

# **User Acceptance in an mHealth Application: Exploring the *You and Your Baby* Platform**

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## **Abstract**

Acceptance of technology is a field devoted to understanding how users accept and use technology. The UTAUT2 (Unified Theory of Acceptance and Use of Technology 2) model is one framework through which researchers can analyse the factors affecting the usage of an application. This study applies the model to understanding the acceptance or lack thereof of an educational mHealth application. "You and Your Baby" is a platform developed to aid the Bhabhisana Baby Project, an NGO in the Western Cape of South Africa, by supporting caretakers of babies born with developmental issues. The author measured usage of the platform and conducted user interviews. Through these methods, they found that users have a range of criticisms of the application and that usage is low. These results indicate that the staff and the caregivers at the Bhabhisana Baby Project do not fully accept the system. If the design of the "You and Your Baby" platform is not iterated upon, the system is unlikely to be used regularly in the future. The most crucial areas for improvement are fixing a video display issue on the mobile Android app and simplifying the user interface on the web portal. This knowledge will enable future developers and collaborators to better design mobile health applications that will be useful for and accepted by the community of child development professionals and caregivers in the Western Cape of South Africa.

## 1. Project Context

### 1.1. Early Childhood Development

Early childhood development refers to the first several years of a child's life in which crucial cognitive, social, emotional, and physical development occurs (Harvard University, 2022). Providing children with nurturing care in those years sets them up to thrive later in life. Nurturing care is defined by Britto et al. (2017) as "a stable environment that is sensitive to children's health and nutritional needs, with protection from threats, opportunities for early learning, and interactions that are responsive, emotionally supportive, and developmentally stimulating." When children lack these experiences in early childhood, they are prevented from reaching their full developmental potential (Daelmans et al., 2017). In the early years of a child's life, the human brain is at its most flexible, or "plastic" — with age, the brain's capacity for change lessens. Therefore, intervention is most effective in this period. (Harvard University, 2020). Early childhood development interventions positively impact various outcomes including adult income, intelligence, educational attainment, health, decreasing violence, mental health, and generational growth (Black et al., 2017). Children in low-income and medium-income countries are especially at risk of suboptimal development. Black et al. (2017) found that 43% of children under five are vulnerable because of poverty and stunting (impaired growth due to malnutrition, repeated infections, and poor psychosocial stimulation). South Africa is one such country. Samuels et al. (2012) state that "children in South Africa are frequently exposed to multiple and cumulative risks, and, as these risks accumulate, development is increasingly compromised." These risks include exposure to violence, malnutrition, and HIV infections.

A UNICEF (2020) report also found that 67% of South African children live below the upper-bound poverty line. Continued legacies of apartheid contribute to a vast inequality split along racial lines, with a disproportionate number of Black and Coloured people living in poverty (Kate, 2022). These factors contribute to a vast need for adequate early childhood development intervention in South Africa.

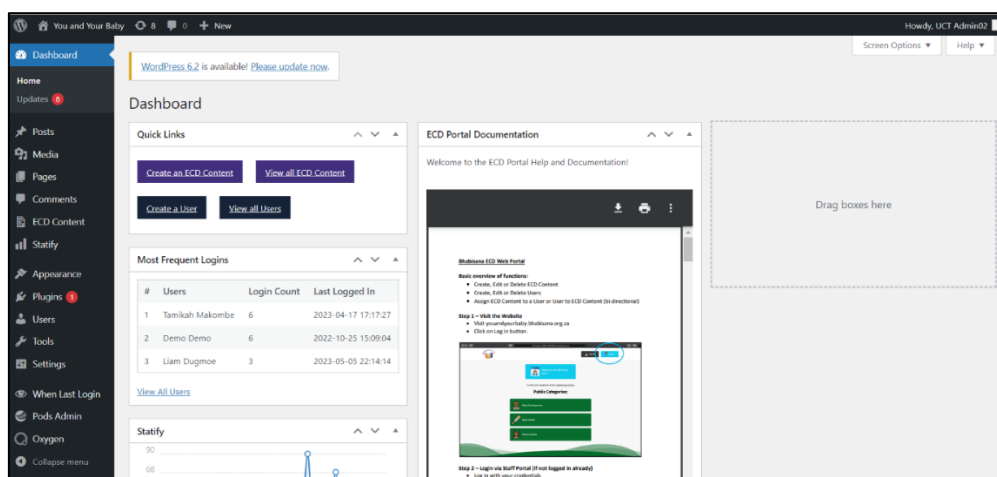
### 1.2. Bhabhisana Baby Project

The Bhabhisana Baby Project is a non-governmental organization in the Western Cape of South Africa. Formed in 2015, the project serves parents of children born with developmental issues who come from resource-constrained communities. These are environments that are characterized as low-income and low bandwidth (Anderson et al., 2012). They aim to help with early childhood development interventions, specifically during the first 1000 days of a child's life. The staff members include physiotherapists, occupational therapists, and speech and language therapists. Bhabhisana uses an interdisciplinary approach to provide therapy and care.

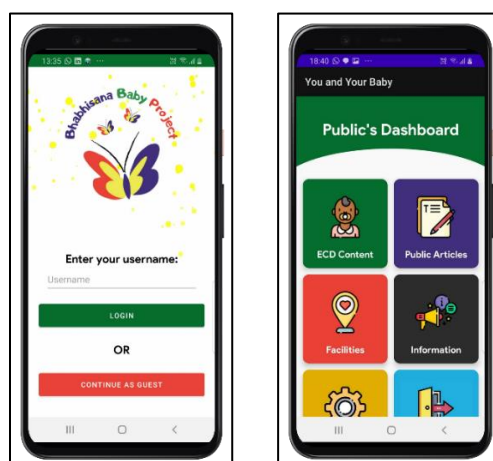
### 1.3. "You and Your Baby" Platform

Building on the prior and ongoing work of a master's student (Toshka Coleman in Till et al., 2022), a group of honours computer science students at the University of Cape Town worked with the Bhabhisana Baby Project and their beneficiaries to co-design, develop, and deploy a content delivery system called "You and Your Baby" (Swanepoel et al., 2022). The team of developers aimed for their platform to be functional, accessible, easy to use, and sustainable. The system includes a web portal for staff members to upload, manage, and assign

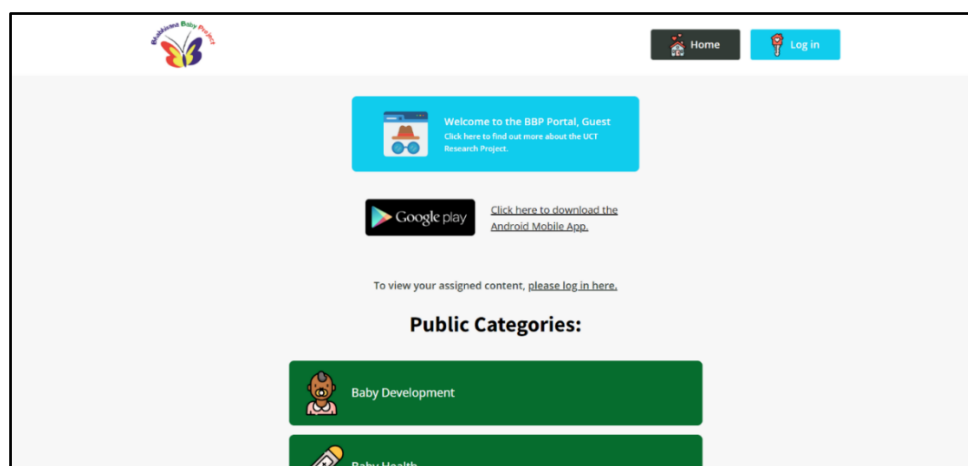
educational resources on early childhood development to individual caregivers. It also has a web app and a mobile Android app that caregivers can log into to view and download their assigned content. The web app was deployed in August 2022, and the mobile Android app in September 2022. Images of "You and Your Baby" are included below in Figures 1-3.



