

---

# Chatbot for Family Planning Counseling

**Syed Ali Hussain**

Michigan State University  
404 Wilson Road, Room 359  
East Lansing, Michigan 48823  
Hussai52@msu.edu

**Folu Ogundimu**

Michigan State University  
404 Wilson Road, Room 305  
East Lansing, Michigan 48823  
ogundimu@msu.edu

**Shirish Bhattarai**

Trext Inc.  
101 Arch Street, Boston, MA  
Shirish.bt@gmail.com

Paste the appropriate copyright/license statement here. ACM now supports three different publication options:

- ACM copyright: ACM holds the copyright on the work. This is the historical approach.
- License: The author(s) retain copyright, but ACM receives an exclusive publication license.
- Open Access: The author(s) wish to pay for the work to be open access. The additional fee must be paid to ACM.

This text field is large enough to hold the appropriate release statement assuming it is single-spaced in Verdana 7 point font. Please do not change the size of this text box.

Each submission will be assigned a unique DOI string to be included here.

**Abstract**

This project is about testing a culturally sensitive mobile phone-based Chatbot designed to provide information about family planning and contraceptive use. Chatbot is essentially a text-messaging service that follows a decision-tree structure to provide feedback to users on a particular a topic. The Chatbot was built using a text-messaging platform developed by Trext and can be used by sending 'BCS' as a text message to phone number +1-313-228-3034. UTAUT model of technology adoption was employed to assess the factors that may determine the adoption and usage of Chatbot by users. The Chatbot was tested with 52 participants of age 18+ who were married or in a relationship. Results show that attitude towards using Chatbot and reduced anxiety in acquiring information appeared as the key predictors of using Chatbot for family planning related information. Additionally, facilitating conditions such as availability of mobiles phone was also a marginally significant predictor. The project has implications to help mothers, husbands and health providers to learn basic concepts of family planning in an effective, interactive and enjoyable manner.

**Author Keywords**

Chatbot; Mobile Health; Family Planning.



Figure 1. Chatbot Prototype

## ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

## Introduction

Think of a global social development problem and it will inevitably find its roots in population growth. Let it be poverty, energy crisis, climate change, food scarcity or political turmoil, all issues have a direct or indirect association with increasing population and limited availability of resources. As famously stated in the book *Population Bomb*, "We have a finite planet with finite resources. In such a system, you can't have infinite population growth" (Ehrlich, 1970). At current rate of 80 million people born per year, there will be 9.2 billion people on planet by 2050 (Population Institute, 2017). Just in terms of food availability, almost one billion people in the world go hungry every day.

The problem can largely be addressed by curbing population increase and providing universal access to family planning and contraceptive health services to masses. Unfortunately, in many developing as well as developed countries, talking about family planning is a taboo, surrounded by stereotypes. For instance, over 100 million women in the world have an unmet need to practice family planning methods due to lack of information and reduced access to the modern contraceptive methods.

In this study we developed and tested a mobile phone-based service, known as Chatbot, using [Ttext](#) messaging platform. The family planning Chatbot is essentially a text messaging service that follows a decision-tree mechanism to provide feedback to users about family planning methods (Fig. 1).

## Study rationale

This study is based on the argument that the best way to learn is by *doing* stuff and getting feedback. People are more likely to remember concepts when they discover them on their own. Family planning has largely been a one-sided conversation through mass media or community health workers. People don't typically learn unless they join the conversation in a two-way communication. Additionally, text-messaging interventions have consistently proven to be effective in a range of health topics such as patient self-management (Car et al., 2012) or to manage patient appointment attendance (DeJongh et al., 2012).

The proposed Chatbot offers a disruption in family planning counseling in following ways:

1. Chatbot offers a standardized way of acquiring information about which contraceptive method to pick, thus reducing the complexity and stigma of contacting a health provider.
2. Chatbot allows for information to be transferred via customized text-messages rather than through commonly used content-heavy materials like brochures, posters and flip charts.
3. Chatbot reduces health systems cost of operating a helpline requiring dozens of staff.
4. Chatbot offers a superior counseling experience that is engaging, fun and interactive for users and provides culturally tailored and personalized information.

Overall, the family planning Chatbot is expected to provide users a guided learning experience about which contraceptive methods to use, confront potential misconceptions about each method and choose the one that best meets their needs. Using a step-by-step conversation model, participants will learn about new things that they wrongly perceived about family planning.

