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MASTER THESIS

FACTORS EXPLAINING USAGE INTENTION AND USE OF DIET AND EXERCISE MOBILE APPLICATIONS IN GHANA

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Exploring Factors Explaining Usage Intention And Use Of Diet And Exercise Mobile

Applications In Ghana

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Abstract

Background: A remarkable increase in the number of Diet and Exercise Mobile Applications app stores in the face of rapid increase in sedentary lifestyles and chronic illness in Ghana raises the question about how these apps are being accepted and used. ***Objective:*** To examine usage intention and actual use of Diet and Exercise Mobile Applications among Ghanaians with the integration of the Unified Theory of Acceptance and Use Technology (UTAUT) and Protection Motivation Theory (PMT). ***Method:*** Respondents were recruited via social media and SMS throughout Accra and filled out an online questionnaire in a cross-sectional study. The 23-item questionnaire measured UTAUT-PMT constructs with Usage Intention and Actual Use. Descriptive Statistics, Correlation and Regression models were performed on SPSSv25. ***Results:*** 156 respondents [M (age) = 26.58, 93% male) replied to the survey. Performance Expectancy, Perceived Vulnerability and Perceived Severity had unique explanatory values on Usage Intention (all $p<0.1$). Facilitating Conditions and Usage Intention had unique explanatory values on Actual Use (all $p<0.1$). ***Conclusion:*** The integration of the UTAUT-PMT models resulted in a significant contribution from Performance Expectancy, Perceived Vulnerability and Perceived Severity in explaining Usage Intention (46% explained variance) while Facilitating Conditions and Usage Intention explain Actual Use (34% explained variance).

Keywords: Diet and Exercise, UTAUT, PMT, mobile apps, Usage Intention , Actual Use

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I LOVE YOU DAA!

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LIST OF ABBREVIATIONS

UTAUT: Unified Theory of Acceptance and Use of Technology

DE Apps: Diet and Exercise Mobile Applications

UI: Usage Intention

PMT: Protection motivation theory

PE: Performance expectancy

EE: Effort expectancy

SI: Social influence

FC: Facilitating Conditions

PV: Perceived vulnerability

PS: Perceived severity

SE: Self-Efficacy

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Introduction

The increase in sedentary lifestyle has resulted in an alarming rise in chronic conditions (Milani & Franklin, 2017; Hamine et al., 2015). According to the World Health Report (2002), by 2020 75% of people are projected to die of and 43% being burdened by chronic conditions globally. In Ghana, unhealthy diets and lack of exercise has been linked to a plethora of hypertension, strokes and obesity cases especially in the urban centres (Sanuade, Boatemaa & Kushitor, 2018; Ofori-Asenso, et al., 2016). The growing numbers in chronic conditions stemming from unhealthy lifestyles puts more pressure on the already burdened healthcare system. The World Health Organization recommends the ideal doctor-to-patient ratio to be 1:1000 worldwide but that of Ghana's is 1:8481 (Ministry of Health, 2017), thus the healthcare system does not possess sufficient resources to manage these preventable health conditions. Considering this, a push for self-management is vital for health promotion. This means that, individuals need to take an active role in engaging in and maintaining healthy lifestyles (healthy eating and regular exercises).

The emergence of smartphones has made Mobile health (mHealth) based interventions more effective in health promotion and health behaviour changes (Carter et al, 2013). The technology of smartphones has made it possible for mobile applications (apps) to help individuals monitor and improve eating habits and physical activity (Wohlers, et al, 2009). Wang, Egelandsdal, et al. (2016) conducted a study on the effectiveness of diet and physical activity apps. They revealed that use of such apps is associated with significant changes in the way people eat healthily and engage in physical activities. This is also however evident in the upsurge of health apps that are currently in App Stores (Krebs & Duncan, 2015; McKay et al., 2018). A search

for current Diet and/or Exercise Mobile Applications (DE Apps) available in the app stores yielded thousands of results (SimilarWeb Stats, 2019). According to the Consumer Health Information Corporation (CHIC) survey conducted in Chicago, USA out of 395 people who download health apps 26% use these apps only once and those who stick to them lose interest at around 10 uses. Considering the increase in chronic conditions in Ghana, the increase in smartphone use and increase in the number of available diet and exercise apps in the mobile app stores, questions about the actual use or intensions to use these apps among Ghanaians is necessary.

In finding answers to Usage Intentions and Actual Use of DE Apps in Ghana, the technology acceptance model, Unified Theory of Acceptance and Use of Technology (UTAUT) an extension with the Protection Motivation Theory provides an insight into probable justifications. No known studies have been conducted explicitly on the usage intention and use of DE Apps in Ghana. This study focuses on understanding the factors that explain usage intention and actual use of DE Apps, thus involving both current users and nonusers of such apps.

Explaining Factors Used In The Study

Unified Theory Of Acceptance And Use Of Technology (UTAUT)

Development of new technologies in health and research on changing attitudes or perceptions of humans have contributed to the evolution of a number of theoretical models that explain and assess the usage intention and use behaviour of these technologies. The UTAUT developed by Venkatesh et al. (2003) combines eight (8) of these models into a single framework to explain technology use and acceptance. These integrated framework is said to be capable of explaining about 50% of Actual Use and 70% of Usage Intention while Technology Acceptance Model (TAM), which is the next popular model in this domain explains about 40% of Usage Intention

(Venkatesh et al., 2003). The UTAUT model posits that there are four (4) key constructs that influence acceptance of technology. These constructs Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions have an impact on Usage Intention. On the other hand, Facilitating Conditions coupled with Usage Intention are said to explain Actual Use. Furthermore, the original UTAUT model posit that the relationship between the constructs and Usage Intention are moderated by the variables; gender, age, experience and voluntariness of use. For this study the moderating variables are gender, age and education.

Protection Motivation Theory (PMT)

The Protection Motivation Theory developed by Rogers (1975) stemmed from the Health Belief Model (HBM). The theory asserts that a set of processes (threat appraisal and coping appraisal processes) explains the relationship between a person's cognitive processes during threatening situations and behavioural intention. The Threat appraisal process consists of Perceived Vulnerability (PV), which is a person's feeling of judgment that his/her health is being threatened and Perceived Severity (PS), is a person's assessment of perceived health risks that determines the possibility that he/she will adopt or not adopt a new technology. Coping appraisal refers to how a person responds to a threatening situation by evaluating their ability to cope and prevent potential harm and its constructs are, Response Efficacy, Self-Efficacy and Response Cost. Both UTAUT and PMT measure Usage Intention and Behaviour or Use, thus some of their constructs tend to interlock. Woon & Tan, 2005 mention that Response Efficacy and Effort Expectancy both measure ease of use and Response Cost is associated with Facilitating Conditions. Therefore, this study will adopt the two threat appraisals, Perceived Vulnerability and Perceived Severity and then Self-Efficacy.