**Figure 1: Web Portal**



**Figure 2: Mobile Android Application**



**Figure 3: Web Application**

### 1.4. Project Aim

Initial feedback on the "You and Your Baby" platform was positive. However, at the time of this study, nine months have passed since the system was implemented at the Bhabhisana Baby Project. More information on the current status of the application in the organization is required to ensure the continued use and usefulness of the platform. Therefore, this project has three primary goals:

1. Evaluate current usage of the "You and Your Baby" platform by the users at the Bhabhisana Baby Project.
2. Understand how and why users engage with the platform and their acceptance of the platform or lack thereof.
3. Develop a list of suggestions for future development of the platform.

By exploring usage and acceptance of the "You and Your Baby" system, future developers will be instrumented with the knowledge to iterate upon its design. By improving this system, and therefore, increasing its usage, caregivers of babies with developmental issues in resource-constrained communities in South Africa will be better equipped to raise and care for their children.

## 2. Background

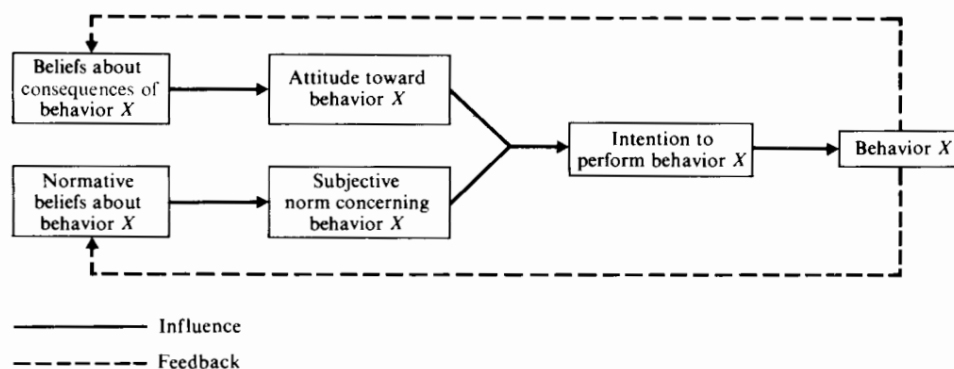
Two major disciplines informed the formation of this research: acceptance of technology and mobile health, also known as mHealth.

### 2.1. Acceptance of Technology

Acceptance of technology is a field that studies, as the name implies, how users come to accept and use a technology. This discipline has a rich history of evolution, with researchers building off and responding to each other's work.

#### 2.1.1. Theory of Reasoned Action (TRA)

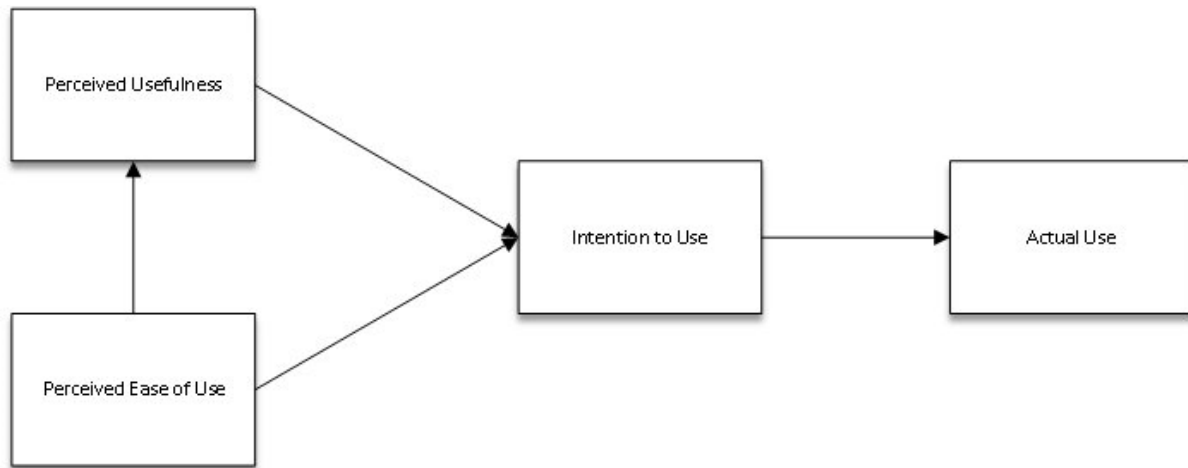
In 1975, Martin Fischbein and Icek Ajzen developed the Theory of Reasoned Action. With roots in social psychology, the TRA posits two factors that contribute to intention, which then, in turn, leads to behaviour. These factors are attitude (a positive or negative evaluation of a behaviour) and subjective norm (the belief that important people support a behaviour). Fischbein and Ajzen believed such factors were influenced by beliefs shaped by other external variables such as personality, demographics, etc. These relationships are illustrated below in Figure 4 (Fishbein & Ajzen, 1975).



**Figure 4:** Theory of Reasoned Action

### 2.1.2. Technology Acceptance Model (TAM)

The Technology Acceptance Model, developed by Fred Davis in 1989, is an adaptation of the Theory of Reasoned Action. The model is specific to how users accept information systems and is depicted below in Figure 5 (Marikyan & Papagiannidis, 2023a). According to the TAM, the aspects of a system's design influence a user's perception of how useful and easy that technology is. These factors impact a user's intention to continue using that technology, which then predicts its future usage.



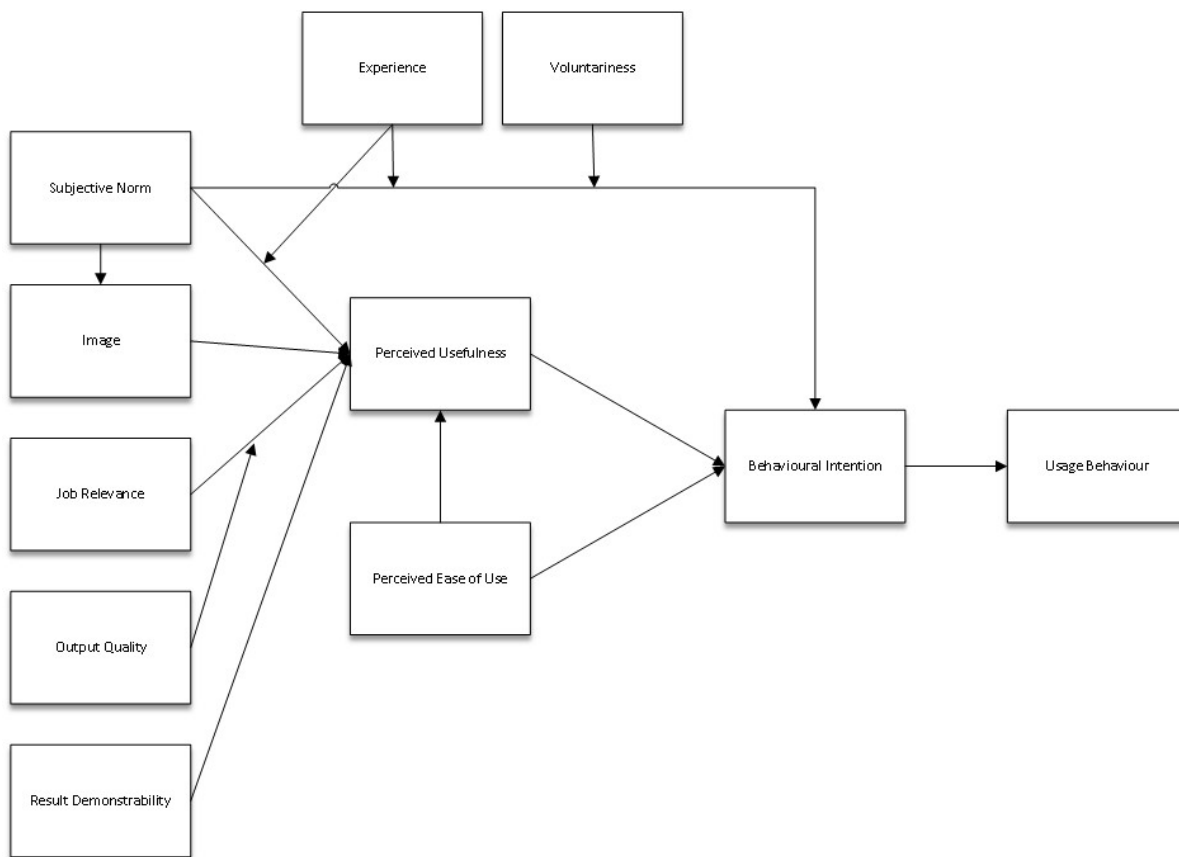
**Figure 5:** Technology Acceptance Model