### **Innovativeness**

This project is innovative in its ability to bring interactivity and guided learning through either feature phones or smartphones. The content of Chatbot is based on the Balanced Counseling Strategy (BCS) manual prepared by Population Council (2015).

The project offers the following concrete implications:

5. Enabling healthcare providers to see the world as people *do*, as they battle with family planning decisions, myths, stigma, taboos and stereotypes.
6. Proposing a culturally sensitive family planning Chatbot using feature phones to improve access, demand and acceptance for modern contraceptives.

### **Theoretical Framework - UTAUT Model**

The present study is based on Venkatesh et al. (2003) proposed the unified theory of acceptance and use of technology (UTAUT) model to assess user acceptance of a technology. The model is based on following seven constructs.

- Performance expectancy: the degree to which using Chatbot will improve performance

- Effort expectancy: the amount of effort required to use the system
- Attitude toward using technology: subjective perception towards using the technology
- Social influence: influence of social others in using the technology
- Facilitating conditions: resources and support available to use the technology
- Self-efficacy: personal ability to use the technology
- Anxiety: level of anxiety and emotional stress associated with using the technology

The study objective is to understand how a mobile phone texting service can be used to improve knowledge about family planning methods. Seven constructs described above were measured to determine which construct(s) best predict the utilization of Chatbot.

### **Methods**

#### *Participants*

Inclusion criteria for the study comprised of participants who are of age 18-65 years, married, living together or engaged and may be thinking about which family planning method to choose. In the main study, the questionnaire were distributed to 52 participants through a PAID-participant pool in the mid-west region of United States. Two invalid responses were removed before data analysis. Pretest was conducted to validate the scale and study flow and seek feedback about the layout and content of the Chatbot.

	PE	AT	SI	FC	SE	AX	BI	EE
Performance Expectancy (PE)	1							
Attitude towards Technology (AT)	.793**	1						
Social Influence (SI)	.715**	.807**	1					
Facilitating Conditions (FC)	.294*	.193	.246	1				
Self-Efficacy (SE)	.309*	.417**	.395**	.453**	1			
Anxiety (AX)	.122	.145	.106	-.476**	-.128	1		
Behavioral Intention (BI)	.645**	.769**	.693**	.164	.300*	.348**	1	
Effort Expectancy (EE)	.639**	.567**	.517**	.433**	.420**	-.084	.431**	1

Table 1. Inter-item Correlation Matrix

#### Measurement

The questionnaire items, presented in Appendix 1, were adapted from the UTAUT model of Venkatesh et al. (2003).

Construct	Cronbach's Alpha
Performance Expectancy (PE)	.93
Attitude towards Technology (AT)	.93
Effort Expectancy (EE)	.96
Social Influence (SI)	.89
Anxiety (AX)	.89
Behavioral Intention (BI)	.97
Self-Efficacy (SE)	.81
Facilitating Conditions (FC)	.35

Table 2. Scale Reliabilities

All items were measured on a seven point Likert scale. Cronbach's Alpha was employed to assess the internal consistency reliability (Table 2). Examples of scale items include, "Using FP Chatbot increased my chances of choosing the right contraceptive method" (PE), "I find FP Chatbot easy to use" (EE), "Using FP Chatbot is a good idea" (ATT), "My spouse will be supportive of me using the FP Chatbot" (SI), "Chatbot is not compatible with the phone I use" (FC), "FP Chatbot is

somewhat intimidating to me" (AX) and, "I plan to use FP Chatbot in the future" (BI).

#### Procedure

After completing the consent form, participants were asked to send 'BCS' as a text message to phone number 313-228-3034. As a result they received back an automated text message providing them different menu options to choose from. Participants could use the Chatbot as many times as they want to be familiar with the information. The cost of text messages depend on their data plan. After using the Chatbot, participants were provided a link to proceed with the Qualtrics survey asking questions about their experience of using Chatbot. The questions tap into seven constructs of the Venkatesh model: performance expectancy (PE), effort expectancy (EE), attitude towards technology (AT), social influence (SI), facilitating conditions (FC), self-efficacy (SE), anxiety (AX) and behavioral intention (BI) to use in future. Then, participants were asked demographics questions. After the survey, participants were asked to enter their email address so that a \$5 online gift card could be sent to them. The email address was collected for the sole purpose of sending

gift card and this information was not linked with the survey responses. The study was approved by IRB of the respective institution.