Table 1. Operational Definitions of independent variables in the study

Construct	Author	Operationalization for study
Performance Expectancy (PE) refers to the "degree to which using a technology will provide benefits to consumers in performing certain activities"	Venkatesh et al., 2012	In this context, it refers to the belief that using DE Apps will help him/her to achieve the goal of losing weight or living a healthier lifestyle
Effort Expectancy (EE) refers to the "degree of ease associated with consumers' use of technology"	" "	In relation to the study, this construct explains how easy or difficult a person considers the use of DE Apps to be
Social Influence (SI) refers to the "extent to which consumers perceive that important others (e.g., family and friends) believe they should use a particular technology"	" "	For the study, social influence assesses the level of social involvement that motivates the intention to use or continue using a DE App.
Facilitating Conditions (FC) refers to the "consumers' perceptions of the resources and support available to perform a behavior"	" "	In this study, the construct evaluates the individual's perception that DE Apps always provides the necessary tools to aid in proper dieting and exercising. Thus conditions such as poor Internet connections, low knowledge of smartphone use, (Yaqub et al., 2013) and the like may hinder the adoption of DEAs

Perceived Severity (PS) measures the weight of the consequences a person will suffer if the threat prevails	Rogers, 1983, Milne et al. 2000	Consequences such as developing a chronic illness or facing a disability are considered in this context. Based on the concept of this construct, a person will act to reduce the level of consequences when the consequences become unbearable. In that sense, people are expected to resort to the use of apps when they have to check their diets and be active when they experience serious conditions.
Perceived Vulnerability (PV) refers to a person's evaluation that his/her own health is being threatened	Rogers, 1983	Hence one may assess that living an unhealthy lifestyle (diet and exercise) will make him/her prone to a disease or adverse condition. Studies on PMT and technology adoption have identified that individuals who exhibit high levels of PV may show a heightened intention to adopt a technology. The study intends to investigate whether usage intention will increase if people are at high risk of health consequences.
Self-Efficacy on the premise of self-confidence, in the sense that, if a person believes that they can do a particular activity, they are more likely to perform this	Bandura,1977, 1978, Rogers, 1983	The study intends to know if there is a possibility that possessing the confidence or ability to diet and exercise can explain Usage Intention and Actual Use of DE Apps.

activity than if they think their efforts will be futile.		

Integration of UTAUT and PMT in The Study

The PMT allows for UTAUT model to assess health behaviour through the use technology. There are just a handful of studies that have used the UTAUT model with extension of PMT. However, those studies that have verify that the combination of the models yields favourable results in regards to health behavior.

In a study by Hsieh et al. (2015) on personal health records, they found that both UTAUT and PMT had good predictive values of behavioural intention with performance expectancy and self-efficacy. Studies on mHealth adoption have supported the integration of PMT with UTAUT. Sun et al. (2013) formulated and empirically validated a unified model based on UTAUT-PMT, and found that perceived vulnerability and severity have direct effects on adoption intention. Supporting this assertion, a study by Gao et al., 2015 mentions that perceived vulnerability and perceived severity do positively influence the adoption of wearable technology among individuals.

As at the time of writing this research no known study on health or psychology in Ghana has conducted research on the integration of these two models. Thus this study will be a significant contribution to the theoretical knowledge in health technology in Ghana.

Moderation Effects

This refers to variables that may indirectly affect the relationship between the main independent variables in the study (constructs of UTAUT and PMT) and Usage Intention. For the study, Gender, Age and Education are moderating variables of this relationship.

Gender and Age

According to Venkatesh et al. (2003), gender and age have effects on PE, EE, SI, PV, PS and only age influences FC.

According to Morris and Venkatesh (2000) men are likely to have higher PE since they are more task-oriented, i.e. they are more likely to exert more effort to complete a task no matter the difficulty as compared to women. Wang, et al. (2009) also posit that young people are extrinsically motivated and thus if the technology yields good results they will engage more with it. Based on the premise of men being more task-oriented, women have higher effort expectancy because they will adopt and use a technology if it requires less effort to operate it and also when the technology is easy to use older people are more likely to use it (Wang, et al., 2009).

Concerning Social Influence, women are more likely to be influenced by social norms than men (Morris & Venkatesh, 2000) and older people are more likely to rely on social support when they have less experience with the technology. Older people tend to put emphasis on the resources available to use a new technology thus if the environment is not favourable they may feel reluctant unlike younger generations who are more advanced in technology use (Chung, Park & Wang, 2010).

When it comes to Perceived Vulnerability and Severity, Women are more inclined to pay attention to health threats as they are more vulnerable and are more likely to seek help and take preventive measures (Rhudy & Williams, 2005). Aging comes with deterioration in general health this means that older people are more vulnerable to health risks and thus will be more inclined to take measures to eliminate or control the risks (Chung, Park & Wang, 2010).

Education

Although education is not included as one of the four moderators in the UTAUT model, it is has been a dominant moderator in studies on technology

acceptance in health and other fields (van Dijk et al., 2008, Kijsanayotin, 2009). These studies suggest that people with high levels education are more likely to explore and understand more information that these technologies convey. In a study on e-commerce buyers and non-buyers by Sanchez-Torres et al. (2017) education was seen to have a positive influence on SI, EE, and FC. With SI, when knowledge is acquired by users they share their experience with the app among each other. When it comes to its moderation effects on EE, people with a higher level of education are more inclined to have the technical knowledge or know-how needed to use the app, which then makes the use of the app less of a hassle. This also satisfies some conditions the user needs to operate the app (FC). They however mention that education level has a negative relationship with PE, because users with good education may engage in the apps at an advanced level leading to an experienced use, which may become boring or fall below the users needs thus affecting use.

Usage Intention and Actual Use

The study has two outcome or dependent variables and these are Usage Intention and Actual Use. The Usage Intention phase (also referred to as Behavioural Intention or Intention to Use), which precedes Actual Use (also known as Use), is where people explore, scout out and decide on what new technology suits their specific needs before commencing use (Bouwman et al., 2005).

Research Questions

1. To what extent does UTAUT-PMT constructs explain Usage Intention of DE Apps among Ghanaians?

2. Can PMT constructs improve upon the explanatory value of the UTAUT model?

3. Do age, gender and education of Ghanaians moderate the effects of UTAUT-PMT constructs on Usage Intention of DE Apps?

4. To what extent do Usage Intention and Facilitating Conditions explain Actual

Use of DE Apps?