### 2.1.3. Technology Acceptance Model 2 (TAM2)

In 2000, Davis and Viswanath Venkatesh expanded the TAM to improve its accuracy. Their new model, the TAM2, adds five additional variables and two moderators that influence perceived usefulness. These constructs, as defined by Davis and Venkatesh, are:

- Subjective norm, defined as "a person's perception that most people who are important to him/her think he/she should or should not perform the behavior in question."
- Image, defined as "the degree to which use of an innovation is perceived to enhance one's... status in one's social system."
- Job relevance, defined as "an individual's perception regarding the degree to which the target system is applicable to his or her job."
- Output quality, defined as "how well the system performs... tasks."
- Result demonstrability, defined as "the tangibility of the results of using the innovation."
- Experience, defined as time spent with a system.
- Voluntariness, defined as "the extent to which potential adopters perceive the adoption decision to be non-mandatory."

This model is shown in Figure 6 (Marikyan & Papagiannidis, 2023a).



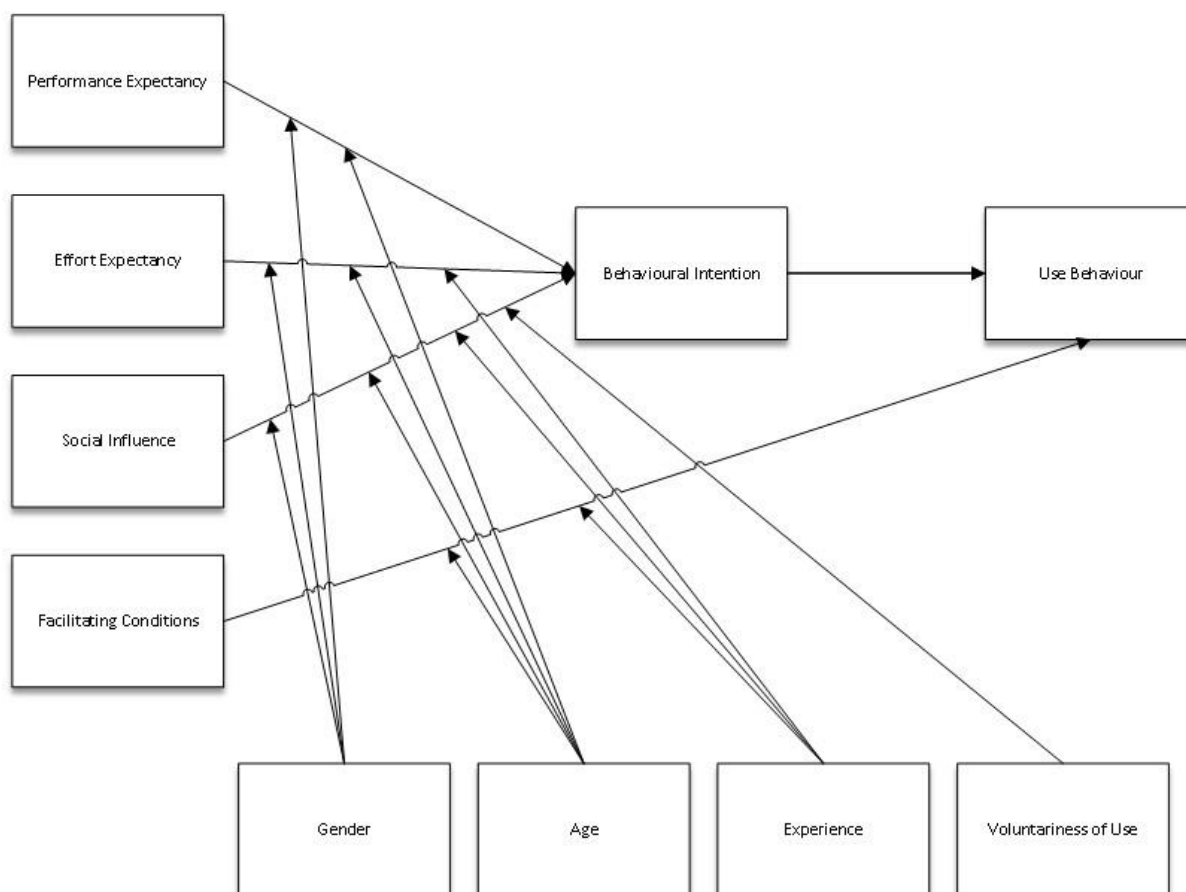
**Figure 6:** Technology Acceptance Model 2

#### 2.1.4. Unified Theory of Acceptance and Use of Technology (UTAUT)

In 2003, Venkatesh et al. reviewed, compared, and combined eight leading user acceptance models. Among these eight models were the TRA and the TAM. From this review, the authors produced an integrated, empirically validated model known as the Unified Theory of Acceptance and Use of Technology. The UTAUT identifies four factors and four moderators related to predicting intention to use a technology and the actual usage. The factors are:

- Performance expectancy, defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance."
- Effort expectancy, defined as "the degree of ease associated with the use of the system."
- Social influence, defined as "the degree to which an individual perceives that important others believe he or she should use the new system."
- Facilitating conditions, defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system."

The four moderators are age, gender, experience with the technology, and voluntariness. The UTAUT model is depicted below in Figure 7 (Marikyan & Papagiannidis, 2023b).



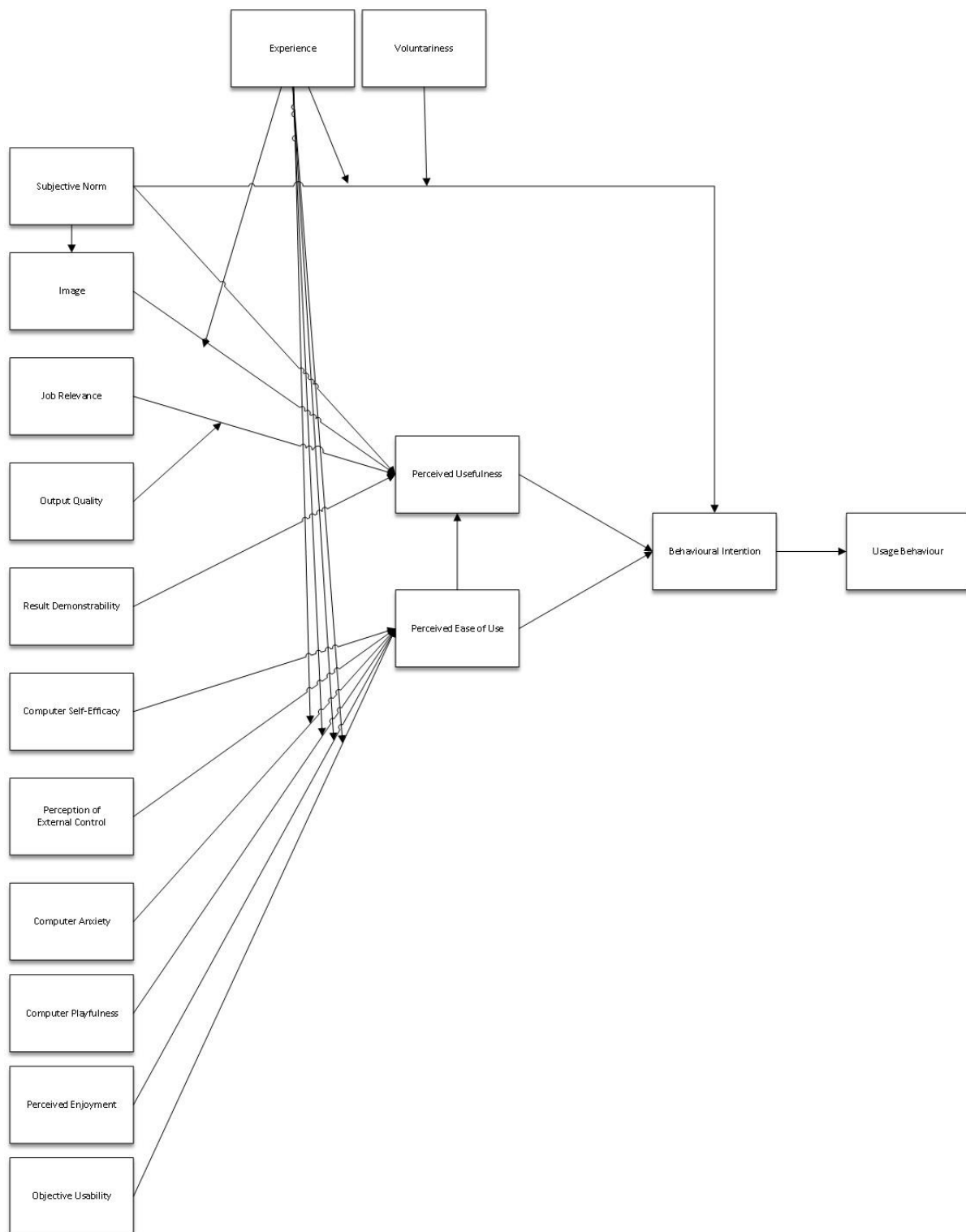
**Figure 7:** The Unified Theory of Acceptance and Use of Technology

