

Increasing Family Planning Uptake in Kenya Through a Digital Marketplace: A Case

Study in Human Centered Design

by

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Date: March 21, 2017

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Thesis submitted in partial fulfillment of
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ABSTRACT

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Abstract

Despite the clear benefits to women, families, and society, family planning is not universal. In 2015, 12 percent of married or in-union women who want to prevent or delay pregnancy were not currently using a method of family planning. In Africa, this rate is even higher, at 24 percent. In order to meet the unmet need for family planning, new approaches to service delivery are required. A critical question for anyone interested in ensuring universal access to sexual and reproductive health-care services like family planning is how to create new products, services and implementation models that work for users. The objective of this case study is to describe how Human Centered Design (HCD) was used to develop a digital marketplace for family planning in Kenya, called Nivi, and draw lessons for broader application to global health challenges. By using the HCD approach, we sought to better understand the challenges users face with the Nivi platform and the opportunities that exist to make improvements. By incorporating HCD, we were able to build a service with greater potential for use and usability for Nivi users. We believe that taking an HCD approach allowed us to build a product that has the potential to meet the unmet need for family planning services in Kenya. This case study highlights the strengths and challenges to inform the use of HCD for other health applications in emerging markets.

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Acknowledgements

I would like to thank Dr. Eric Green for his support, mentorship and guidance throughout this research. I would also like to thank my thesis committee members, Dr. Kevin Schulman and Dr. Lavanya Vasudevan for their critical reading of this manuscript. Finally, I would like to thank Dr. Amy Finnegan and the entire Nivi team. This research would not have been possible without them.

1. Introduction

Access to family planning services and contraceptives gives couples and individuals the information needed to make an informed decision to choose when and if they want to have children in the future. Voluntary family planning has been shown to improve newborn health outcomes, advance women's empowerment, and bring socioeconomic benefits through reductions in fertility and population growth (Bongaarts et al., 2012). Family planning is also an effective tool for averting maternal deaths (Ahmed et al, 2012).

Despite the clear benefits to women, families, and society, family planning is not universal. Contraceptive prevalence rates have increased over time in every part of the world, but too many women and men who stand to benefit from family planning are not using any modern methods (United Nations, 2015). The concept of "unmet need" for family planning is a helpful indicator of this gap. Unmet need is defined as the percentage of married or in-union women (age 15-49) who want to prevent or delay pregnancy but are not using any method of contraception (Casterline and Sinding, 2000). Globally, the prevalence of unmet need for married or in-union women was 12 percent in 2015 (United Nations, 2015). The prevalence is highest in low income countries in Africa, where unmet need was double the global average at 24 percent in 2015 (United Nations, 2015). Based on global projections, meeting the unmet need for contraceptives

would prevent more than two-thirds of unintended pregnancies and more than two-thirds of maternal deaths (Singh et al., 2009).

Another challenge to full coverage is that many women are unsatisfied with their method and discontinue use within 12 months (Curtis et al., 2011). Globally, it is estimated that one-third of women who start a modern method of family planning will discontinue in the first year and over half will discontinue within two years of starting. For those who discontinue for reasons other than wanting to become pregnant, the majority report their reason for discontinuation as “method related concerns” or side effects. Another common reason for discontinuation is related to the service environment, including quality of service, stock-outs, and lack of choice of methods (Castle and Askew, 2015).

In an effort to accelerate progress on the use of family planning, the international community came together in 2012 at the London Summit on Family Planning and set an ambitious goal to enable an additional 120 million women and girls to use contraceptives by 2020 (Population Council, 2013). Since then, the Family Planning 2020 (FP2020) initiative has closely tracked contraception use in 69 of the poorest countries in the world. By 2016, 30.2 million additional women in these target countries had started using a modern method of contraception, and overall more than 300 million women and girls were using a modern method of contraception (FP2020 Momentum, 2015). As a result, 82 million unwanted pregnancies were prevented from July 2015 to July 2016,

which prevented an estimated 25 million unsafe abortions and 124,000 maternal deaths (FP2020 Momentum, 2015). Despite this overall progress, uptake of family planning in FP2020 countries has been slower than anticipated. The initiative is short of reaching its goal of enabling 120 million women and girls to uptake contraception by 2020; at the midway point, the initiative is off track by 19.2 million family planning users (FP2020 Momentum, 2015).

While it is clear that family planning 'works', meeting the unmet need and reducing high discontinuation rates will require new approaches to service delivery. This is a similar refrain heard throughout global health. A good example is maternal mortality. We know why women die in pregnancy and childbirth and how to prevent these deaths (Campbell & Graham, 2006). The barrier to further reductions in maternal mortality is the challenge of scaling up effective interventions. It is a similar story for family planning. Family planning is a cost-effective intervention, but current approaches to expanding coverage are failing to meet the needs of women and families.

Therefore, a critical question for anyone interested in ensuring universal access to sexual and reproductive health-care services like family planning is how to create new products, services, and implementation models that work for users. Increasingly, global health practitioners are being encouraged to apply an approach called Human Centered Design (HCD) to solve these implementation challenges, but there are few examples to guide global health applications. Thus, the objective of this case study is to

describe how the HCD approach was used to develop a digital marketplace for family planning in Kenya and draw lessons for broader application to global health challenges.

1.1 Current Approaches to Family Planning Promotion

Approaches to family planning promotion generally fall into two categories, demand side or supply side approaches. Current demand side approaches to family planning promotion include changing men and women's current attitudes, beliefs and knowledge about family planning, thus increasing use of family planning methods (Salem et al, 2008). The use of media, through radio, television or print media has been a popular approach to increasing knowledge about family planning and reproductive health for over 50 years. An example of where this approach has been effective is in Tanzania with the radio soap opera, "Twende na Wataki" (Let's go with the times). The storyline of this soap opera is about a promiscuous truck driver, named Mkwaju, who chooses not to use contraception and how this affects his wife, Tunu. Their relationship is compared to another couple, who chooses to use family planning and the positive effects on their lives as a result of doing so. The effectiveness of this soap opera was measured in a cross sectional study over a two-year period and was shown to have a significant effect on women's use of contraceptives in areas where the radio soap opera was broadcasted (Mwaikambo et al., 2011).

Interpersonal communication is another demand side approach to family planning promotion. This approach attempts to influence knowledge, attitudes and

behaviors toward reproductive health and family planning through facilitator-led curriculum based programs, one-on-one sessions and small group discussions. This type of approach typically has targeted adolescents and young adults between the ages of 10 and 26. In a systematic review measuring the effectiveness of this approach, 86 percent of these interventions reported improved knowledge and attitudes of family planning, while 63 percent of these studies found a positive effect on actual use of contraceptives (Mwaikambo et al., 2011).

Development approaches to family planning promotion are another demand side strategy. This type of approach includes interventions such as using conditional cash transfer, savings and credit programs. However, a conditional cash transfer intervention in Honduras, in which treatment groups were given conditional payments based on various behaviors such as enrolling their children in schools, attending regular doctor appointments and getting vaccinations, inadvertently had a negative impact on fertility rates, as this program aligned incentives with child bearing (Stecklov et al., 2007). In other countries where the conditional cash transfer programs took place, there was no significant impact on fertility rates (Mwaikambo, et al., 2011).