Below is a model adopted for the current study.
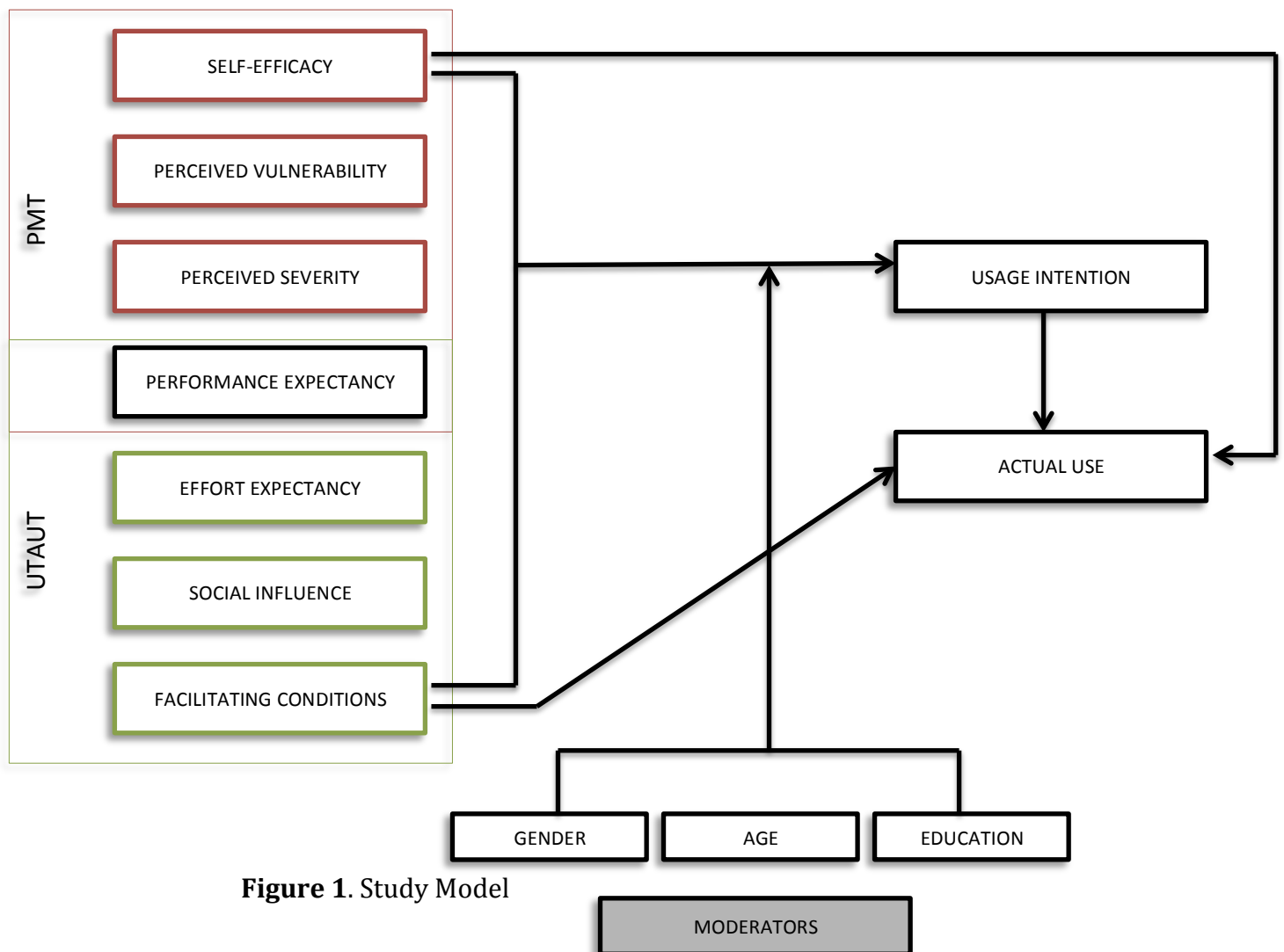
Figure 1. Study Model

METHODS

A cross-sectional survey method was adopted to measure and explain Usage Intention and Actual Use of DE Apps in the Ghanaian context (Campbell, Machin, Walters et al, 2007). The online survey was conducted on the Qualtrics Survey Software, a web-based software used for creating surveys.

Participants (Respondents)

The sample used for the current study was residents of the urban city of Accra. Accra is one the three largest cities in Ghana (others are Sekondi-Takoradi and Kumasi) with great amounts of internal migrants, that is migration of ethnicities within the country, making Accra a multi-ethnic city with people from diverse social backgrounds. The city is also increasing in the prevalence of obesity and sedentary lifestyle(). The target population is therefore ideal for the study. Concerning the inclusion criteria, a typical respondent was Ghanaian (by birth or naturalization) lived in Accra, owned a smartphone, had at least completed basic school education and had to be 16 years or above although the average age of a Ghanaian with basic school education is 15 years (Ghana Demographic and Health Survey 2008), a respondent had to be 16 years or above for ethical reasons.

A total of 195 responses were collected, after eliminating responses with incomplete responses and those that did not meet the inclusion criteria, data of 156 respondents were valid for analysis. These consisted of 93 males (59.6%) and 63 females (40.4%). The age range was between 17 and 45 (M= 26.58, SD= 6.33). The results also showed that the majority of the sample had attained a high level of education with the greater number of people having a Bachelor's/First degree, 48.7% and the lowest level was Primary school/ Junior high school certificate with only 1.3%.

Questionnaire

The design of questionnaire used in the study is described as follows. The questionnaire begun, with an introduction section which consisted of a welcome message, purpose of study, contact information of the researcher and a participation agreement or informed consent (see **appendix 1**).

The UTAUT construct items (Performance Expectancy, Effort Expectancy, Social Influence, Facilitating Conditions, Usage Intention) were adapted from the Consumer Acceptance study by Venkatesh et al. (2003), Consumer and Apolinario-Hagen et al. (2018)'s study on the intention of use of Multiple Sclerosis Mobile Applications. The PMT constructs, Perceived Vulnerability and Severity, were adopted from Guo et al. (2015)'s study on mHealth Acceptance and Johnston et al. (2010)'s study on participant's risk perception about their health and weight loss. The researcher developed the Diet and Exercise Self-Efficacy item, specifically for the study. Thus the study model had a total of seven (7) independent variables and two (2) dependent variables. All items under these variables or constructs were measured using a five (5) point Likert scale, ranging from "Strongly Disagree" (coded as 1) to "Strongly Agree" (coded as 5) for UTAUT-PMT (Threat appraisals) constructs and "Very Difficult" to "Very Easy" for Self-Efficacy with the exception of Actual Use, which was a dichotomous dependent variable.