#### 2.1.5. Technology Acceptance Model 3 (TAM3)

Venkatesh and Hillol Bala (2008) extended the TAM2 into the TAM3. The TAM3 preserves the same constructs for perceived usefulness but adds six new factors predicting perceived ease of use. As defined by Venkatesh and Bala, they are:

- Computer self-efficacy, defined as "the degree to which an individual believes that he or she has the ability to perform a specific task/job using computer."
- Perception of external control, defined as "the degree to which an individual believes that organizational and technical resources exist to support use of the system."
- Computer anxiety, defined as "the degree of an individual's apprehension, or even fear, when she/he is faced with the possibility of using computers."
- Computer playfulness, defined as "the degree of cognitive spontaneity in microcomputer interactions."
- Perceived enjoyment, defined as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system use."
- Objective usability, defined as "a comparison of systems based on the actual level (rather than perceptions) of effort required to complete specific tasks."

The model is represented below in Figure 8 (Marikyan & Papagiannidis, 2023a).



**Figure 8:** Technology Acceptance Model 3

#### 2.1.6. Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

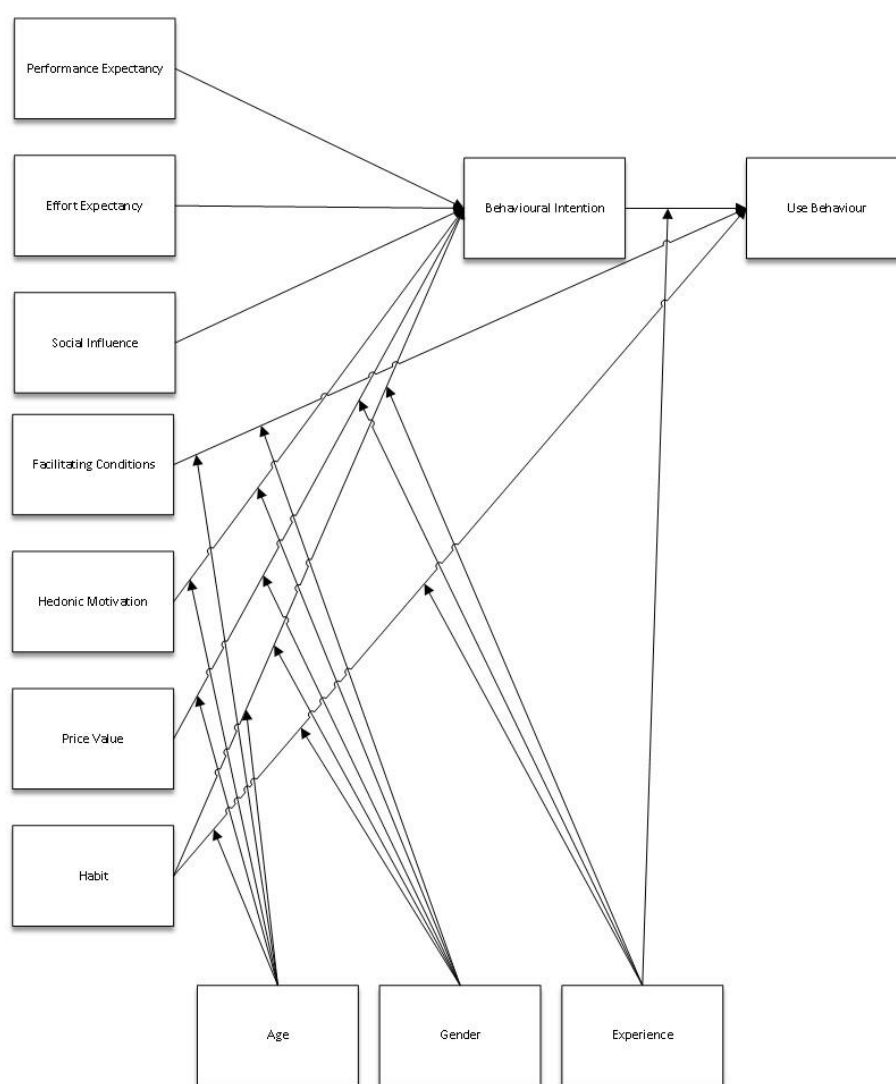
Venkatesh et al. (2012) developed a new extension of the UTAUT, the UTAUT2. All technology acceptance models discussed here (the TAM, TAM2, UTAUT, and TAM3) evaluate technologies designed for internal and organizational use. Uniquely, the UTAUT2 assesses consumer technology acceptance instead of professional. This model modifies the



original four factors and drops voluntariness as a moderator. Additionally, it also adds three more factors. All together, they are:

- Performance expectancy, defined as "the degree to which using a technology will provide benefits to consumers in performing certain activities."
- Effort expectancy, defined as "the degree of ease associated with consumers' use of technology."
- Social influence, defined as "the extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology."
- Facilitating conditions, defined as "consumers' perceptions of the resources and support available to perform a behavior."
- Hedonic motivation, defined as "the fun or pleasure derived from using a technology."
- Price value, defined as "consumers' cognitive tradeoff between the perceived benefits of the applications and the monetary cost for using them."
- Habit, defined as "the extent to which people tend to perform behaviors automatically because of learning."

The UTAUT2 is shown in Figure 9 (Marikyan & Papagiannidis, 2023b).



**Figure 9:** The Unified Theory of Acceptance and Use of Technology 2

### 2.1.7. Model Selection

A vast number of studies have tested and validated all the discussed technology acceptance models for a variety of geographical settings — they would all be appropriate for the South African context (Matikiti et al., 2018; Mberi & Kekwaletswe, 2020; Petersen et al., 2020; Ujakpa & Heukelman, 2018). However, a comparison of modern technology acceptance models found that the UTAUT2 is the most accurate (Rondan-Cataluña et al., 2015). Additionally, the UTAUT2 was uniquely developed for evaluating consumer technology acceptance, which is more representative of the user population in this research. Consequently, the author selected the UTAUT2 model as the framework for understanding acceptance in this study.

## 2.2. mHealth

The field devoted to studying the use of mobile wireless technology for public health is known as mHealth. Researchers have studied mHealth for decades (Fiordelli et al., 2013). The World Health Organization released a report on mHealth, discussing mobile technology's significant role in national health care (Executive Board, 2017). According to that same report, mHealth has massive capability to increase access to quality health services (including sexual and reproductive health), reduce early death from non-infectious diseases and their comorbidities, increase global health security, increase the safety and quality of care, and increase patient, family, and community engagement. Additionally, the UN published a 2009 report on mHealth in developing countries, which provided evidence for the potential mHealth has particularly in low resource settings (Vital Wave Consulting, 2009). They found that the critical applications for mHealth in those regions are education and awareness; remote data collection; remote monitoring; communication and training for healthcare workers; disease and epidemic outbreak tracking; and diagnostic and treatment support.