The other side of family planning promotion approaches are supply side strategies. These approaches consist of interventions targeted at making contraceptives accessible to the population. Strategies for this approach include making contraceptives

affordable, diversifying channels of delivery, and improving quality of client-centered services (Richey et al, 2008).

Social franchising programs are an example of a supply side approach. This type of approach typically consists of creating a network of private medical practitioners under a brand name. These franchises typically offer a standard set of services at lower costs. The Green Star Network in Pakistan is an example of this approach where a social franchising network resulted in an 8 percent increase in female sterilization, but a 7 percent decline in condom use (Hennick and Clements, 2005).

Another supply side approach to family planning promotion are community outreach or distribution programs. This strategy typically brings family planning services to rural or underserved populations through various models, including home visits or mobile clinics. This type of approach had positive findings for all family planning outcomes measured in a systematic review, including increased contraceptive use, reduced unintended pregnancies, and improved knowledge and attitudes about family planning (Mwaikambo et al., 2011).

A final supply side approach is improving quality of care. This approach includes strategies such as increasing method choice, improving quality information given to users and increasing technical expertise. However, findings on the effectiveness of this type of approach are not consistent for whether or not this leads to increase in

contraceptive use, with only 6 out of 10 studies of this approach resulting in increased use of contraceptives (Mwaikambo et al., 2011).

Both supply and demand side approaches have led to increased knowledge about family planning in recent years. However, in terms of effect on fertility and family planning outcomes, such as increased intentions to use family planning, reduced unmet need, and reduced unintended pregnancies, the results from these types of approaches are inconsistent. Less than half of these studies reported reduced unintended pregnancies, while 70 percent reported increased contraceptive use (Mwaikambo et al., 2011).

Though there are a variety of approaches to family planning promotion, these current strategies are falling short of meeting the unmet need for these services. In an analysis by the World Health Organization, contraceptive use in West Africa was only increasing at a rate of 0.6 of a percentage point per year between 1991 and 2004. At this rate, it would take more than 25 years to reduce the fertility rate in West Africa from 5.5 to 4.6 lives births per woman. In East Africa, though the rate is higher, the rate actually slowed during this timeframe, changing from 2.7 percentage points in the 1990s to 1.45 in the early 2000's (Cleland et al., 2010). Thus, a new approach to family planning promotion is needed to increase the uptake of contraceptives among those with an unmet need in order to avert maternal deaths and increase socioeconomic benefits through reductions in fertility and population growth.

1.1.2 Digital Health in Family Planning Promotion

Over the past decade, the use of mobile phones across sub-Saharan African has been rapidly growing, making digital health applications a promising tool to be applied in the healthcare space (Adler, 2007). Mobile phones and other digital applications have been used to improve timely and accurate data collection in health facilities, (Trucano, 2014) as well as establish electronic medical records (Fraser, 2010). On the supply side, digital health applications have been used to support healthcare providers at the point of care. On the demand side, digital health applications have been used to promote medication adherence and other healthy behaviors (Betjeman, 2013).

With increasing rates of access to mobile technology in Africa and the use of mobile phones growing and expanding, there is an opportunity for digital health tools and products to play a role in reducing the unmet need for family planning services. Within the family planning space, digital health applications have generally targeted three focus areas: supply chain management, healthcare work force support and training, and health communication and education to promote more informed decision making (Haas et al., 2015).

For example, in an effort to decrease the problem of family planning commodity stock outs, mobile phones were used in Bangladesh to track use and availability of family planning commodities. This data was collected on mobile phones at the healthcare facility level and was then given to national level planners in an attempt to

reduce commodity stock outs (Center for Health Market Innovations, 2017). Other digital health applications have also been used to support community health workers and improve family planning service delivery. In Nigeria, for example, the Interactive Distance Education Application helps midwives recognize provider bias and suggests alternative counseling approaches (NURHI, 3013). Lastly, digital health applications are being used as a channel to communicate with and educate users about family planning options. Mobile 4 Reproductive Health (m4RH) uses mobile phones as a platform to provide access to family planning information to interested men and women. The platform also helps men and women find healthcare facilities nearby through SMS (FHI360, 2017).

Though there are other digital health applications currently in the market that are working toward increasing family planning uptake, there are still gaps in the current approaches. Nivi was designed to fill these existing gaps. Instead of focusing on either the supply side or the demand side, the Nivi platform does both. On the demand side, Nivi gives users the information necessary to make an informed decision for a family planning method that is right for them, and then empowers the user to reach a clinic nearby by letting the user know which clinics near them offer the method that they want and connecting them with free transportation. On the provider side, Nivi is able to let healthcare providers know beforehand when a client is coming, and work with the providers to project future demand trends to prevent issues like commodity stock outs.

Nivi is also able to provide real time insight to healthcare providers on service quality facility performance.

1.2 Human Centered Design

Human Centered Design, also known as user centered design and design thinking, focuses on the needs and experiences of target users throughout the design and development process (Brown, 2008). This type of design thinking places the user at the center of the iterative development process of the product, soliciting user feedback along the way. HCD involves users who are likely to use the specific product to be tested in real world scenarios (IDEO.org, 2015). HCD, in a sense, allows the user to be a co-developer of the product. By designing products and services in this way, the goal is for the end product to meet the end user's wants and needs in a manner that fits with their everyday behaviors and lifestyle (IDEO.org, 2015).

Good design is imperative for global health applications to work. Failing to take into account the user perspective has resulted in failed global health interventions. One example is the treadle pump designed to help farmers irrigate their land in East Africa. Small-scale farmers make up 80 percent of the poor population in Africa. However, only about 5 percent of land in sub-Saharan Africa is irrigated. With the long dry seasons and unpredictable rainy seasons, this can present a problem for small-scale farmers. Relying on the rain alone, small-scale farmers can only harvest one to two times per year (Kickstart, 2016). The idea behind the treadle pump is to provide an affordable, human-

powered tool that farmers can use to irrigate up to two acres of land per day, using previously inaccessible groundwater (Kickstart, 2016). However, treadle pumps initially went largely unused by the intended beneficiaries after coming onto the market in East Africa. The inventors began asking farmers why the pumps were not selling and learned that the movement required to operate the pump was similar to riding a bicycle and caused the hips to sway, which was considered very inappropriate for women. No matter how useful and affordable the treadle pump was, it was not going to be used in these communities if it required a woman to move her hips in this motion. Once this was realized, the pump was redesigned in a way that did not require this specific motion, and sales immediately rose (Gates, 2015). This is an example of how incorporating HCD resulted in much higher use of a global development innovation.

Though HCD has been used for many years in the industrial design and information technology fields, its application in the health field is recent. Examples of this include using HCD to develop a new clinical decision support system for integrating tuberculosis and HIV care in Kenya (Catalani et al., 2014), or using HCD to find alternatives to ultrasound gel in Congo and Ethiopia (Salmon et al., 2015). We have also seen HCD used to reduce anxiety in cancer patients with radiotherapy treatment (Mullaney, et al., 2012) and develop strategies for chronic disease prevention (Matheson, 2012).

Incorporating HCD in these health innovations has proven to be successful in recent years. Therefore, incorporating this approach into designing new family products and services may result in a better and deeper understanding of the problem, resulting in the development of more useful solutions. Ultimately, additional research and examples are needed to promote and demonstrate the application of HCD in the delivery of family planning services.