## Results

Regression analysis was done to determine predictor variables. The R-Square value for the model is approximately .68, which is relatively high to determine the strength of linear relationship between the independent (AT, SI, EE, PE, AX, FC, and SE) and dependent (BI) variables. However, after further analysis, the results demonstrate that only AT, FC and

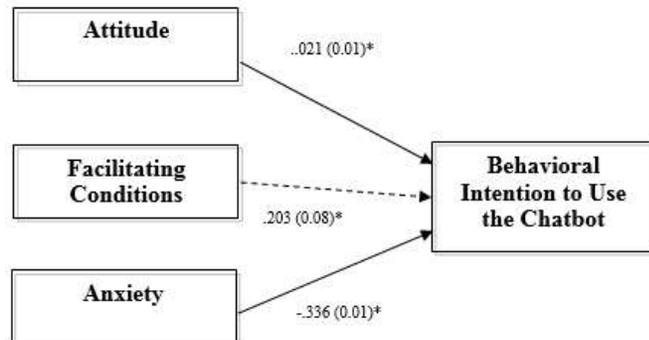


Figure 2. Regression Model

AX affect BI, as shown in the model (Figure. 2). Meanwhile, BI, SE, PE, and EE were not significant to predict BI. Taken as a set, the predictors (PE, AT, EE, SI, AX, BI, SE, FC) account for 68% of the variance in BI. The overall regression model was significant,  $F(7, 46) = 14.49, p < .001, R^2 = .68$ .

The data from table 3 shows that the coefficients for Attitude and Anxiety are statistically significant ( $p < .01$ ). Moreover, Attitude is found to have the greatest impact on BI ( $\beta = .584$ ). The data also demonstrate

that Anxiety ( $\beta = .336$ ), is an important element to the BI assessment. Finally, the data indicate that PE, SI, FC, SE and EE are not significant to the BI assessment. In summary, the result from the experiment can be interpreted to mean that only Attitude towards using Chatbot and the associated Anxiety are significant factors to determine the behavioral intent.

Predictor Variables	Standardized Coefficients (SE)	Significance
PE	-.021 (-.135)	.893
AT	.584 (3.41)	.001
EE	-.018 (-.157)	.876
SI	.180 (1.249)	.218
AX	.336 (3.394)	.001
SE	-.049 (-.479)	.634
FC	.203 (1.78)	.082

R-Square (R-Square Adjusted)

.68 (.64)

Table 3: Regression Coefficients for Predictors

## Relevance to HCI Across Borders

The present study was conducted to test the Chatbot prototype in United States. However, considering the stigma and taboos associated with family planning related conversations, the Chatbot is relevant for implementation in both developed and developing countries alike. For example, separate Chatbots can be developed on sensitive topics like menstruation, HIV/AIDS and mental health. Additionally, a Chatbot can be introduced either as a stand-alone intervention or integrated with an existing family planning and reproductive health intervention. For example, family planning counseling interventions in developing countries, may face a reduced uptake of contraceptives even after the products and services are made readily available. This could be because of social stigma around

accessing family planning related information or just because of geographic distances. In both cases, a family planning Chatbot can be introduced as a safe and culturally sensitive way to connect with the community. Consequently, the Chatbot can be used to improve the performance of existing family planning services by introducing more potential customers to the contraceptive products and services.

### **Relevance to Sustainable Development Goals**

Specifically in terms of achieving the sustainable development goals, the family planning Chatbot offers following concrete implications:

7. The Chatbot intervention will help in reducing the rate of unintended pregnancy and unsafe abortions.
8. Participating families will be able to make a decision about the number of children they can care for; reducing medical costs with increased likelihood of healthy growth in children due to birth spacing.
9. Increased likelihood of healthy growth in children due to spacing of births approximately 24 months apart.
10. The project will inform health providers and policy makers to better understand reasons for low contraceptive prevalence and implement culturally sensitive family planning services.
11. The Chatbot can be designed in a way to be easily replicable in other countries especially in fragile

and high-risk regions with limited access by community health workers.

12. Girls will be less likely to have to care for younger siblings and more likely to stay longer in school.
13. Finally, the Chatbot offers users an opportunity to actively explore contraceptive options, as opposed to just being told what the answer is.

### **Conclusion and Future Research**

This study was about developing and empirically testing a mobile-phone based Chatbot to provide information about family planning methods. For future research, we propose testing the Chatbot in collaboration with existing family planning service providers. As a result of that we aim to provide the users a list of family planning service providers available to them in the community. Additionally, we want to test the option in which users could provide their contact information to receive contraceptives by mail, which is of specific relevance to users living in remote rural communities with little or no access to a family planning service provider. We will also test the option in which users could request a call-back to seek more one-on-one counseling.