In summarizing constructs items/questions into subscales, composite scores were calculated for all constructs. These scores were unit-weighted, that is, items/questions under each construct was equally weighted by calculating the mean or average of the items.

UTAUT Constructs

Performance Expectancy consisted of 3 items ($\alpha= 0.855$) and measured the people's perception of the benefits and usefulness of using the apps, examples of statements asked included *"I find DE Apps useful for living a healthier life or for my weight loss"* and *"Using DE Apps could be fun and make me happy"*.

Effort Expectancy measured the ease of use with which an individual can operate DE Apps and consisted of 3 items ($\alpha= 0.763$) with statements such as "I believe that using DE Apps would always be easy".

Social Influence had 3 items ($\alpha= 0.897$) measuring expected support and edging people may receive with the use of such apps, an example was "Generally, I have had social support (from family, friends, experts or others) in the use of DE Apps".

Facilitating Conditions consisted of 3 items ($\alpha= 0.811$) that measured possible external factors that hinder or urge the person to actually use the app and consisted of statements like, *"I have the necessary resources (eg. access to good internet connection, strong battery power, facilities to eat and exercise well, etc) to be able to use DE Apps"* and *"I have the required technical know-how to use DE Apps"*.

PMT Constructs

Perceived Vulnerability had 2 items ($\alpha= 0.919$) and an example of statements here was *"I am at a risk of being unhealthy or gaining too much weight"* and ***Perceived Severity*** with 3 items ($\alpha= 0.877$) had statements such as *"If I become unhealthy or gain too much weight, it would be a severe problem"*.

Self-Efficacy consisted of only one item asking about the level of difficulty attributed to generally living a healthy life or losing weight.

Usage Intention measured intention but did so at gradual levels, that is, intention to search for, download, use and continue the use of DE Apps and consisted of 5 items (α= 0.936).

Actual Use *as* mentioned above was a dichotomous or categorical variable consisting of Current users of DE Apps (coded as 1) and Non-users (coded as 0). This was measured by asking the question *"Have you ever used a Diet and/or Exercise Mobile Application?"*

Demographics

Nationality and Residence asked the questions, "*Are you currently a holder of (or eligible to hold) a Ghanaian Passport/National ID?"* and "*Are you a current residence of Accra?"* both of which required "Yes" or "No" response.

Age was measured in years and was initially an open-ended question, thus a string variable in SPSS. It was recoded into in an ordinal scale with age ranges "16-25" (coded as 0), "26-35" (coded as 1) and "36-55" (coded as 2).

Gender was represented with 0 and 1 dummy variables where 0 was Male and 1, Female.

Education was nominal scale ranging from the lowest educational level, Primary school or Junior high school certificate (coded as 1) to the highest level, Graduate studies (coded as 5).

Rate, Frequency and Intensity of DE App Use, consisted of 4 items. Rate included number of apps used, choosing from a provided list of popular apps (with open text for other options)(see **appendix 1**). Frequency enquired about how often the app was opened and how often it was used and Intensity was measured in minutes spent on the app.

Comments, the last section was mainly an open-ended question which sought to allow respondents provide their perceptions on using DE Apps and also some challenges or benefits they have experienced with such apps (see **appendix 2** for summary of comments).

The adapted instrument went through a series of assessments for face/ content validity before its administration. First, the questionnaire was examined by four (4) colleagues who have BSc and MSc degrees in Psychology, Statistics and Human Resource to identify problems with the wording and framing of the questionnaire items in relation to the Ghanaian context. After, the survey was also reviewed for content validity, clarity and semantic consistency by 2 academic experts-supervisors before administering a brief pre-test.
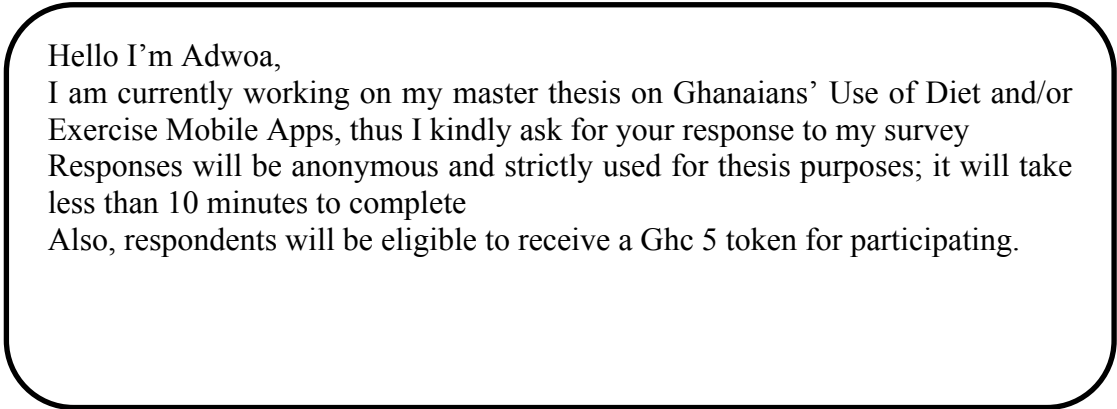
Pretest

The pretest consisted of 10 respondents. The respondents were mainly people within the researcher's circle of friends (and friends of friends). The pretest was conducted on the Qualtrics Survey Software and the purpose of this was mainly to find out if the items were readable and understood by the average Ghanaian. To find answers to this, an addition of open-ended questions on the level of understanding and concerns were asked at the end of the actual survey. An example of such questions is "Are there any questions in particular that proved difficult for you? If yes, Please state the question number(s) and your reason(s) below". Feedback from the pretest was mostly positive, except for the complaint of the survey being too long. This was not however a severe concern because the length of the survey was affected by the extra questions, which were only there for the pretest and were thus omitted in the actual administration. Also the progress bar was added to the questionnaire to enable respondents track their progress.

Data collection and Procedure

Before the survey was administered the researcher gained ethical approval from the Ethics Committee of University of Twente. Data collection commenced from in the first week of July 2019 to early September 2019. Participants were recruited via Bulk messaging, which is the dissemination of large amounts of SMS to mobile phone units, done by NPONTU Technologies Ghana as well as via social media sites (WhatsApp and Facebook). Invitations sent through these mediums contained an anonymous link to Qualtrics and a brief message about the study and imploring people to respond to the survey (see figure 2). The message also advertised a chance to be selected to win a token (cash prize of GHc 5, approximately 1 euro) as compensation for participating in the study and also to attract more participants. Once the respondents were on the survey page, they were required to give informed consent by answering, "Yes" or "No" to a participation agreement before answering the survey questions.