### 2.2.1. UTAUT2

The constructs of the UTAUT2 model have all been validated for use in mHealth applications. Performance expectancy is the strongest predictor of mHealth usage (Nunes et al., 2019). However, the other factors have all also been positively associated with behavioural intention for health applications. (Chao, 2019; Nunes et al., 2019; Schomakers et al., 2022).

### 2.2.2. South African mHealth

Smartphone penetration, a method of measuring mobile phone use by SIM cards, was at 91.2% in South Africa in 2019 (Independent Communications Authority of South Africa, 2022). Additionally, only a minority of the population in South Africa has health insurance — those without must rely on under-resourced and inaccessible public healthcare or unreasonably expensive private healthcare (Hampshire et al., 2015). These factors indicate that there is both an immense need for improved healthcare in South Africa and that mHealth has immense potential to be a solution for this setting.

### 2.2.3. South African Maternal mHealth

There are a variety of existing digital solutions that aim to provide health education for maternal and child health. According to Muthelo et al. (2023) some of these in South Africa include MomConnect, Pregnancy+, and WhatsApp. That same study found that, while

mothers in rural areas had good experiences with these applications, their usage was restricted by the high cost of data and the limited storage capabilities on the participants' phones. The "You and Your Baby" platform sought to address those limitations by prioritizing data and storage considerations in its design (Swanepoel et al., 2022).

### 3. Methods

For this study, the author took two primary approaches to collect data on the use of the "You and Your Baby" platform: first, conducting interviews with the users at the Bhabhisana Baby project and, second, gathering usage statistics from the web and mobile Android applications. The study period was from March 1<sup>st</sup>, 2023, to May 14<sup>th</sup>, 2023. A group of computer science honours students at the University of Cape Town assisted with these processes (Rinya Singh, Lwazi Sibeko, and Tariro Banganayi). These students are also working on "You and Your Baby" as part of their honours project and will continue to work on the system after this study concludes. The honours students and the author obtained ethical clearance for this study from the University of Cape Town. The data was first collected at an initial meeting at Bhabhisana, followed by a staff interview, then a caregiver interview. At the end of the study, the author gathered the application statistics.

#### 3.1. Initial Meeting

The author and the honours students met with two staff members at the Bhabhisana Baby Project in Athlone, Cape Town, South Africa. This meeting allowed the team to introduce themselves, learn about Bhabhisana's work, discuss the research they aim to do, and see the physical space. In this initial meeting, the author gained insights that confirmed early hypotheses about the app's functionality and how people engage with it — namely, that platform usage is currently low, and that the mobile Android application is malfunctioning. Additionally, the staff provided valuable information on logistics for how best to plan the contextual inquiry in a way that prioritized the time and comfort of the participants.

#### 3.2. Interviews

The team recorded semi-structured interviews with staff members and caretakers at the Bhabhisana Baby Project. They received signed informed consent forms from all involved. The initial meeting, prior work done with Bhabhisana, and the UTAUT2 model informed the content of these discussions. The interviews incorporated all constructs of the model, except for price value, as the application is free to use.

##### 3.2.1. Staff Interview

The author conducted the staff interview over Zoom with two participants and two honours students observing (Rinya Singh and Lwazi Sibeko). The interview was approximately one hour in length. The staff members were female therapists specializing in early childhood development born in the 1960s. They had about nine months of constant use of experience with the platform. See Appendix A for a list of guiding questions and related UTAUT2 constructs used in the interview.

##### 3.2.2. Caretaker Interview

Two of the honours students (Rinya Singh and Lwazi Sibeko) and the author conducted a workshop with five caretakers: three female and two male. The participants were all parents

of children with developmental issues, born in the 1980s and 1990s, and from resource-constrained communities. Their experience with the "You and Your Baby" platform varied from none to approximately nine months of sporadic use. Additionally, the caregivers shared experiences of isolation, stigma, and intense stress. The staff at the Bhabhisana Baby Project helped recruit the parents for the workshop. They looked for caregivers who were excited about the application and willing to sacrifice a Saturday morning to participate. In the workshop, the team asked participants to download the application onto their phones, login, and spend some time navigating and exploring the application. Afterwards, participants discussed their experiences. The workshop and the following interview took around two hours. The team remunerated participants for their time with R80 each and lunch. See Appendix B for the questions and corresponding UTAUT2 constructs used to guide the conversation.

### *3.2.3. Transcription and Analysis*

The author used Otter.ai to roughly transcribe the recordings from the staff interview and the caregiver interview. Afterwards, they cleaned the transcriptions manually. The author then analysed the transcripts using deductive thematic analysis, with the UTAUT2 framework guiding the generation of themes and codes.

### 3.3. Application Statistics

The author gathered application statistics from March 1<sup>st</sup>, 2023, to May 14<sup>th</sup>, 2023. The web application continuously collects and stores website views using the Statify WordPress plugin and the Statify – Extended Evaluation WordPress plugin. These plugins allow for collecting basic engagement data per page of the website, while preserving user privacy. The mobile Android application is hosted on the Google Play Store, which tracks the number of users who have the application installed on at least one active device. The author exported the page views and the installed audience data to CSV files and then used Excel to conduct a fundamental statistical analysis.

## **4. Results**

### 4.1. Interviews

The author analysed the staff and caregiver interview using deductive thematic analysis using the UTAUT2 model. The factors of the model were defined in the Background section, but they are more concisely defined as follows:

- Performance expectancy refers to the usefulness of the platform.
- Effort expectancy refers to how easy it is to use the platform.
- Social influence refers to the opinions of important others concerning the platform.
- Facilitating conditions refers to perceived support and resources for the platform.
- Hedonic motivation refers to how pleasant the platform looks and feels to use.
- Habit refers to the regularity and essentiality of the platform.
- Frequency refers to how often the application is currently used.
- Behavioural intention refers to the users' intention to continue using the platform.

Below are some of the results from this analysis.

#### 4.1.1. Staff Interview

"A" and "B" are codes used to anonymously designate the staff members.

Theme	Code	Sample Quote
Performance Expectancy	Future potential	A: "It's almost like looking into the future. So, when it is a bit more user friendly... I can see that it would be incredibly useful for our work with our parents."
	General usefulness	B: "I don't think we're at the stage of implementation... I don't think we've achieved what I felt excited about."
Effort Expectancy	Efficiency	A: "So, for me, [using the app is] long... it often takes me a while."
	Easiness to learn	A: "As I'm using it more, I'm getting better. So, in the beginning, it would take me forever to do things. Now it's a little bit quicker because I'm kind of using it more frequently."
	Easiness of web app vs. mobile Android app	A: "I feel quite comfortable on the computer... I don't feel very comfortable on the phone."
	General easiness	A: "In this kind of building up stage, it feels a bit cumbersome."
Social Influence	Recommending to co-workers	A: "We've sort of given the platform to the colleagues that we work with... it's not in the form that we would like before it can be made more public."
	Recommending to parents	B: "I'm not yet at the point where I'm just gonna tell any parent to go and have a look, because I'm not yet confident, comfortable that it's going to be easy for them to access."
	Recommending to family	A: "I got my husband to look at it... and for him, it didn't really make much sense."
	Others' approval of the app's concept	A: "I think they can all see that it would be very valuable for us, and for the families that we work with."
Facilitating Conditions	Comfort with technology	B: "I don't feel comfortable using technology... I'm not in a comfort zone when I'm using technology."
	Problem-solving	A: "If something goes wrong, I don't know how to sort it."
	Ability to use the app	B: "I think we need lots more... in our own resources, like, personally, [we need to be] more skilled to be able to be comfortable with using this app."
Hedonic Motivation	How the app looks	A: "I actually quite like the colour scheme on the app. I like the different colours, there's more primary colours."
	Smoothness	B: "So, for me it doesn't feel smooth. I feel like I need to be focused."