1.3 Case-Study: A Digital Marketplace for Family Planning in Kenya

According to a recent survey of women of reproductive age in Kenya, 18 percent of currently married women and 27 percent of sexually active unmarried women have an unmet need for family planning, meaning that they would like to delay or prevent pregnancy but are not using contraception (Kenya National Bureau of Statistics, 2015). These women account for the majority of unplanned pregnancies – and in Kenya, more than 2 out of every 5 pregnancies are unplanned (Kenya National Bureau of Statistics, 2010). Rates of contraceptive use vary across Kenya's 47 counties, from a low of 5 percent to a high of 67 percent (FP2020 Momentum, 2015). There are also key demographic differences in uptake: the modern contraceptive prevalence rate (mCPR) among the poor is almost half of the national rate (Kenya National Bureau of Statistics, 2015). In Kenya, there is a 31 percent family planning discontinuation rate within the first 12 months of starting a method, with the majority citing side effects as the main

factor that contributed to their discontinuation (Kenya National Bureau of Statistics, 2015).

The focus of this case study is a new social venture for family planning started in Bungoma County. Nivi is a digital marketplace that helps men and women identify suitable methods of family planning and connects them with local providers who offer those methods. Nivi is a free service that men and women can call into to receive a personalized recommendation about methods. Through an automated screening, Nivi recommends a family planning method to a caller based on their location and personal preferences in a matter of minutes. Nivi then matches the user to several nearby family planning providers that offer their recommended family planning methods. Nivi sends a referral code via SMS to the caller to be redeemed at their choice of the recommended health care facilities. The service is free and can be accessed on any type of mobile phone.

With a high unmet demand for family planning services, Kenya is a promising landscape for a service like Nivi to be successful. However, there are associated challenges that come with designing and developing products in emerging markets like Kenya. In the global health field, entrepreneurs must attempt to create high impact, low cost products and services for complex problems. In emerging markets, consumers are price conscious, demanding, and the environment is fast changing (Gudlavalleti et al., 2013). The objective of this case study is to demonstrate how the HCD approach was

used for the development of Nivi and draw lessons to apply this approach to other global health applications.

2. Methods

2.1 Setting

The setting for this case study is Webuye East and Webuye West constituencies, an area that covers roughly 402 square kilometers and has a population of approximately 230,000 people. Webuye East and Webuye West are 2 of the 9 constituencies that make up Bungoma County, Kenya's fifth largest county that is home to more than 1.6 million residents. Nivi launched in March of 2016 because of the founders' previous work in the region and existing ties to the health system.

In Bungoma County, the median for age at first sexual intercourse is 17.1 years, and the fertility rate is 5. This is substantially higher than the national rate of 3.9 and the rate in Nairobi, Kenya's capital, of 2.7 (Kenya National Bureau of Statistics, 2015). In Bungoma, 53.9 percent of married women between the ages of 15-49 are currently using a modern method of contraception (Kenya National Bureau of Statistics, 2015). Nationally, 6 in 10 women obtain contraceptives from public sector facilities, and many are not informed about the potential for side effects (37.1%) or what to do in the event of experiencing side effects (44.0%). This contributes to why nearly a third of women discontinue their method within 12 months. In addition to women who discontinue their methods, there is also a substantial unmet need for family planning; in the Western

region where Bungoma is situated, 20.7 percent of married women want to limit or space childbirth but are not using any methods (Kenya National Bureau of Statistics, 2015).

2.2 Nivi

Nivi Inc. is a digital health company that was incorporated in the U.S. in 2016. The company's first product was a screening and referral service for family planning called Nivi. Nivi was created to engage users with an unmet need for family planning, educate them about contraceptive options based on their personal preferences, and enable them to access their chosen contraceptive at a healthcare provider convenient for them.

A user initiates contact by calling or sending a free SMS to Nivi. If the user calls the Nivi number, Nivi registers the call and hangs up before the user is charged. Upon receiving a call or SMS, Nivi initiates a free call back through Voice over Internet Protocol (VoIP) to the user's phone. When the user answers the call, she begins listening to a series of automated prompts in English or Swahili and responds by pressing numbers on the phone keypad. This format is known as interactive voice response (IVR) and works entirely over the voice line—no data service is required. Nivi's IVR screening takes the caller through a series of questions to determine which family planning methods are suitable given her stated preferences. After completing the screening, Nivi

sends an SMS to the caller with a list of recommended family planning methods and referral codes for local providers that offer the recommended methods.

2.3 Facility Partners

Prior to Nivi's launch in March 2016, the team conducted facility surveys with more than 100 of the 175 public and private health facilities located in Bungoma County and registered in the Kenya DHIS2 Health Information System. The survey included questions about access to internet, number of staff in the family planning department, if the facility was linked to community health volunteers, types of family planning methods offered, cost of different methods, and best days and times to receive clients. The team focused on facilities in Webuye East and Webuye West Constituencies and ultimately selected eight within a five-kilometer radius to invite to join Nivi (see **Table 1**).

Table 1: Pilot Facility Characteristics

	Type	Ownership	New Family Planning Cases in 2015	Total clients receiving long acting commodities in 2015	Revisit FP cases in 2015
Facility A	Health center	MOH	512	268	1,178
Facility B	Secondary care hospital	MOH	1,116	529	3,618
Facility C	Dispensary	MOH	324	151	214
Facility D	Clinic	Private	147	111	109
Facility E	Primary care hospital	Faith Based	136	57	778
Facility F	Health center	Faith Based	68	16	296
Facility G	Dispensary	MOH	356	211	523
Facility H	Dispensary	MOH	295	105	716

2.4 Participants

During the pilot phase that ran from March to August 2016, anyone could call Nivi for free, but only women and men (age 15 or older) residing in Bungoma County could complete the screening call and receive a referral. Marketing efforts were limited to residents of Webuye East and Webuye West, with an emphasis on reaching women

with an unmet need for family planning services and those at risk of discontinuation of their current method.

Nivi was designed to operate on any phone, and it was not a requirement for users to own their own phone to participate. According to the 2014 DHS survey, 86 percent of Kenyan households own a mobile phone and more than 1 out of every 10 women in Bungoma County are illiterate (Kenya National Bureau of Statistics, 2015). Nivi's voice-based platform was designed with these women in mind.

2.5 Case Study Procedures

I collaborated with the Nivi team to develop the product through the HCD approach, and this case study documents our process. We drew inspiration from the HCD process developed by IDEO, a global design and consulting firm. Based on the IDEO approach, we incorporated the HCD process in three phases: hear, create and deliver (IDEO.org, n.d.). In the iterative design process, we incorporated these three stages in a nonlinear process, instead using a cycle of learning and rapid prototyping.

Phase 1: Hear

In the hear phase, the goal is to gain a deep understanding of the product user. Through a variety of qualitative methods, including observation and interviewing, designers attempt to deeply understand the end user's life, desires and needs. The objective is to better understand the challenge and to gain a deep understanding of the context in which the product or service will be used.

Phase 2: Create

In the create phase, designers attempt to make sense of all the information learned during the hear phase. Through synthesizing this information, designers can generate ideas and identify product opportunities. In this phase, the designers ideate all possible product iterations and build new prototypes to be tested. This testing and refining process, known as rapid iteration, continues until the prototype is ready to be delivered in a real-world situation.