Figure 2. Message attached to survey's anonymous link

Hello I'm Adwoa,
I am currently working on my master thesis on Ghanaians' Use of Diet and/or Exercise Mobile Apps, thus I kindly ask for your response to my survey
Responses will be anonymous and strictly used for thesis purposes; it will take less than 10 minutes to complete
Also, respondents will be eligible to receive a Ghc 5 token for participating.

Data Analysis

The researcher performed data analysis in order to gain an understanding of and interpret the data collected. The 195 responses collected from the Qualtrics survey platform were exported to SPSS (version 25). Before the analysis, the data was

cleaned and the variables properly coded in the software as established in the questionnaire section. After the cleaning procedure, a total of 156 responses were used for the analysis and 39 responses were rejected. Rejected responses included (1) 21 incomplete responses, consisted of responses that had only demographics entered and those that had no or less than 3 subscales (constructs) answered and (2) 19 responses not meeting the inclusion criteria.

Some missing values were still recognized in the derived data and they made up 3.6% of the whole data and according to Little's test the values were missing completely at random (Taylor & Little, 2012). Because the percentage of missing values were below the rule of thumb of 5% and missing completely at random, no imputations were done for missing values, however they were excluded pairwise in the analysis. The data was screened for outliers, normality and multicollinearity during correlation and regression analysis. No violations of these were found in the data (Cortina, 1993).

The researcher performed reliability analysis, descriptive statistical analysis (mean, standard deviation, range), frequencies, and inferential statistical analysis (correlation and regression).

Reliability analysis was performed to make sure that the results are always consistent and thus the questionnaire is free of random error. As a general rule of thumb, a Cronbach's α lying between 0.7 and 0.8 is considered to be good internal consistency and Cronbach's α above 0.8, are considered excellent internal consistencies (Peterson, 2013, Cronbach, 1951).

For the analysis of Usage Intention all UTAUT-PMT constructs and moderators, Gender Age, Education are tested for correlation while for Actual Use, Facilitating Conditions, Usage Intention and Self-efficacy are included in the separate

correlation model. Pearson's Correlation analysis, Hierarchical regression analysis and Logistic regression analysis was conducted to find relationship effects between the independent variables and the dependent variables of the study (Toothaker, Aiken and West, 1994, Chan, 2003).

Moderation analysis of Gender, Age, and Education on the relationship of UTAUT-PMT and Usage Intention was performed with PROCESS (Hayes, 2013). Additionally, for the moderation effects, Bonferroni's correction was applied to correct for family-wise/ Type 1 errors that are associated with multiple testing (Bonferroni, 1936)

RESULTS

Summary Statistics of UTAUT-PMT Constructs

Results from the descriptive statistics and reliability analysis of the variables are displayed in Table 2. The mean results indicate that responses were within the "Neither Agree or Disagree=3" and "Agree=4" points. It is seen that most people "Agree" with Perceived Severity, Performance Expectancy, Facilitating Conditions and Usage Intention and standard deviations of these constructs indicate more consistent scores as opposed to Social Influence, Self-Efficacy and Perceived Vulnerability, which were below a mean of 4 and had quite dispersed scores (SD = 1.05, 0.97 and 1.22 respectively). All constructs used in the study had a Cronbach's alpha above 0.70, indicating good to excellent internal consistency of the questionnaire (Peterson, 2013, Cronbach, 1951, Cortina, 1993).

Table 2. Mean, Standard deviation, range of scales and reliability scores for all UTAUT-PMT variables (N=156)

Constructs	Range of Scales	M	SD	Number of Items	Cronbalch's α

Self-Efficacy	1-5	2.84	0.97	1	-
Perceived Vulnerability	1-5	3.27	1.22	2	0.919
Perceived Severity	1-5	4.21	0.79	3	0.877
Performance Expectancy	1-5	4.06	0.76	3	0.855
Effort Expectancy	1-5	3.75	0.80	3	0.763
Social Influence	1-5	3.19	1.05	3	0.897
Facilitating Conditions	1-5	3.54	0.88	3	0.811
Usage Intention	1-5	3.99	0.84	5	0.936

Note. M= Mean, SD=Standard Deviation

Demographic Characteristics of Respondents

Table 3 shows the frequency and percentage statistics of the 156 respondents reported in the study. Males were slightly more than the females and the sample was averagely youthful, with more than half of the sample falling below 25 years and highly educated, that is having a training college diploma (similar to the Dutch HBO diploma) or higher. 71.2% of the sample reported not using a DE App at the time of the data collection as compared to the Actual Users (28.8%)

Table 3. Frequency and Descriptives of Demographic Characteristics (N= 156)

Measure	Items	Frequency	Percent (%)	M	SD
Gender	Male	93	59.6	1.40	0.49
	Female	63	40.4		
Age	16-25	81	51.9	26.58	6.33
	26- 35	58	37.2		
	36- 55	17	10.9		
Education	Primary school or Junior high school certificate	2	1.3	3.31	1.01
	Senior high school or Vocational training certificate	46	29.5		
	Training College	21	13.4		
	Bachelor's/First degree	76	48.7		
	Graduate studies (Masters, PhD)	11	7.1		
Actual Use	Users	45	28.8	2.89	0.45

Non-Users	111	71.2

Note. M= Mean, SD=Standard Deviation

Exploring Factors Explaining Usage Intention- Correlation and Regression Analysis

Table 4 displays the correlation results of the study. Usage Intention had a strong positive correlation with Performance Expectancy (r= 0.61), a moderate positive correlation with Perceived Severity (r= 0.36), Effort Expectancy (r= 0.43) and Social Influence (r= 0.42) and weak positive correlation with Perceived Vulnerability (r= 0.23). The correlation effects between Usage Intention and Self –Efficacy was insignificant (r= 0.13).