Habit	Habitualness of usage	A: "[Using the app is] not really a habit."
	Essentialness	A: "So, I think, in the future, it's going to be actually essential... But at the moment, it's a small part of our work."
Frequency	Current usage	B: "I don't think it's being used."
Behavioural Intention	Intention to use in the future	A: "I think we would [continue to use the app in the future] ...But I think it would remain a small part of what we do."

**Table 1:** Results from thematic analysis of staff interview

- Performance Expectancy

The staff members emphasized that the platform has enormous potential to be useful for their work, but that it has not yet met those expectations. The staff members also reported that the application requires more educational resources, which limits its usefulness.

- Effort Expectancy

The staff members said that navigating and uploading content on the web portal is difficult. They also felt that their time on the platform is being used inefficiently — that completing tasks takes a lot of time for them to do. It took them a long time to learn how to use the platform, and they still struggle. Additionally, the staff members emphasized a preference for accessing the platform from their computer rather than through a mobile device, saying that they find it easier from a laptop.

- Social Influence

The staff members had given their colleagues the platform to use but said their co-workers would only use the application when asked to. Additionally, they claimed they are uncomfortable recommending it to parents because they are concerned about the platform's lack of user-friendliness. One staff member said that she gave it to her husband to try and that he was confused by the platform. However, both staff members think that the important people in their lives approve of the app's concept, and that those people are excited by the app's potential for their work.

- Facilitating Conditions

The staff members emphasized that they are very uncomfortable with technology in general and that their discomfort extends to the platform. When problems with the platform occur, they do not know how to solve or troubleshoot them.

- Hedonic Motivation

The staff members expressed that they like the app's appearance, but that using it can be stressful and frustrating.

- Habit

The staff members felt they have not yet integrated the app into their routines at work. Additionally, they said the app has yet to prove essential for them.

- Frequency

One of the staff members uses the platform more frequently than the other, as she is in charge of uploading and assigning content. As of the interview, one staff member uses the platform once every few weeks and the other uses it every few days. However, that usage is influenced by this study; the staff members said their usage has increased since the initial meeting for the study.

- Behavioural Intention

The staff members said they intend to continue using the platform, but in its current state they would only use it minimally.

- Staff Suggestions

In addition to discussing questions from the UTAUT2 model, the staff suggested things they would like to see changed or added for the next version of *"You and Your Baby."* In no particular order, some of these include:

- Storing login information for users: the staff could not access passwords for returning users who had forgotten their login information.
- Improving searchability of videos and articles: educational resources can be searched for only by their exact name.
- Changing the section title for educational resources from "ECD" to "First 1000 Days": the staff felt that the caregivers at the Bhabhisana Baby Project would not know what ECD stands for.
- Changing illustrated icons to pictures of babies: the staff wanted images of actual babies at the Bhabhisana Baby Project to be incorporated into the platform.
- Alert users when new content is uploaded to the platform: the staff wanted parents to know when content that could be relevant to them was added.

#### 4.1.2. Caregiver Interview

Preceding the caregiver interview, the team (the author, Rinya Singh, and Lwazi Sibeko) held a workshop with the participants. In this workshop, they were guided through downloading, logging in, and using the "You and Your Baby" mobile Android application. Downloading the application was difficult for the participants but still readily achievable. Logging in and navigating the app went smoothly. The primary issue occurred when participants tried accessing educational content: videos on the mobile Android application did not display, leaving most of the content on the application blank. Following this workshop, the caregivers were interviewed on their experience with the platform. The staff members are designated by the "A" and "B," and the caregivers are anonymized with letters "C" through "G." The analysis of this interview is below:

Theme	Code	Sample Quote
Performance Expectancy	Function of videos	C: "The video shows no content, no content in those categories."
	Future potential	C: "I think it will be useful. Like for first time parents. If the app is [ready to be] recommended."
	General usefulness	E: "I am happy with the app because it helps us it... also teaches us a lot of things. So, I am very happy with this app."
Effort Expectancy	Easiness of getting app	D: "That is the only problem. To get in on our phones. I think sometimes our phones are old."
	Easiness of navigation	G: "I think you can, you can find what you're looking for."
Social Influence	Recommending to other parents	C: "I have a question. So can we, like, recommend the app to other parents as well?"
	Recommending to family	G: "So, I wanna give also to my mom, she helped me with, so can she use the same password?"
Facilitating Condition	Using the app without support	G: "Yeah, I'd be able to do it on my own."
Hedonic Motivation	How the app looks	C: "I like the way it looks."
	Smoothness	C: "And it was smooth."
Habit	Essentiality	G: "Yeah, we all use it essentially. Because we all need the app."
Frequency	Current usage	D: "For me, I use it twice a week."
Behavioural Intention	Intention to use in the future	F: "Yeah, yes. I will use it."

**Table 2:** Results from thematic analysis of caregiver interview

- Performance Expectancy

The caregivers reported that videos do not display correctly on the mobile Android application. Despite this, they claimed they are delighted with the app and find it very useful. They expressed that they are satisfied with the app now but will be even happier once it works fully.

- Effort Expectancy

The caregivers had difficulty downloading the mobile Android application but could login easily. The caregivers found the app easy to use and navigate. However, they did mention that finding specific videos or articles is confusing.

- Social Influence

The caregivers were very eager about recommending the application to their family and other parents.

- Facilitating Conditions

The caregivers expressed having all the necessary resources and skills to use the application. They felt that they would be able to use the application in the future



without outside help. However, they also expressed a lack of confidence with technology.

- Hedonic Motivation

The caregivers said that they like the way the app looks. They also felt that it is a smooth user experience.

- Habit

The caregivers reported that the app feels essential, especially for first time parents.

- Frequency

Most of the caregivers had not used the application before the day of the interview, but for the two who had, one reported using the application once every two weeks. The other said they use it twice a week.

- Behavioural Intention

All the caregivers expressed that they intend to continue using the application in the future.

- Caregiver Suggestions

Similarly, to the staff, caregivers also suggested new features or alterations for the application. These include:

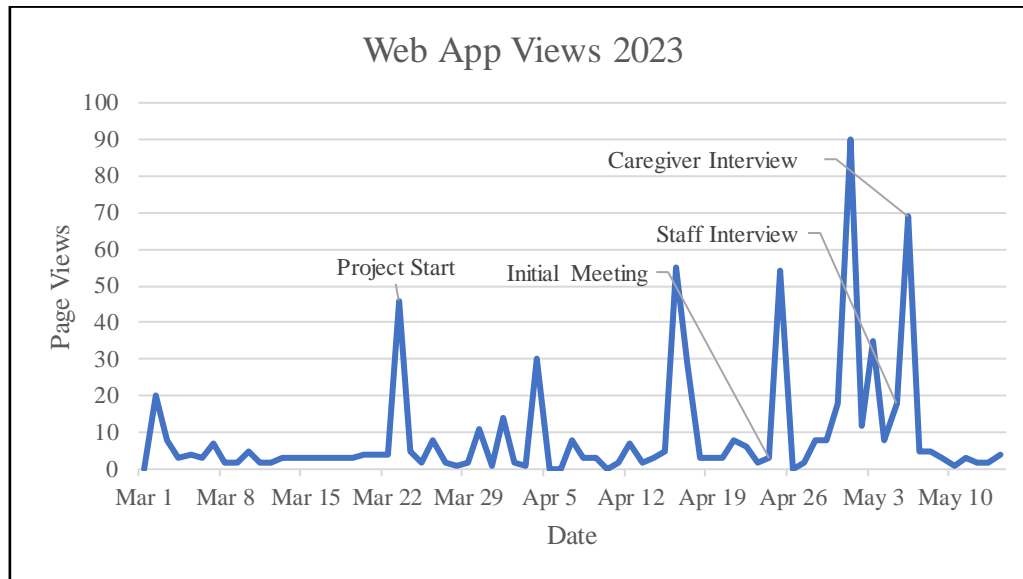
- Support for more languages: the caregivers wanted the app to be accessible for their relatives who do not speak English, Afrikaans, or Xhosa. They specifically asked for Shona to be added to the application.
- Move the search button to the home page: the caregivers had trouble locating the search button.
- Change the application's logo to the Bhabhisana logo: the caregivers wanted the mobile Android app to have the same logo as the Bhabhisana Baby Project on their home screens to make it easier to locate in their apps.
- Add resources for mental health: the caregivers wanted more content on mental health that was specifically relevant to them.
- Add personal stories of hope and testimonials: the caregivers wanted more content from other parents and family members.
- Add resources for health workers: the caregivers wanted videos explaining concepts to health workers that they could show when accompanying their children in health settings.