Phase 3: Deliver

In this phase, the designers bring the prototype to the market and test the business model. Through live prototyping, the designers continue to gain more insights and returns to phase one—starting the cycle of hear, create and deliver over again.

2.6 Data Sources

In order to facilitate and inform the hear, create and deliver design process, we incorporated several qualitative and quantitative data collection methods. For the purpose of creating this case study, I only had access to anonymized data. The Duke University Institutional Review Board determined that this case study was exempt from review.

2.6.1 Nivi Call Logs

Each time a user interacts with the Nivi screening, all key presses are logged in a database. These call logs served as the basis for quantitative use patterns, providing data

on caller demographics, family planning preferences and trends, current contraception use and unmet need. We also used the call logs to determine at which point in the screening calls were dropping or users were connecting to customer service for additional assistance.

2.6.2 Interviews with Users

To better understand the user experience, the Nivi Community Manager (Kenyan woman) conducted three types of user interviews on a regular basis:

1. Failed Screening Interview: This interview was conducted when a user called into the Nivi platform but did not complete the screening to the point of receiving a referral.
2. Incomplete Referral Interview: This interview was conducted with users who completed the Nivi screening, received a referral code for a healthcare facility, but had not yet redeemed their referral at the facility.
3. Redeemed Referral Interview: This interview was conducted with users who completed the Nivi screening, received a referral code and redeemed their referral code at a Nivi facility.

2.6.3 User Testing

We also recruited convenience samples of women waiting for services in a partner facility to try new features in a live testing session. In the live testing sessions, the woman was prompted to call the Nivi screening and complete the screening on her

own. After elucidating points of difficulty on the screening through this observation, we invited the women to participate in a focus group discussion to better understand their challenges and determine possible solutions together. The focus of these group discussions evolved over time as we iterated the screening.

2.6.4 Facility Data Collection

During the pilot phase, each facility was asked to maintain a paper register to record data on all Nivi users who visited the facility to redeem their referral code. The register data collected on the paper form was also sent via SMS from the healthcare provider to a Nivi database. This data informed the Nivi team about family planning method uptake by Nivi users at the facility and client demographic information.

Additionally, the Nivi Community Manager conducted weekly meetings at each health care facility with the facility in charges. During these meetings, the Community Manager discussed any challenges the facility was facing or feedback for how to improve the service.

3. Results

3.1 Initial Development and Prototyping

We set out to create an automated screening that would mimic an in-person counseling session. Our starting point was the Balanced Counseling Strategy Plus (BCS+) counseling algorithm, a tool developed by the Population Council to improve the quality of family planning and HIV counseling in South Africa and Kenya (Population Council, 2016). In the BCS+, the first step is to rule out pregnancy. Next, the counselor lays out physical cards representing different family planning options. The counselor is prompted to ask the client about her preferences and, depending on the client's answers, the counselor sets aside each contraindicated counseling card (Population Council, 2015). The final step is method selection. In this stage, the counselor offers more extensive information about each remaining method and its level of effectiveness. The BCS+ toolkit assists the provider in this stage until the client has selected their method of choice (Population Council, 2015).

In a study looking at the effectiveness of the BCS+, the results were positive. This study reported that the BCS+ algorithm increased the likelihood of healthcare providers offering counseling and testing for HIV and family planning services. In this study, almost all providers with access to the BCS+ materials offered counseling and testing for HIV and family planning services. In comparison, for providers without access to the BCS+ materials, only 65 percent offered counseling and testing services (Menziwa, 2009).

Though the BCS+ is a useful tool for family planning counseling, its usefulness is limited to those who can physically reach a healthcare facility. With this in mind, we aimed to build a service that would be accessible to the hardest to reach and most vulnerable populations. As previous literature suggests that IVR is a simple and effective technique for delivering health information over the phone (Lee et al., 2003), we adapted the BCS+ for our purposes by creating an algorithm that could be administered as an automated screening over the phone using IVR to create the alpha version of the Nivi screening.

With the alpha prototype ready, the Nivi team introduced the prototype to a group of potential users for a first round of feedback before launching the product live. In this user testing session, the team solicited feedback from 8 community health volunteers (CHVs). Each CHV was prompted to call into the screening and go through the prompts without further instruction.

The results from this first user testing session were positive overall and the service was generally well comprehended. Without knowing anything about Nivi, after going through the screening, all CHVs understood the purpose of the service being to give information about family planning and connect users to health facilities. The only point of confusion during this user testing session came from using IVR. Many of the

CHVs were unfamiliar with IVR and expressed confusion with how to use it. However, in the group discussion, all CHVs reported that they believed potential Nivi users would be able to use IVR easily as long as the marketing for the service explicitly explained how to press the buttons on the phone in order to respond.

Taking this feedback into account, the Nivi team wanted to ensure that users would understand the service and especially how to use IVR. As a result, the Nivi team opted for a door to door marketing strategy and the CHVs were invited to be a part of Nivi's first marketing team. After a brief marketing training with the CHVs, the team was ready to launch the alpha version of the screening live in the community.

3.2 Nivi Usage Over Time

From March through August 2016, 5,550 individuals initiated the Nivi screening.¹ Of these unique users, 1,343 (24.2%) completed the screening to the point of receiving a referral code to a healthcare facility. Of those who received a referral, 310 (23.1%) redeemed their referral at the healthcare facility. **Figure 1** displays the monthly time series during the pilot phase.

¹ Calls were uniquely identified by phone number, gender, and age to account for the fact that different users could share one phone.