Table 4. Pearson's Product-Moment Correlation of UTAUT-PMT constructs with Usage Intention (N= 156)

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Gender	-										
2	Education	0.09	-									
3	Age	0.02	0.27**	-								
4	Self-Efficacy	-0.16*	0.04	0.11	-							
5	Perceived Vulnerability	0.36**	0.08	-0.04	-0.36**	-						
6	Perceived Severity	0.24**	-0.04	0.02	-0.03	0.37**	-					
7	Performance Expectancy	-0.02	0.09	0.11	0.19*	0.09	0.24**	-				
8	Effort Expectancy	-0.05	0.01	-0.04	0.25**	0.07	0.16*	0.61**	-			
9	Social Influence	-0.01	0.09	-0.07	0.14	0.24**	0.17*	0.51**	0.65**	-		
10	Facilitating Conditions	-0.06	0.11	-0.07	0.19*	0.14	0.13	0.51**	0.59**	0.61**	-	
11	Usage Intention	0.01	0.03	0.12	0.13	**0.23**	**0.36**	**0.61**	**0.43**	**0.42**	**0.31**	-

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 5 below showcases a 3-step hierarchical linear regression analysis of rUsage Intention. A regression with a forced entry was used to measure the significance of the relationship between the UTAUT-PMT constructs and Usage Intention (Cohen et al, 2013).

In the first step, the interacting (moderating) variables, Gender, Age and Education were entered into the first block. The model summary for this analysis showed that the control variables were not significant, $F_{(3,152)}= 0.75$, $p = 0.53$ and account for 1% of explained variance in Usage Intention.

The second step consisted of entering the UTAUT variables, Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions in the next block. Inferring from the model summary of the results, this step was significant $F_{(7,148)}= 14.29$, $p<0.00$ and the ΔR^2 shows an explained variance of 39% in Usage Intention.

The last step had the PMT variables Perceived Vulnerability, Perceived Severity and Self-Efficacy and the model summary was found to be $F_{(10,145)}= 12.39$, $p= 0.002$ with 6% explained variance. Thus, the total overall explained variance of the regression was 46%. The variables with significant explanatory value were Performance Expectancy ($\beta= 0.48$, $t=5.83$, $p<0.00$), Perceived Severity ($\beta = 0.08$, $t= 2.72$, $p=0.01$) and Perceived Vulnerability ($\beta= 0.13$, $t= 1.85$, $p= 0.07$). Social Influence ($\beta =0.14$, $t=1.59$, $p= 0.11$), Effort Expectancy ($\beta= 0.05$, $t= 0.55$, $p= 0.58$) and Facilitating Conditions ($\beta= -0.11$, $t= -1.26$, $p= 0.21$) were shown to have no significant explanatory relationships with Usage Intention.

Table 5. Three-Step Hierarchical Regression of UTAUT-PMT with Usage Intention (N= 156)

Step	Variables	β	t	p	R^2	ΔR^2
1	**(Constant)**		12.05	0.00	0.014	0.014
	Gender	.012	0.15	0.88		
	Age	0.12	1.43	0.15		
	Education	0.00	-0.00	0.99		
2	**(Constant)**		2.93	0.00	0.403	0.389
	Gender	0.03	0.46	0.65		
	Age	0.09	1.28	0.20		
	Education	-0.05	-0.79	0.43		
	Performance Expectancy	0.53	6.22	0.00		
	Effort Expectancy	0.05	0.52	0.60		

		β	t	p		
	Social Influence	0.19	2.11	0.04		
	Facilitating Conditions	-0.09	-1.05	0.29		
3	**(Constant)**		0.82	0.41	**0.461***	0.057
	Gender	-0.06	-0.85	0.39		
	Age	0.08	1.20	0.23		
	Education	-0.04	-0.62	0.54		
	Performance Expectancy	0.48	5.83	**0.00**		
	Effort Expectancy	0.05	0.55	0.58		
	Social Influence	0.14	1.59	0.11		
	Facilitating Conditions	-0.11	-1.26	0.21		
	Perceived Vulnerability	0.14	1.85	**0.07**		
	Perceived Severity	0.19	2.72	**0.01**		
	Self-Efficacy	0.08	1.09	0.28		

Notes. β=standardized regression co-efficient, t=t-test co-efficient, $p \leq 0.1$.
Total explained variance in **bold*,** Significant constructs in **bold**

Exploring Factors Explaining Actual Use- Correlation and Regression

The study conducted correlation analysis to determine a possible relationship between Usage Intention, Facilitating Conditions, Self-Efficacy and Actual Use. Table 6 displays the correlation results of the analysis. Actual Use had a moderate positive correlation with Usage Intention (r= 0.35) and Facilitating Conditions (r= 0.35) and weak positive correlation with Self-Efficacy (r= 0.19).

Table 6. Pearson's Product-Moment Correlation of Usage Intention, Facilitating Conditions and Self-Efficacy constructs with Actual Use (N= 156)

	Variable	1	2	3	4
1	Usage Intention	-			
2	Facilitating Conditions	0.31**	-		
3	Self-Efficacy	0.13	0.19*	-	
4	Actual Use	**0.35****	**0.35****	**0.19***	-

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

A binary logistic regression was performed to determine the effects of Usage Intention and Facilitating Conditions on the likelihood that respondents use DE Apps.

Overall, the regression model was statistically significant, X^2 (2) = 42.750, p<0.1, implying that odds of actual use was related to Usage Intention, Facilitating Conditions and Self-Efficacy. The model explained 34% (Nagelkerke R^2) of the

variance in Actual Use, using the. Also, it was able to correctly classify 76.3% for all cases. A summary of the binary logistic regression coefficients, Wald statistics, odds ratios [(Exp (B)] along with a 90% CI is presented in the table. Inferring from Table 7, it is seen that Usage Intention and Facilitating Conditions have unique explanatory values (p <0.1) on Actual Use. Thus as Usage Intention and Facilitating Conditions of DE Apps increases by one unit each, the likelihood that the app is used increases by 3.95 times (295%) and 3.07 times (207%) respectively. Self-Efficacy on the other hand, was found to be a non-significant variable (p= 0.31) when explaining Actual Use.

Table 7. Binary Logistic Regression of Usage Intention, Facilitating Conditions and Self-Efficacy with Actual Use (N= 156)

Variable	B	SE B	Wald X^2	df	p	OR	90% CI OR	
							Lower	Upper
Constant	-11.49	2.19	27.44	1	0.000	0.00		
Facilitating Conditions	1.12	0.32	12.69	1	**0.000**	3.07	1.83	5.16
Usage Intention	1.37	0.39	12.50	1	**0.000**	3.95	2.09	7.49
Self-Efficacy	0.22	0.21	1.04	1	0.31	1.24	0.87	1.77

Notes. OR= Odds Ratio, CI= Confidence Interval, p≤0.1

Moderation Effects of Gender Age and Education on the UTAUT-PMT and Usage Intention Relationship

The moderation analysis was measured separately for each UTAUT-PMT construct under Gender, Age and Education, thus results of 18 moderation models were derived. The independent and moderating variables were automatically centralized for each moderation model in PROCESS.