#### 4.2. Application Statistics

For the period between March 1<sup>st</sup>, 2023, and May 14<sup>th</sup>, 2023, the author collected quantitative data from the web and mobile Android applications to evaluate their current usage.

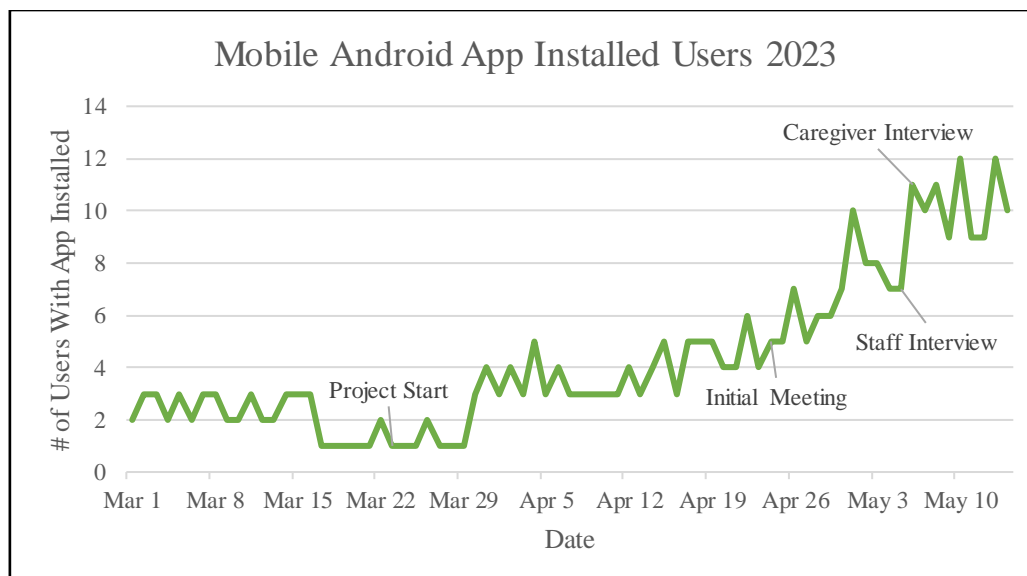
#### 4.2.1. Findings

For the web application, page views were used to estimate usage. Page views refer to the number of times any page on the website was viewed. Displayed below in Figure 10 are the views across the period of evaluation.



**Figure 10:** Page views of the web application from March 1<sup>st</sup>, 2023, to May 14<sup>th</sup>, 2023

For the mobile Android application, installed users were used to estimate usage. Installed users refer to the number of users who currently have the application installed on at least one active mobile Android device. Displayed below in Figure 11 is the number of installed users across the evaluation period.



**Figure 11:** Installed users of the mobile Android application from March 1<sup>st</sup>, 2023, to May 14<sup>th</sup>, 2023

#### 4.2.2. Analysis

The project supervisor, Melissa Densmore, sent an email introducing the current team of students working on the "You and Your Baby" platform to the staff at the Bhabhisana Baby Project on March 23<sup>rd</sup>. At this time, the "official" start of the study, the page views on the web application experienced a spike, with an increase of 800%. However, the mobile Android application downloads remained unaffected. The increase in page views is most likely caused by the staff accessing the web portal in preparation for the study. No gain would have been measured as they already had the mobile Android application downloaded. Before this meeting, the number of page views was low, less than 10, except for a smaller spike to 20 at the start of March.

The initial meeting with the staff at the Bhabhisana Baby Project occurred on April 24<sup>th</sup>. A steady increase in downloads is observable between the introductory email and this meeting. This observation aligns with reports from the staff interview, in which they said they had been telling more caregivers in the program about the application. Additionally, there were several days with spikes in web application usage — one to approximately 30, 45, and 55. This fact may have similar causes, with caregivers and staff both using it more in before the caregiver interview.

The staff and caregiver interviews happened a day within each other, on May 5<sup>th</sup> and 6<sup>th</sup>. Around these dates, the most significant spike in page views during the study period was observed: 90 views. In the days following, mobile Android app downloads were also at record heights. It is too soon to see if the number of users with the application downloaded will continue to grow. However, the page views have already fallen to pre-study levels, hovering between 0 and 5.

## 5. Discussion

### 5.1. Application Usage

Usage is estimated from staff and caregiver accounts, web application page views, and mobile Android application downloads. However, these data points only form an approximation of use. More direct measurements could include measuring logins across time, specific articles and videos accessed, the number of users opening the mobile Android app, etc. (Vest & Jaspersen, 2010). These were unable to be collected due to privacy concerns and the limited timeframe of the project.

The interviews and the application statistics confirm that the staff and the caregivers at the Bhabhisana Baby Project are currently using the web portal, the web application, and the mobile Android application. However, before the start of the study, usage was infrequent for both parties. It increased due to the researchers' involvement, with staff reporting increased web portal access from every few weeks to every few days. Even with this increase, the staff felt that their application usage is minimal and not well integrated into their daily workflow. Use of the application by caregivers was even lower, with only two to four users having the mobile Android app downloaded at the start of the study. Most of the parents interviewed had not used the platform before the day of the workshop. Usage in the days before and after the workshop was high but has since sharply decreased. The data confirms the low use of the "You and Your Baby" platform in the Bhabhisana Baby Project organization.

## 5.2. Motivations for Engagement and Acceptance

The staff interview provided vital insight into the motivations behind staff engagement with the "You and Your Baby" platform. Due to the long and ongoing relationship between the University of Cape Town and the staff members of the Bhabhisana Baby Project, their responses in the interview can be trusted as authentic (Denner et al., 2019). Staff members at the Bhabhisana Baby Project emphasized multiple times that the platform has great potential to be helpful, and that they are very excited by that potential, but that as of right now it is not being used effectively. This is due to a combination of factors including an arduous uploading process for resources, the staff members' lack of confidence in their skills with using technology, and a fear that the application will need to be more user-friendly for parents at the organization. The staff reported finding the platform time-consuming, inefficient, and challenging to learn. They like how the app looks, but the experience of using it requires immense focus which can be unpleasant. So, while the staff members use the platform occasionally, it has yet to be entirely accepted and integrated into their work. They said they intend to continue using the application in the future, but if it remains the same, they will not use it in any significant capacity.

Evaluating motivations behind engagement and acceptance of the application for the sample of caregivers interviewed is complicated, as their current usage of the application is either non-existent or minimal. Instead, what was assessed was their initial or returning reaction to the platform. The mobile Android application does not currently display video correctly, which is the format for information that the caregivers prefer. Despite this, in the interview, the caregivers emphasized how happy they were with the application and how useful they found it. They reported finding the application useful, easy, pleasant to use, and essential to helping them care for their children. They also seemed confident in their ability to use the application from home and that they would receive assistance from the staff at Bhabhisana if they had any issues. The caregivers were especially eager to know if they could share the application with their friends and family.

Much of their praise can be attributed to the concept of the platform and the content stored on it rather than the reality of the mobile Android application. This observation aligns with the theme of future potential that the staff discussed repeatedly. Additionally, the responses from the caregivers may not have been fully authentic: they may have just been saying what they thought the team wanted to hear (Denner et al., 2019). The fact that the caregivers mainly gave positive feedback to an application that is currently only semi-functioning adds credibility to that theory. These optimistic responses would have impacted most themes, except for effort expectancy and social influence. For effort expectancy, the caregivers' usage of the application was observed, and they were all perceivably able to navigate and use the application easily. The results for social influence can also be treated as trustworthy because of the eagerness of the caregivers to recommend the platform to others. For many, it was the first question they asked during the interview. The participants would only have asked if they could share the platform with their friends and family if they sincerely wanted to do so. However, their evaluation of the current iteration of the application as useful and their professed intention to continue using it is less reliable.