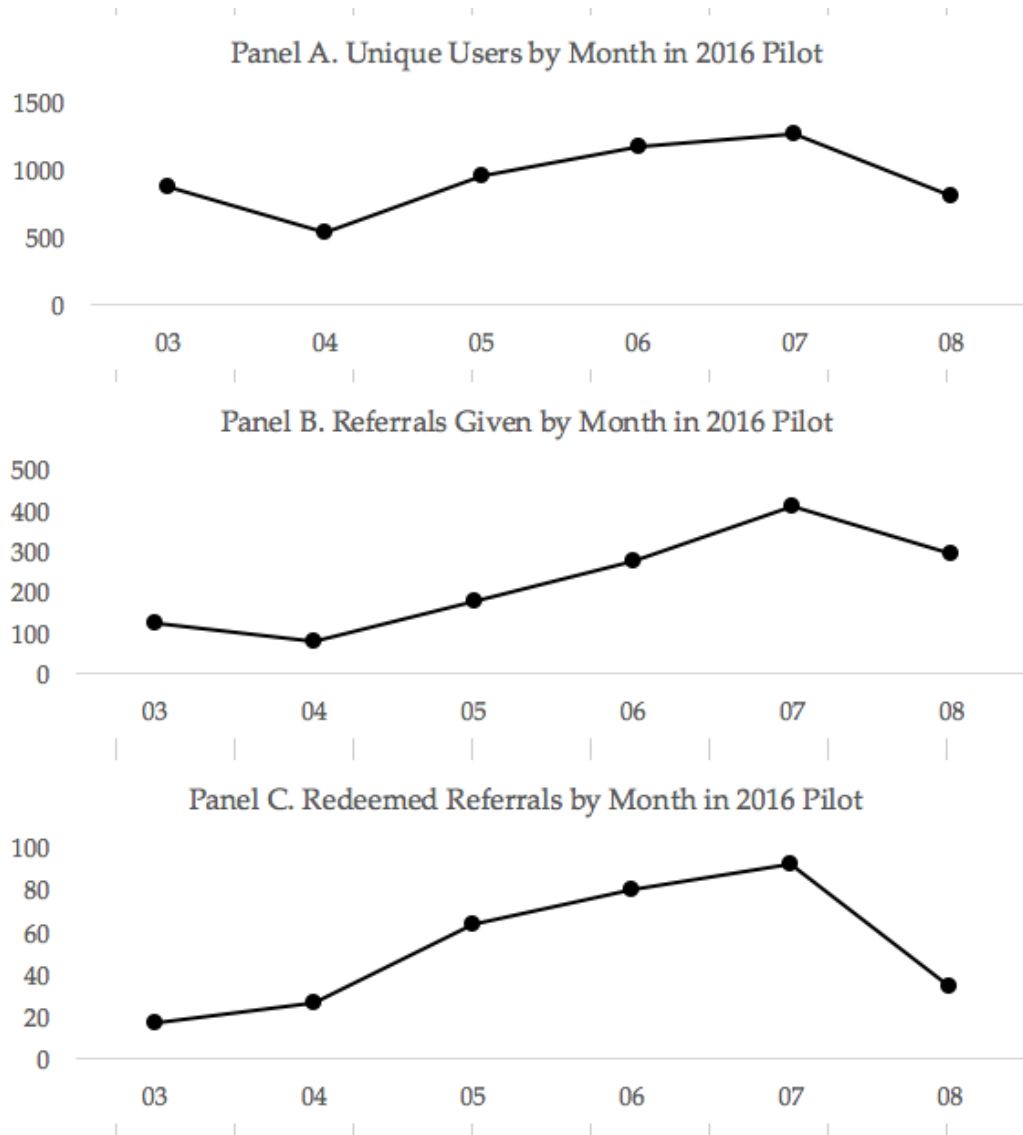


Figure 1: Monthly time series of unique callers, referrals given and redeemed referrals

The time series of users as shown in **Figure 1** demonstrates a steady increase in usage between March and July. The decline in call volume observed in August might be

attributed to the fact that funding for the initial pilot period was almost finished so marketing and field activities were slowing.

3.3 User Demographics

Demographic data on Nivi users who completed the screening to the point of receiving a referral is summarized in **Table 2**. The table is limited to users who responded to demographic questions on the screening and does not represent all unique callers.

Table 2: Characteristics of Nivi users with known demographic data who received a referral between March and August

Characteristic	Female	Male
Number received referral	484	47
Mean number of children (SD)	3.3 (2)	2.6 (2.1)
Mean age (SD)	28.9 (9.2)	30.2 (8.7)
Percent married or living with partner	85 (413/484)	55 (26/47)
Partner supportive in family planning	84 (336/400)	
Partner is using family planning		62 (16/26)
Percent currently using contraceptives (n/N)	62 (300/484)	
Percent satisfied with method	44 (131/300)	
Percent want children in the future	61 (286/469)	
Percent want to delay pregnancy > 5 years	66 (188/286)	

The majority (91 percent) of referred users during the pilot period were female, which reflected our marketing efforts. Most women said that they were married or living with a partner and reported that their partner supported them in family planning. For those women without supportive partners, we added a prompt to the screening

requesting their consent to contact them for follow up in an effort to protect their privacy.

Two-thirds of the women who received a Nivi referral were already using a method of family planning, but only 4 in 10 current users reported satisfaction with their current method. Reaching these women is critical for meeting the unmet need for family planning as discontinuation rates are high. As stated earlier, in Kenya, 37.1 percent of women are not informed about the potential of experiencing side effects when up taking a method of family planning or what to do in the event of experiencing side effects (44 percent). As 66 percent of Nivi users currently using contraceptives are unsatisfied with their current contraceptive, Nivi recommends up to three methods that might work for a caller. When recommending the list of methods to the caller, we then ask the caller if she has had a bad experience with one of these methods in the past; if so, we take that method off of her recommended list and refer a different method.

The male callers during the pilot period were slightly older and a little over half of them were married or living with a partner. To better serve the male callers and identify their reason for calling, we included a few different pathways for men: (i) men were given an option to enter their partner's phone number so that their partner could receive an SMS to complete the Nivi screening, (ii) receive a referral for male condoms or vasectomy, or (iii) listen to a short educational prompt about different family planning methods.

3.4 Evaluation of Call Flow

3.4.1 Failed Calls

During the pilot period, 75.8 percent of unique callers did not complete the screening to the point of receiving a referral. To better understand where calls were failing, we examined the failure rate of calls by each step in the screening. **Figure 2** demonstrates the failure rate of the calls, and at which point on the screening calls were dropped by Version 1 and Version 2 of the algorithm.

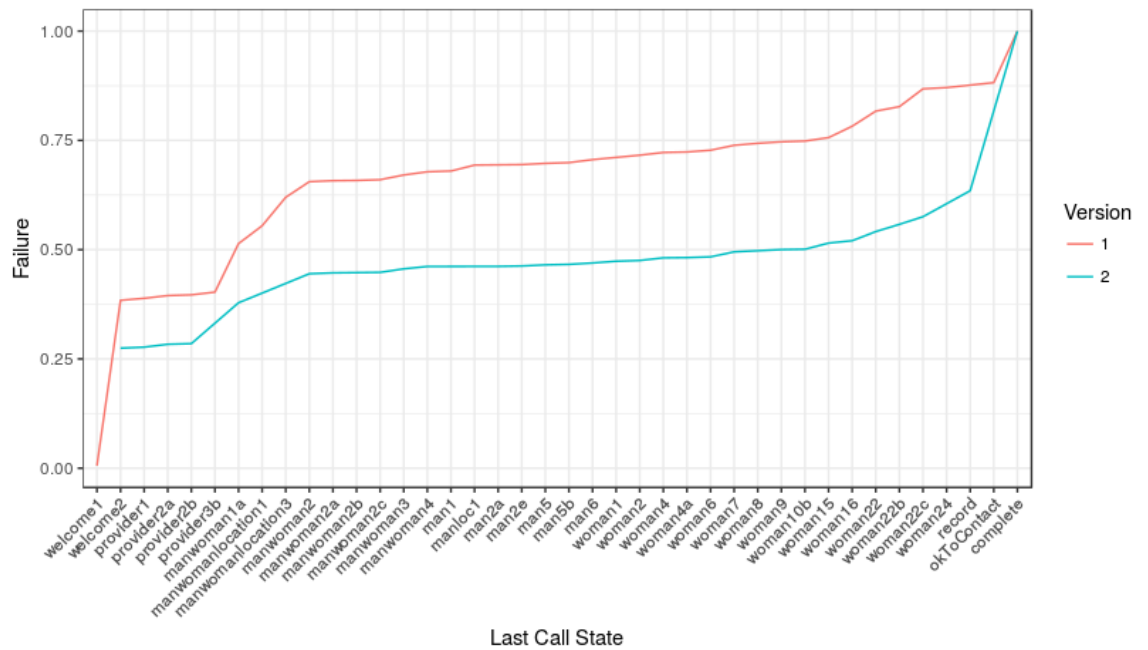


Figure 2: Failure rate by version 1 and version 2 of the screening

This figure demonstrates that the majority of calls that fail do so at the beginning of the screening. The failure rate begins to level off after the seventh prompt.