Out of the 18 models only 4 were found to have some moderating effects. These were moderation models of Gender-Perceived Vulnerability, Age-Performance Expectancy, Age-Effort Expectancy and Age-Effort Expectancy. (see Table 8 below)

However after Bonferroni correction, p'= 0.1/18 = 0.006, the interaction terms were no longer significant.

Table 8. Significant Results of Moderation Effects

Moderator	Variable		Interaction summary			Model Summary		
			B	t	p	F	P	R^2
Gender	PV	int	0.21	1.69	**0.09**	4.07	0.0082	0.07
		1	0.11	1.64	0.10			
		2	0.33	3.08	0.00			
Age	PE	int	-0.62	-2.57	**0.09**	20.41	0.00	0.41
		1	0.72	6.95	0.00			
		2	0.75	7.06	0.00			
		3	0.09	0.43	0.67			
	EE	Int	-0.48	-2.35	**0.02**	9.28	0.00	0.24
		1	0.55	4.96	0.00	9.28	0.00	0.24
		2	0.48	4.35	0.00			
		3	-0.02	-0.11	0.91			

Note. Int=interaction term (moderation), B=standardized coefficient, F= F-change , R^2
Significant interaction term (p) in **bold**, p'=0.006

DISCUSSION OF FINDINGS

The aim of this study was to explore the factors that explain Usage Intention and Actual Use of Diet and Exercise Mobile Apps in Ghana. The study addressed the following research questions:

- *To what extent does UTAUT-PMT constructs explain Usage Intention of DE Apps among Ghanaians?*

- *Can PMT constructs improve upon the explanatory value of the UTAUT model?*

- *To what extent do Usage Intention and Facilitating Conditions explain Actual Use of DE Apps?*

- *Do age, gender and education of Ghanaians moderate the effects of UTAUT-PMT constructs on Usage Intention of DE Apps?*

This discussion and interpretation of findings is organized around the research questions.

Inferring from the descriptives, the means of constructs with the exception of Self-efficacy were found to range between 3, Neither Agree or Disagree and 4, Agree, leaning more to Agree. Although no inferences can be made from descriptive scores, it can be said that generally people are more likely to consider using a DE App.

To what extent does UTAUT-PMT constructs explain Usage Intention of DE Apps among Ghanaians?

The results of this study were parsimonious to that of Venkatesh (2003). Only one out of the four UTAUT constructs, Performance Expectancy, was significant and the explained variance (46%) in this study was quite lower than Venkatesh's 70%. The change in moderators (Gender, Age, Experience and Voluntariness of use) used in Venkatesh's original model could be a reason for the low explained variance (Thomas, 2013). This is reasoned because the addition of Gender, Age and Education in the first step/block of the regression model explained only 1% of the variance on Usage Intention. Also, Performance Expectancy was the only significant construct derived from the whole UTAUT model, while all four constructs in the original model resulted in the 70% variance explained.

The significant UTAUT-PMT constructs that explained Usage Intention were Performance Expectancy, Perceived Vulnerability and Perceived Severity.

The significance of Performance Expectancy confirms the descriptive results found in the study. It suggests a possibility that Ghanaians will use a DE App if the app can help him or her in attaining a healthier lifestyle or weight loss, thus if the app proves it utilitarian value. This is following previous studies (Haque et al., 2018, Venkatesh et al., 2003). It implies that people place a strong emphasis on the app's usefulness and benefits of aiding in healthy living to decide on its use. It is recommended that the apps should be culturally relevant and relatable in addition to having good health app features. For instance, a good diet app for Ghanaians should have options for healthy Ghanaian meals or even having ingredients that are readily available in the market, which makes it more useful for them.

Perceived Vulnerability and Severity is also a significant factor explaining Usage Intention. This implies that people who feel vulnerable in the face of increased risk to health problems and serious weight gain are more likely to engage in preventive or control behavior such as the use of a DE App to work on their health (Guo et al. 2015, Plotnikoff & Higginbotham, 1998). Considering that Perceived Vulnerability and Severity is threat-driven, features of and advertisement for DE Apps or any health app in Ghana should play on this notion to attract users.

Can PMT constructs improve upon the explanatory value of the UTAUT model?

Protection Motivation Theory constructs, Perceived Vulnerability and Perceived Severity satisfied the presumptions gathered from previous research (Woon & Tan, 2005, Gao et al., 2015, Sun et al. 2013) as having significant explanatory relationship with Usage Intention. Self-Efficacy, on the other hand did not have any significant effects on Usage Intention or Actual Use in this study. Although PMT added only 6% percent of variance, it increased the overall variance if the model. Also the significant explanatory values of Perceived Vulnerability and Severity explain the

cognitive processes that may influence the usage intention of a technology that UTAUT could not have an answer to. (Chenoweth et al,2007, Woon & Tan, 2005)

To what extent do Usage Intention and Facilitating Conditions explain Actual Use of DE Apps?

Usage Intention and Facilitating Conditions, significantly explained Actual Use. This agrees with previous studies that suggest that favourable conditions like free wifi, gyms coupled with intention to use an app may have strong unique explanatory value on acceptance and Actual Use (San Martin and Herrero, 2012; Venkatesh et al., 2003, Ali et al., 2016).

The results further suggest that Self-Efficacy did not significantly explain a person's intention to use a Diet and Exercise App. Self-efficacy was represented by one item, and the mean of the subscale was just above 3 indicating that Ghanaians may not have the all the necessary motivation to use DE Apps. This may be the reason for the insignificant value.

Do age, gender and education of Ghanaians moderate the effects of UTAUT-PMT constructs on Usage Intention of DE Apps?

Unfortunately no moderation effects were found in the study after the Bonferroni correction. However the results before correction suggested that Gender moderated Perceived Vulnerability and Usage Intention while Age moderates Performance Expectancy- Usage Intention and Effort Expectancy-Usage intention relationships. Performance Expectancy and Effort Expectancy is moderated by Age. For Performance Expectancy and Age, these findings are supported by some studies (Taiwo & Downe, 2013, Venkatesh, 2003, 2012). Moderation of Gender on Perceived Vulnerability and Usage Intention posited that an increase in the level of vulnerability, results in an increase in Usage intention in females than in males

Intentions. Effects of Age on Performance Expectancy was in support with a previous study mentioned earlier on Wang, et al. (2009), they assert that the youthful populations (below 25 years) are more motivated to use technologies whose benefits are readily seen or experienced as compared to the older people.