Both groups, the staff and the caregivers, expressed that they would continue to use the application in the future. However, the staff members control usage regardless of the

caregivers' intention to continue using the platform. They assign videos and articles on the platform to individual parents. If the staff members do not use the platform, neither will the caregivers. Consequently, as the staff members are generally dissatisfied with the platform due to the reasons already discussed, they are unlikely to add new caregivers to the application or assign new content to existing users (Venkatesh et al., 2012). For the caregivers already on the application, their usage will be limited by the lack of functioning on the mobile Android application, the version of the platform that the caregivers have most access to. Overall, future application usage is likely to remain low in its current version with its present flaws.

### 5.3. Future Development

As the need for further development on the "You and Your Baby" platform has been demonstrated, the author has developed a list of suggestions based on the user interviews. Each recommendation is assigned a severity rating describing how severe of a usability issue the suggestion deals with (cosmetic, minor, major, catastrophic) and a priority rating for implementation (low, medium, or high). These are listed below in Table 3.

<b>Suggestion</b>	<b>Justification</b>	<b>Severity Rating</b>	<b>Priority Rating</b>
Fix video display on mobile Android application	Caregivers should be able to access and view videos on the mobile Android application	Catastrophic	High
Simplify web portal	Staff should be able to navigate and upload content to the web portal quickly and easily	Major	High
Improve content searchability	Staff and caregivers should be able to search for videos and articles by key terms and concepts rather than just the resource's exact name	Major	Medium
Relocate or emphasize search button	Staff and caregivers should be able to easily locate the search button	Minor	Medium
Add support for more languages	Caregivers should be able to access the app in more languages than English, Afrikaans, and Xhosa (specifically text, section names, etc.)	Minor	Medium
Alert users to new content	Caregivers should know when new content has been assigned to them or uploaded to the platform	Minor	Medium

Change section name "ECD" to "First 1000 Days"	Staff wanted the section name "ECD" to be changed to "First 1000 Days" because many parents do not know that ECD stands for early childhood development	Cosmetic	Medium
Change mobile Android app logo on home screen	Staff and caregivers wanted the logo of the app on their home screen to be the Bhabhisana Baby Project's logo to make the app easier to find	Cosmetic	Low
Replace icons with images of real babies	Staff wanted the app to have more images of actual babies	Cosmetic	Low

**Table 3:** Suggestions for future development

### 5.3.1. Beyond the Platform

During the staff interview, the staff members stressed the need for more content on the application. They mentioned the difficulty of finding videos and articles online that are appropriate and relevant to the parents they work with. Future app designers can remedy usability issues, but a lack of available resources is an issue that goes beyond the platform's design.

The staff members came up with a solution: encouraging and supporting the caregivers at Bhabhisana to make their own videos. The staff members emphasized that the parents have an abundance of stories and knowledge spread out among them that could be essential if collected and disseminated. During the caregiver interview, the caregivers discussed this possibility eagerly and agreed with its immense potential. More than half the time in the session was devoted to sharing personal experiences and reflecting on how they wished that they would have been able to hear from someone else at the time who had gone through the same thing. Many confidently proclaimed that they would personally be willing and able to make a video.

Specifically, caregivers wanted to see and make videos on mental health for parents of children born with developmental issues and stories of hope and encouragement. They also wanted the app to have videos with explanations meant for health workers, which the parents could have available in medical contexts.

### 5.4. Limitations

There were several limitations to this study, the biggest being the short timeframe of the project. With more time, more precise usage data could have been collected, rather than the approximations with page views and mobile Android app downloads. Additionally, more interviews could have been conducted to gather more information on the caregivers' perceptions of the platform. More interviews would have increased the sample size of participants. Additionally, if several sessions were held with the same group of people, trust could have been built between the caregivers and the researchers, resolving the issue with potential inauthenticity in responses.

## 6. Conclusions and Future Work

This project had three primary goals concerning the "You and Your Baby" platform. First, evaluating current platform usage by the Bhabhisana Baby Project; second, understanding the motivations behind user engagement and acceptance of the platform; and third, developing suggestions for future development. To do this, the author collected usage data from the web and mobile Android applications and conducted interviews with platform users. They found that the Bhabhisana Baby Project's platform usage is minimal. Additionally, the staff are generally dissatisfied with the current iteration of the application, but the caregivers claim to be happy with it. Both user groups are very excited about the platform's potential once it is polished and fully functioning. Several changes would improve user acceptance of the platform, but the most pressing are fixing the video display issue and simplifying the web portal.

This project is ongoing, with a group of honours computer students at the University of Cape Town (Rinya Singh, Lwazi Sibeko, and Tariro Banganayi) iterating on the platform's design. Future work could evaluate the changes they make to the platform once they have concluded their work. Additionally, the platform could be extended to other communities and organizations working in early childhood development. This work has also already begun, with new iterations being implemented in different locations in South Africa.

With further development, this platform can fundamentally change the work that the Bhabhisana Baby Project does. By allowing caregivers to access educational resources on early childhood development from home, parents will be equipped with the knowledge and skills to care for their children better. The parents that Bhabhisana works with are from resource-constrained communities, and have experienced isolation, stigma, and intense stress. The content on this platform could provide more than just learning resources, but also hope and community for this group.

## 7. Acknowledgements

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4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.

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## Appendix A: Staff Interview Questions

<b>Question</b>	<b>UTAUT2 Construct</b>
Which decade were you born in?	Age
What is your gender?	Gender
For how many months have you been using the platform?	Experience
How often do you use your phone? What do you use your phone for?	Experience
How often do you use a computer? What do you use a computer for?	Experience
Do you feel comfortable using technology?	Experience
How frequently do you use the platform? In a single session, how long do you use it for?	Usage
Do you feel that your time using the platform is used efficiently?	Performance Expectancy
Is the platform effective at helping you achieve things that are important to you?	Performance Expectancy
If the platform worked perfectly and easily, would it be useful for your work?	Performance Expectancy
How intuitive is the platform for you?	Effort Expectancy
Could you walk us through the steps you take while using the platform?	Effort Expectancy
Do the people who are important to you approve of the platform?	Social Influence
Do you feel like you have the necessary knowledge and resources to use the platform?	Facilitating Conditions
How does the platform feel to use?	Hedonic Motivation
How do you feel when you use the platform?	Hedonic Motivation
Are you in the habit of using the platform?	Habit
How essential is the platform to your work?	Habit
Do you feel inclined to use the platform in the future?	Behavioural Intention
Generally, what do you like about the platform? What do you dislike?	N/A
What changes would need to be made for you to use the platform more?	N/A

## Appendix B: Caregiver Interview Questions

<b>Question</b>	<b>UTAUT2 Construct</b>
Which decade were you born in?	Age
What is your gender?	Gender
Have you used the platform before today?	Experience
If you've used the platform before today, for how many months have you been using it?	Experience
If you've used the platform before today, how frequently do you use it?	Usage
If you've used the platform before today, in a single session, how long do you use it for?	Usage
If you've used the platform before today, are you in the habit of using the platform?	Habit
If you've used the platform before today, how essential is the platform to you?	Habit
How often do you use your phone and what do you use it for?	Experience
If you have access to a computer, how often do you use it? What do you use it for?	Experience
Do you feel that your time using the platform is used efficiently?	Performance Expectancy
Is the platform effective at helping you achieve things that are important to you?	Performance Expectancy
If the platform worked perfectly and easily, would it be useful for you?	Performance Expectancy
How intuitive is the platform for you?	Effort Expectancy
In the future, do you think you'll be able to use the platform on your own without any help?	Effort Expectancy
Do you think the platform is easy to use?	Effort Expectancy
Do the people who are important to you approve of the platform? If they don't know about it, do you think they would?	Social Influence
Do you feel like you have the necessary knowledge and resources to use the platform?	Facilitating Conditions
How does the platform feel to use?	Hedonic Motivation
How do you feel when you use the platform?	Hedonic Motivation
Is there any content you would come back to look at?	Behavioural Intention
Do you feel inclined to use the platform in the future?	Behavioural Intention
Generally, what do you like about the platform? What do you dislike?	N/A
What changes would need to be made for you to use the platform more?	N/A