When analyzing where these calls dropped in the first version of the algorithm, 60 percent of all failed screenings dropped during the opening message. To learn more about why callers were disconnecting during the welcome message, we conducted follow up interviews with a subset of these users. Follow-up interviews with users suggested two main reasons: (i) people calling Nivi out of curiosity and hanging up and (ii) confusion about IVR.

From interviews and focus groups, we learned that many Nivi callers had never used IVR before. As the Nivi screening was recorded in a Kenyan woman's voice, many of them believed they were talking to a real person. In the first version of the algorithm, there was no explanation of how to use Nivi; we assumed that callers would understand what to do when prompted to press buttons on the phone's keypad to respond. Follow-up interviews with users revealed widespread confusion with how to interact with the service. Many initial users reported that they attempted to speak into the phone and eventually hung up. Those who did use their keypad to respond expressed confusion with why they could not just speak to the operator and were frustrated with using their keypad to respond.

In response, we identified ways to change the opening message on the screening to better explain how to use the service and respond to the screening prompts. In the second version of the algorithm, the team decided to explain further in the initial welcome message about how it is necessary to use the keypad to respond. After making

this change, the screening completion rate increased from 14.8 percent in Version 1 to 29 percent in Version 2. **Figure 3** summarizes the steps of the HCD process.

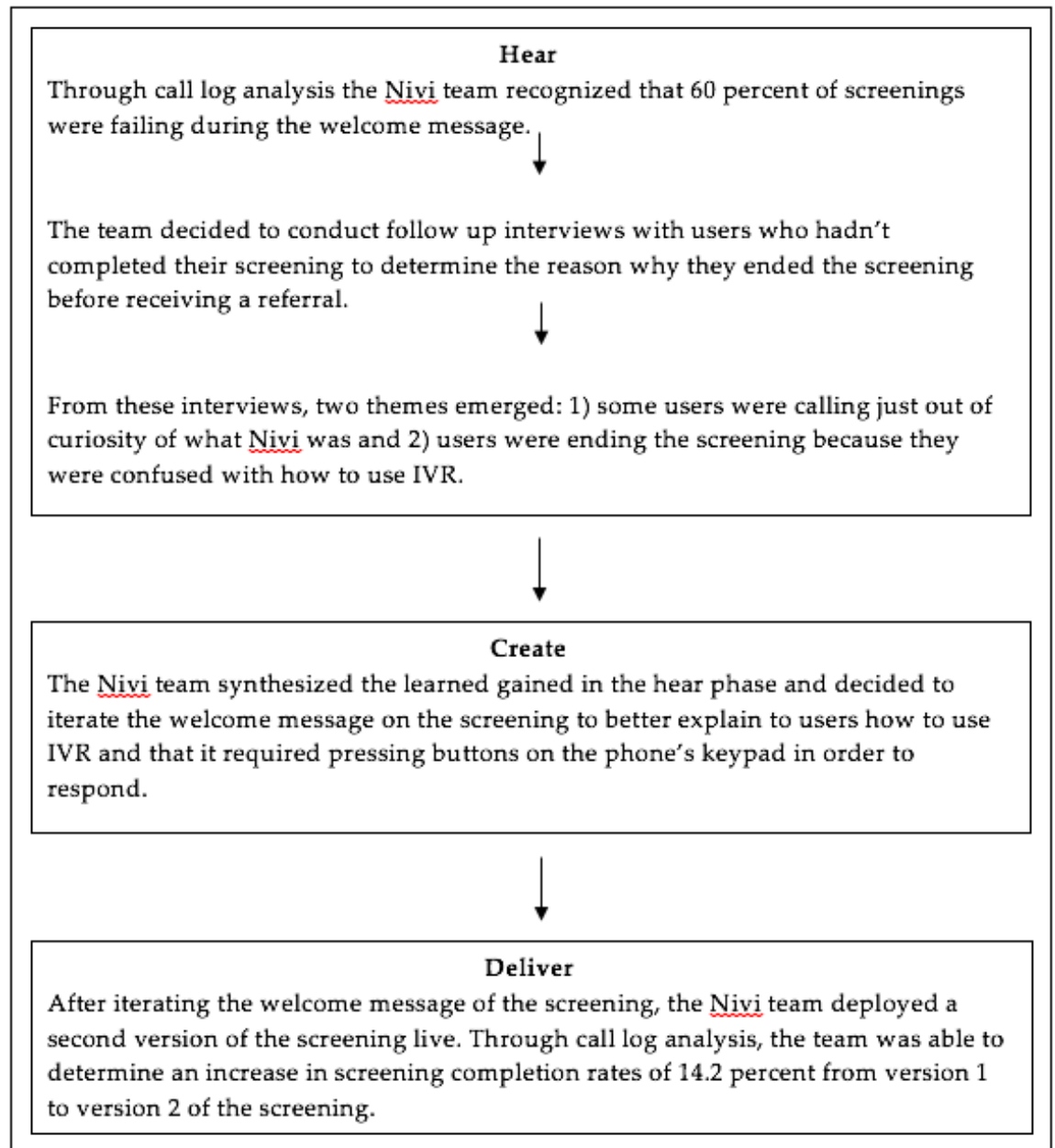


Figure 3: HCD process to decrease screening failure rate

3.4.2 Call Duration

Another common theme that emerged during user interviews was that the screening was too long. We iterated on the algorithm multiple times to decrease the call duration and increase screening completion rates and referral redemption rates by further explaining how to use the keypad to respond to the prompts. **Table 3** summarizes call length and call status for Version 1 and Version 2 of the screening that went live during the pilot period. From Version 1 to Version 2 of the screening, the algorithm iterations resulted in the median call length shortening by 2.16 minutes.

Table 3: Summary of version of screening and caller status

	<i>Version 1</i>	<i>Version 2</i>
Median call length (minutes)	7.98	5.82
Unique callers	1,882	3,668
Referral rate (n)	14.8% (279)	29% (1,064)
Referral Redemption Rate (n)	20.7% (58)	23.7% (252)

3.5 Redeemed Referrals

3.5.1 Method Choice

During the pilot period, 310 clients redeemed a Nivi referral at a family planning facility (94.5% public facilities). **Table 4** shows type of method redeemed at the facility

by Nivi users as compared to all family planning methods used by clients at family planning facilities in Bungoma.

Table 4: Percent distribution of Nivi users by contraceptive method

Method	DHS 2014 (Bungoma)	Nivi
Female sterilization	9.4	9.6
IUD	1.5	3.4
Pill	8.1	2.2
Injectable	53.8	13.6
Implants	21.9	56
Emergency contraception	0	1
Male condoms	5.3	10.8
Female condoms	0	3.4

A notable difference in the method uptake by Nivi users as compared to the 2014 Kenya DHS data for Bungoma is the use of implants. The proportion of Nivi users who chose implants is more than double what has been observed in Bungoma. As shown in **Table 2**, two-thirds of Nivi users who said they want to have children in the future reported wanting to delay pregnancy for more than 5 years. This might indicate that Nivi is meeting women’s preferences for wanting to delay pregnancy longer and empowering them to uptake a long-term contraceptive method, as compared to injectable methods which last for 1-3 months. Or, perhaps the Nivi screening asks more questions and offers more information about method options than a woman typically

receives in a healthcare facility, thus creating a shift in which method a woman might choose.

