

# Self-Service IT Support: Chatbot versus Search Engine

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## Background

We compared users' experience with self-service IT support using a time-tested robust search tool versus a new chatbot (implemented using [Ivy.ai](#)), both running on top of the same large knowledge base at the Indiana University (which is a large state university in the US with more than 111,000 students).

**Search Tool:** The first version of this online [knowledge base](#) was established in 1988, and it started supporting keyword searches by 1990. The University IT Services (ITS) team at the Indiana University has won [several awards](#) for their excellence and so has the search tool provided by the team. To sum, the search tool is a well-developed mature tool designed to provide self-service IT support.

**Chatbot:** ITS was looking for ways to better serve the users' needs while reducing operational costs. One of the objectives of implementing the chatbot is to replace entry level staff where the turnover rate is high, and high turnover rate means high retraining cost. Entry level staff typically provides answers by searching against the knowledge base, so providing a better way to search to the end users was key. The ITS' chatbot project broke ground in May 2020, roughly 4 months before our experiment. The prototype was made available for testing in the late July of 2020.

## Main Study

We recruited 261 business undergraduate students (44% female). The participants first reported their *personal innovativeness with IT* (PIIT). They then interacted with the chatbot and the search tool (presented in random order) and reported their experience with the tools. Specifically, we asked the participants about (i) satisfaction, (ii) likelihood of use, and (iii) perceived difficulty; all these were measured on 7-point Likert scales. The first two were measured using multiple items, and the internal consistency was verified to be high (Cronbach's  $\alpha > 0.96$ ).

The participants were tasked with finding answers to two questions ("how do I connect to the IU VPN" coded as question type 0 and "can I change my username" coded as question type 1), and each question was randomly assigned to search tool and chatbot treatments. We verified that both the search tool and the chatbot successfully returned the correct answers to the questions. This was to make fair comparisons between the tools—since the chatbot was still under development at the time of the experiment.

## Results from the Main Study

Figure 1 presents the average satisfaction, likelihood of use, and difficulty in using the tools, along with their 95% confidence intervals. The chatbot led to higher satisfaction and greater likelihood of use, and was perceived to be easier to use compared to the search tool.

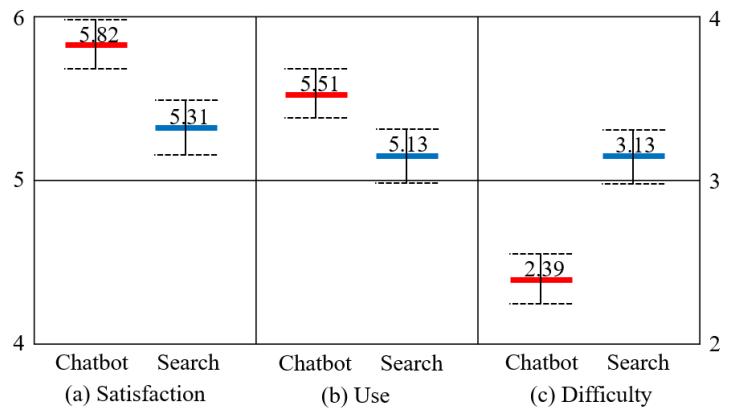


Figure 1: Means and 95% Confidence Intervals (Main Study)

For a more rigorous analysis, we ran a set of linear regressions that included all the control variables. Table 1 shows the same results: Chatbot had a significant positive effect on satisfaction and likelihood of use, and a significant negative effect on perceived difficulty.

Table 1: Results from the Main Study

	Satisfaction	Use	Difficulty
Chatbot	0.509*** (0.106)	0.381*** (0.105)	-0.747*** (0.124)
PIIT	0.171** (0.061)	0.178** (0.069)	-0.210*** (0.063)
Female	0.163 (0.126)	0.395** (0.133)	-0.033 (0.144)
Question Type 1	0.048 (0.122)	0.142 (0.132)	0.108 (0.142)
Chatbot First	-0.402** (0.123)	-0.343** (0.132)	0.445** (0.144)

Note: N=261. Estimated coefficients (and standard errors).

\*\*\*p ≤ 0.001, \*\*p ≤ 0.01, \*p ≤ 0.05.

We also found an order effect. When users received the chatbot treatment before the search tool treatment, they rated their satisfaction lower compared to those who received the treatments in the other order. The appeal of the chatbot became more salient *after using* the search tool. Similar results apply for likelihood of use and perceived difficulty.

## Supplementary Study

The goal of the supplementary study was to see if the results hold in a setting with a greater variety of questions. We selected 93 questions from the set used to train the chatbot and were verified to have answers available via both the chatbot and the search tool. The main study showed an order effect, so to eliminate any potential issues from the order of treatments, we used a between-subjects design, where the participants received either the chatbot treatment or the search tool treatment but not both. The main study asked the participants several similar questions to ensure scale reliability. In the supplementary study, we used two short questions (one about satisfaction and the other about perceived difficulty) to get a quicker gut-level response from the users. We recruited 91 business undergraduate students (54% female).

### Results from the Supplementary Study

Figure 2 shows the average satisfaction and level of difficulty, along with their 95% confidence interval.

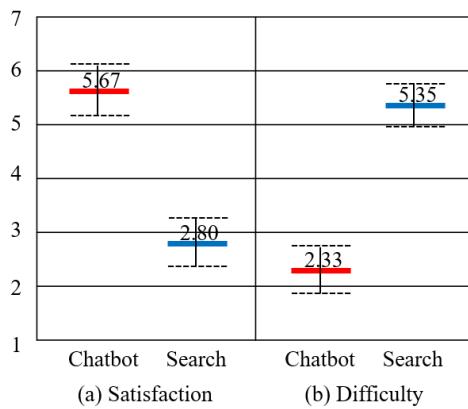


Figure 2: Means and 95% Confidence Intervals (Supplementary Study)

When compared to Figure 1, we see that the confidence intervals are wider, likely because of the smaller sample size and increased variance from the larger pool of questions. Still, we see a clear separation between user's responses for the chatbot and for the search tool. Overall, the chatbot led to higher satisfaction and lower perceived difficulty.

Once again, we ran a set of linear regressions, and the results are shown in Table 2.

Table 2: Results from the Supplementary Study

	Satisfaction	Difficulty
Chatbot	2.922*** (0.319)	-3.022*** (0.300)
PIIT	0.349* (0.155)	-0.157 (0.145)
Female	0.708* (0.336)	-0.184 (0.316)

Note: N=91. Estimated coefficients (and standard errors).

\*\*\*p ≤ 0.001, \*\*p ≤ 0.01, \*p ≤ 0.05.

We see strong support for the results we found in the main study: Chatbot had a significant positive effect on satisfaction, and a significant negative effect on perceived difficulty.

## Conclusion

In summary, we conclude that using the chatbot led to higher satisfaction, increased likelihood of use, and lower perceived difficulty compared to procuring self-service IT support using the search tool.

Looking at the responses for the open-ended questions in the survey, we can glean some insights as to why the participants preferred the chatbot over the search tool:

*"(It) seems like an efficient way to get my questions answered without spending hours scrolling through IU's website and randomly guessing what things are on one.iu."*

*"I like that it seems like you are texting someone when you are getting help."*

*"The text that was displayed was conversational and made it easier to read and understand."*

These responses reveal that the characteristics of chatbot which separate it from search tool are the ones that participants found attractive. In particular, the subjects appreciated the conversational nature of the chatbot, shorter and more to-the-point responses, and the feeling of social presence (i.e., the sense that someone was guiding them through the process).