tay' and 'Zo' have warped public perception about what the majority of chatbots are

currently capable of. The mimicry of human conversation and the 'learning from' aspect of those bots do capture the imagination, but the reality is that this can lead to user frustration in the short term for a chatbot that centres around relaying much-needed information. That is why, as previously detailed, a more structured approach was taken. The aim is not to have our chatbot hold a user's hand throughout the conversation, but to minimise frustration for all users, even if this betrays the 'chat' in chatbot to a certain extent. It is possible, in the future, that Planbot shifts back to a more 'fluid' conversation structure, but for now this style of chatbot is preferred.

The current feature set of Planbot aims to showcase a range of uses available to different users. At this stage, however, it is primarily focused on the self-builder, with features that aim to educate rather than to serve. Planbot is an 'open book' of sorts: being an experimental community project its content could change dramatically over the next year and beyond. Further features could include, for instance, the ability to search within PDF documents for more specific information. As well as this, there is evidently more planning information to be included in Planbot. In an earlier version of the bot, a feature that allowed users to fetch recent market reports from sources such as Savills and Cushman Wakefield was included, however it was decided that this was at odds with core Planbot features. As such this feature is likely to form its own entity in the future.

Looking out over the horizon, we aim to establish Planbot as a viable platform for retrieving property-related information, preferred over using a search engine. We also wish to establish and incorporate our own services, through the use of machine learning.

This white paper has hopefully described and explained the process we have gone through in developing Planbot. Given the rapidly changing field, Planbot is a project that has been designed with flexibility in mind, with the ability to be shaped by many stakeholders. This makes its development a challenge, but one that we relish. We hope that Planbot can assert itself as a viable alternative to current means of finding property information and believe that its current aggregation of information sets it apart in that regard. In the future, we see Planbot as being a powerful agent within the industry through the wider use of data.