3.5.2 Access to the facility

A key metric is the conversion of referred callers to facility visits. In the first month of the pilot period, there were only 17 referrals redeemed at Nivi partner facilities, a 14 percent conversion rate. To learn more about why users were completing the screening, receiving a referral code, but not going to the healthcare facility, we added questions to our follow-up survey. The new questions sought to determine the initial reason the person used Nivi, if the user intended to redeem their referral in the future and why they have yet to do so.

The Nivi team contacted 44 unique callers who had referral codes but had yet to redeem their code at a Nivi facility. Almost all users reported that their reason for calling Nivi was because they wanted to learn more about family planning. During the interviews, when asked if they intended to eventually use their referral at the healthcare facility, 80 percent said yes. The most common reason for not visiting the facility yet was because they were busy with work or other commitments and did not have the time to go to the health care facility. Other reasons included a lack of money required to reach the facility, fear of side effects, and already currently using a method of family planning.

Based on this information, we identified possible product developments that might increase the rate of redeemed referrals: free transportation. Users did not cite

distance to facilities as a barrier, but we hypothesized that an offer of free transportation would nudge clients to overcome their present bias and invest time in their future health and wellbeing. In a setting where information about clinic services is hard to access, it can be risky to divert time from productive activities to preventive health behaviors. For those who do make it to the clinic, it is not uncommon to be turned away from the clinic after investing the time and money to reach the healthcare facility because of stock outs or lack of qualified staff available, especially in rural areas (Turin, 2010).

For this reason, we decided to test if offering free transport to the facility would reduce this risk and result in higher proportion of redeemed referrals. It was a good investment of resources. In the month following the initiation of the offers, the rate of referral redemptions grew to 36 percent, 22 percent higher than before offering free transport to the clinic. Free transportation continues to be a key part of the Nivi model. The HCD process for developing transport offers is summarized in **Figure 4**.

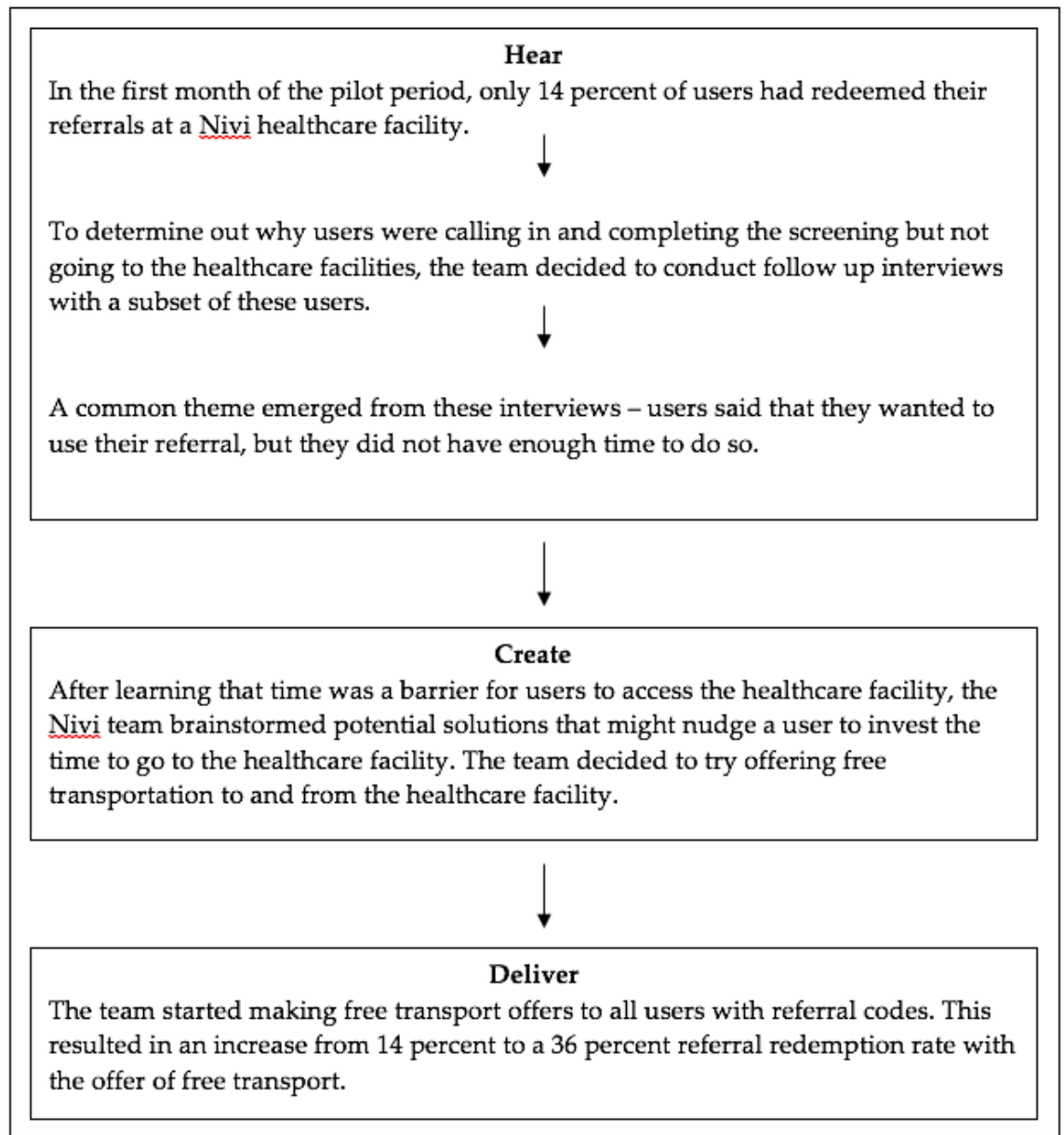


Figure 4: HCD process to promote referral redemption

4. Discussion

4.1 Summary of Results

By using a Human Centered Design approach, we sought to better understand the challenges users face with the Nivi platform and the opportunities that exist to make improvements. During the pilot period, we solicited user feedback daily and used this insight to iterate on the product. In the cycle of ongoing product development, we were able to rapidly iterate the screening which resulted in higher screening completion rates. Additionally, we were able to gain deeper insight into barriers to redeeming referrals, and develop a new product feature offering free transportation to the clinic, which tripled the referral redemption rate the following month.

4.2 Lessons for Incorporating Human Centered Design

Incorporating the HCD approach allowed us to better understand the challenges that our users face, and as a result, build a service with greater potential for use and usability. Though HCD is becoming increasingly popular, there are a lack of case studies that demonstrate how to incorporate this design technique in emerging markets. Though the results of the Nivi case are for a specific context, the following takeaways may generalize to different health applications in emerging markets.