### **References**

- Car J, Gurol-Urganci I, de Jongh T, Vodopivec-Jamsek V, Atun R. Mobile phone messaging reminders for attendance at healthcare appointments. *Cochrane Database Systematic Rev* (2012).
- De Jongh T, Gurol-Urganci I, Vodopivec-Jamsek V, Car J, Atun R. Mobile phone messaging for facilitating

- self-management of long-term illnesses. Cochrane Database Systematic Rev 2012.
- Ehrlich, P. The population bomb. *New York Times*, 47 (1970)
  - Population Institute (2017). [Link](#)
  - Population Council. The Balanced Counseling Strategy Plus: A Toolkit for Family Planning Service Providers Working in High HIV/STI Prevalence Settings (2015). Edition 3<sup>rd</sup>. [Link](#)
  - Venkatesh, Viswanath, Morris, Michael G., Davis, Gordon B., Davis, Fred D. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly*, 27 (2003): 425-478.

### Appendix A

Scales / Items	Mean	S.D.
<b>Performance Expectancy (PE)</b>	<b>4.63</b>	<b>1.76</b>
PE1: I find FP Chatbot useful to acquire information about family planning.	4.89	1.81
PE2: Using FP Chatbot enabled me to acquire information more quickly.	4.76	1.98
PE3: Using FP Chatbot increased my knowledge about family planning methods.	4.65	1.98
PE4: Using FP Chatbot increased my chances of choosing the right contraceptive method.	4.26	1.89
<b>Effort Expectancy (EE)</b>	<b>5.34</b>	<b>1.61</b>
EE1: My interaction with FP Chatbot is clear and understandable.	5.13	1.67
EE2: It is easy for me to become skillful at using FP Chatbot.	5.22	1.75
EE3: I find FP Chatbot easy to use.	5.44	1.67
EE4: Learning to operate FP Chatbot is easy for me.	5.57	1.70

<b>Attitude toward Using Technology (AT)</b>	<b>4.38</b>	<b>1.70</b>
ATT1: Using FP Chatbot is a good idea.	5.04	1.93
ATT2: FP Chatbot makes family planning topic more interesting.	4.26	1.92
ATT3: Using FP Chatbot is fun.	3.87	1.71
ATT4: I like using FP Chatbot.	4.37	1.81
<b>Social Influence (SI)</b>	<b>3.97</b>	<b>1.44</b>
SI1: People who influence my behavior will think that I should use FP Chatbot.	3.30	1.72
SI2: People who are important to me will think that I should use FP Chatbot.	3.31	1.72
SI3: My spouse will be supportive of me using the FP Chatbot.	4.72	1.58
SI4: In general, the community will support the use of FP Chatbot.	4.57	1.57
<b>Facilitating Conditions (FC)</b>	<b>5.57</b>	<b>.98</b>
FC1: I have the resources necessary to use FP Chatbot.	6.11	1.46
FC2: I have the knowledge necessary to use FP Chatbot.	6.07	1.28
FC3: FP Chatbot is not compatible with the phone I use.*	5.88	2.13
FC4: A specific person (or group) is available for assistance with FP Chatbot related difficulties.	4.22	1.77
<b>Self-Efficacy (SE)</b>	<b>5.34</b>	<b>1.31</b>
SE1: I can use FP Chatbot, even if there is no one around to tell me what to do as I go.	6.02	1.38
SE2: I can complete a task using FP Chatbot, if I can call someone for help if I get stuck.	5.31	1.77
SE3: I can complete a task using FP Chatbot, if I have a lot of time to acquire information about family	5.06	1.65

planning.		
SE4: I can complete a task using FP Chatbot, if I have the built-in help facility for assistance.	5.00	1.73
<b>Anxiety (AX)</b>	<b>2.22</b>	<b>1.48</b>
AX1: I feel apprehensive about using FP Chatbot.	2.72	1.84
AX2: It scares me to think that I could lose information using FP Chatbot by hitting the wrong key.	2.15	1.80
AX3: I hesitate to use FP Chatbot for fear of making mistakes I cannot correct.	2.06	1.63
AX4: FP Chatbot is somewhat intimidating to me.	1.96	1.50
<b>Behavioral Intention to Use the System (BI)</b>	<b>3.37</b>	<b>1.87</b>
BI1: I intend to use FP Chatbot in the future.	3.39	1.90
BI2: I predict I would use FP Chatbot in the future.	3.48	1.96
BI3: I plan to use FP Chatbot in the future.	3.24	1.90