Hear

The process of HCD does not take place in a sequential order. Instead, the 'hear', 'create' and 'deliver' phases are often thought of as spaces rather than steps. These

spaces often do not occur in a linear fashion, but rather in a loop, with overlap between each space. As a result, it is not uncommon for this type of design thinking to feel chaotic.

HCD ultimately seeks to gain a deep understanding of the user and empathize with their wants, needs and challenges; therefore, there is a lot of data captured in the 'hear' space. The data from this phase comes from natural settings rather than controlled environments, sometimes making it difficult to capture everything being learned. To minimize the chaos that can result from a flood of data, it is important to have the mechanisms in place to capture the large amount of data that comes with incorporating type of design approach in a structured way. This is especially important because a large part of the hear phase is about developing intuition and recognizing patterns. However, making decisions based off intuition alone can be risky. Instead, having structured frameworks in place to capture data and synthesize the learning helps form a more solid intuition to make an informed decision for which iterations to bring to life in the create phase.

This is an area where the Nivi team did well. Before launching the screening, we had a system in place to synthesize all of the data captured in the call logs and distill it into meaningful information. We also created an internal dashboard to monitor in real time as calls come in, how many times calls are failing, where they are failing, and how

long a user spends on the call. This system allowed us to track the caller experience in real time and make quick decisions.

In the pilot phase, we had two standard weekly meetings to analyze the data from these call logs. This was necessary identifying early insights and quick decisions, such as realizing that 60 percent of failed screenings were taking place during the welcome prompt. Determining this was critical in iterating the screening quickly to better explain this message, and resulted in a much lower screening failure rate in Version 2.

Create

In an ideal scenario, the create phase is spent identifying all possible opportunities to iterate based on what was learned in the hear phase. In order to generate the most innovative and meaningful iterations, we took on an open mindset – all product iterations, opportunities and visions were considered. However, adopting this type of mindset can lead to an overwhelming amount of ideas. There were times when there was a desire to restrain creativity and complexity of ideas and balance this with practicality and feasibility. With a small team and limited budget, we sometimes opted to implement the least complex product iterations for the sake of time and resources. This meant focusing on features with the highest chance for success, but potentially not the ones with the greatest impact or return.

Due to the nature of the startup, the team was simply not big enough to test multiple iterations at once. As a result, we had to determine which iterations had the least amount of risk instead of the highest potential impact. Ideally, we would have liked to execute on many more iterations that were developed in the create phase. Instead, we had to balance creativity and idea generation with practicality and feasibility given the resources available. This reiterates the importance of having systems in place to capture all data on the user's experience to make the most informed decisions and prioritize the vast amount of potential iterations.

Deliver

A natural part of incorporating the HCD process requires experimentation. Rapid iterations are often experiments, formed out of intuition backed by data. Due to the experimental nature of design thinking, it is natural to worry about the repercussions of failure when incorporating rapid iteration. Failure can be costly in terms of the resources spent working toward creating a prototype that ultimately did not work out as intended. To minimize costs associated with iterations that did not ultimately work, we learned that it is important to have metrics in place to track the success or failure of each iteration. If these iterations were to fail, we wanted to fail quickly and learn something in the process.

To minimize damage from potential failure from experimentation, we established a framework that enabled us to determine if a product iteration was successful or not. This framework allowed us to determine when we are failing and why, and do so in an efficient manner. An example where the Nivi team did this well was with the transportation feature. Because the transportation feature was a large cost in terms of time and financial resources, it was important to determine quickly whether this was effective. The team was able to quickly and easily measure and track in real time the referral redemption rate before and after giving transport offers.

As the HCD process is ongoing, the team is currently delivering and testing two new product features: a chatbot and facility dashboard for the Nivi health care facilities. Through one on one interviews, focus groups, user observation and marketing activities, the Nivi team identified a recurring theme among Nivi users: the fear of side effects from starting a method of family planning. To respond to this concern, the team contemplated how the Nivi platform could incorporate a mechanism to address concerns that potential Nivi users might have about side effects. The team ultimately decided that a chatbot would be a feasible solution to this at scale. The Nivi chatbot is a free tool that allows anyone to send a message with questions about family planning and receive an answer in real time. Nivi is currently piloting the chatbot via SMS and Facebook.

The second product feature that the team is currently iterating is a dashboard for the Nivi healthcare facilities. In the initial partnership with facilities, the Nivi team asked facility staff to record data for each Nivi client visit and send this data in a free SMS to a Nivi database in exchange for increasing client volume to the facility. This data was to be recorded first in a paper register kept at the facility and sent via SMS on a weekly basis. The SMS messages were free for the facilities to send to the Nivi database. However, the team quickly noticed that facilities were failing to send in this information via SMS.

The Nivi team conducted one on one interviews with healthcare staff as well as a focus group with facility in charges to better understand why facilities were failing to send in the data via SMS. A common theme emerged in the focus group with the in charges: Nivi is sending more clients to an already overworked and underpaid health center staff. Nivi's request for data collection and reporting was another task for the staff to do that was not a high priority. The Nivi team's original assumption was that an increase in client volume would be positive for all facilities; however, from a health center staff perspective, this was not always the case.

To respond to this challenge, the team is creating and testing a product for facilities that increases the value of partnering with Nivi. The team is currently in the process of developing and iterating a dashboard for facilities to access all the data collected on client preferences and facility performance. With facilities citing a major

complaint as commodity stock outs, collecting user data and being able to provide insight into forecasting future projections for commodities needed would help facilities to better balance supply and demand for each type of method they offer.

4.3 Implications for policy and practice

HCD is built on the principle that the “most valuable tools for improving people’s lives aren’t necessarily the ones designed in the shiniest labs; they are the ones people can and will actually use” (Gates, 2015). In the global health field, it has been demonstrated that although a product or service works, the product or service may not necessarily be used in the way it was intended, or even used at all.

Today’s global health challenges are often complex, dynamic and quickly changing. These challenges are often nuanced to specific contexts, where solutions must be designed to meet specific criteria - not a one size fits all approach. It has been demonstrated that incorporating HCD into the process of developing these solutions is a promising way to design innovations that work in these environments. Yet, there are a lack of resources that demonstrate how to incorporate HCD. More training is needed in global health programs to build a next generation of leaders who will be building these types of solutions. In such a dynamic field, a new approach using rapid small tests, versus long static randomized control trials might be more well suited. Design thinking goes beyond traditional research methodology, and instead presents multiple possible solutions to people who actually are the intended users. This type of design thinking

might be more practical in global health, testing services and products in real world situations where they will be used, rather than controlled environments.

4.4 Implications for further research

This case study demonstrates the utility of incorporating HCD into a digital health service in Kenya. This type of design has been recognized as an international standard for usability; however, this approach is rarely used in global health design (Bevan, 2009). More research is needed in other settings to better inform this process, given the lack of case studies documenting this type of design in the global health field.

4.5 Study strengths and limitations

One limitation of this case study is that the systems to collect data on user interactions with Nivi were built and evolved alongside the core Nivi platform. Thus the data are naturally incomplete. Another limitation is that the team hoped to conduct more user observation sessions and focus groups, but ultimately were not able to due to the lack of time and resources.

5. Conclusion

We believe that taking an HCD approach allowed us to build a product that has the potential to meet the unmet demand for family planning services in Kenya. This case study highlights the strengths and challenges of the approach for other health applications in emerging markets.

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