The findings on Effort Expectancy and Age moderation relationship were contrary to some study findings on moderating effects of age (Venkatesh et al, 2003, Morris, Venkatesh & Ackerman, 2005). They indicate that older people are more salient to Effort Expectancy, that is, if the app demands fewer struggles to operate, older people are more likely to patronize the app. However, this study revealed an unexpected finding where the younger populations have the strongest intention as compared to the older people to use the app when effort expectancy is high.

STRENGHTS, LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

There are characteristics of this study that are considered advantageous. Assessing Usage Intention and Actual Use of Diet and Exercise Apps does not only require the understanding of technology acceptance. The integration of the UTAUT and PMT model gives a more extensive and interdisciplinary perspective on understanding intentions and use of a health app unlike the traditional UTAUT model.

The survey of the study yielded very good reliability scores. Alpha values were within the ranges of 0.7 and 0.9, implying that the survey is free from random error. Also strength, is that the study protecting the findings from family-wise errors/type 1 errors that may have resulted from multiple testing in the moderation analysis.

The study is not without fault; limitations recognized in the study are discussed below.

Some issues with the study sample were recognized. A quantitative, cross-sectional survey was conducted for the study, where self-report bias and inability to measure continued use of apps is prognostic (Moorman & Podsakoff, 1992, Yu & Tse, 2012). This may not yield the real intentions that people have towards the use of DE Apps thus longitudinal research would be effective to measure Usage Intention and see how people move on to engage in use. Also, the addition of a qualitative method such as interviews with focus groups, that is, mixed methods, may yield an in-depth understanding of this topic.

Another limitation was related to the data collection method. It is typical and practical that a study on mobile apps should recruit participants through online surveys. However, online surveys are not always patronized, this made data collection quite difficult. A review by Lupu & Michelitch, (2018) posited that about 85% of studies in developing countries adopt a face-to-face survey method, followed by phone calls then online surveys. It is therefore advised that future studies endeavor to perform paper or face-to-face surveys or employ many of the reputable data collection agencies in Ghana who have "foot-soldiers" who actively approach individuals in target communities with electronic tablets to get their responses.

Last but not least, a limitation associated with the study is multiple testing in moderation analysis. Although this challenge was controlled with Bonferroni correction, the data analysis procedure used for moderation was not ideal for the study. However, the current study is considered to be relatively preliminary and future researchers are encouraged to acknowledge other methods such as Structural Equation Modeling or Partial least Squares that limit the models to be tested for moderation.

Despite the above-mentioned limitations, the study model is meaningful and the findings of the study may serve as a useful guide for app developers, health promoters and further research on acceptance or use of DE Apps in Ghana.

IMPLICATIONS AND CONCLUSION

Implications

There are some implications derived from this study, which are theoretical. The integration of the UTAUT-PMT models in this study has produced relevant results. Although not all the constructs were proven to have significant explanatory value with Usage Intention or Actual Use, Performance Expectancy and Perceived Vulnerability and Severity offer a substantial explanation that complement one another as health technology (Chenoweth et al,2007, Woon & Tan, 2005). For instance based on these 3 significant constructs a DE App with sensors can warn a user for sitting down too long (vulnerability), the app shares possible scenarios that can deteriorate health by sitting down to long (severity) and then the proceeds to give exercise that can be done to help the user (performance expectancy).

Also the findings of this study contribute to the health technology acceptance literature in the Ghanaian context and may serve as a source of reference to other researchers who would venture into a similar study.

Conclusions

Diet and Exercise Apps helps in this fight for good health and long life, by acting as self-management tools, which are easy to use and cost-effective in a developing country like Ghana. It is, therefore, fulfilling that this study can contribute to future research and interventions in this regard.

After the analysis and interpretation of the findings in this research, Performance Expectancy, Perceived Severity and Perceived Vulnerability explain about 46% of variance in Usage Intention and in turn Usage Intention and Facilitating Conditions explain 34% of variance in Actual Use. No moderation effects of Gender, Age, and education was found and the integration of the UTAUT-PMT models was all in all a significant model but future studies should focus on the limitations presented so as to build a more comprehensive model with relevant variables and effective analysis procedures.

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APPENDICES

Appendix 1

DIET AND/OR EXERCISE MOBILE APPLICATIONS SURVEY

Thank you very much for participating in this survey about the use of Diet and/or Exercise Mobile Applications.

The survey is a part of my master thesis to determine the factors that explain why an individual either starts using or continue the use of Diet and/or Exercise Mobile Applications in Ghana. Your responses and opinions on this survey will shed light on such influencing factors for Diet and/or Exercise Mobile Applications use and provide mobile app developers, health institutions and researchers both in Ghana and abroad with essential knowledge to develop evidence based applications that promote healthy living and/or weight loss specifically for the Ghanaian market.

It will take approximately 10 minutes to complete this survey. Your participation in this study is entirely voluntary and you can withdraw at any time. Answers you give will remain confidential to the best of my ability and will exclusively be used for statistical purposes of this thesis.

In case of questions, comments and any other remarks, please do not hesitate to contact me, Adwoa at: deappssurvey@yahoo.com

☐ Yes

☐ No

ABOUT YOU

Please answer the following demographics questions as it applies to you.

1. Are you currently a holder of (or eligible to hold) a Ghanaian Passport/National ID?

    ☐ Yes

    ☐ No

2. Are you a current residence of Accra?

    ☐ Yes

    ☐ No

3. What gender do you identify with?

    ☐ Female

    ☐ Male

    ☐ Other, please specify

4. What is your current age?

5. What is the highest educational qualification you have achieved?

    ☐ Primary school or Junior high school certificate

    ☐ Senior high school or Vocational training certificate

    ☐ Training College

    ☐ Bachelor's/First degree

    ☐ Graduate studies (Masters, PhD)

☐ Other, please specify

[ ]

YOUR USE OF DIET AND/OR EXERCISE MOBILE APPS

A mobile application, most commonly referred to as a mobile app, is a type of application software designed to run on a mobile device, such as a smartphone or tablet.

Therefore Diet and/or Exercise Mobile Application is a type of mobile app, which helps individuals to either adopt healthy eating habits or engage in physical activities or a combination of both behaviours.

6. Based on the definition stated above, have you ever downloaded a Diet and/or Exercise Mobile Application on your device(s)? (Check all that apply)

   ☐ Yes I have downloaded a Diet App

   ☐ Yes I have downloaded an Exercise App

   ☐ Yes I have downloaded a Diet and Exercise App

   ☐ No I have not downloaded any Diet and/or Exercise App

7. Have you ever used a Diet and/or Exercise Mobile Application?

   ☐ Yes, I am currently using a Diet and/or Exercise Mobile Application

   ☐ No, I have never used a Diet and/or Exercise Mobile Application

   ☐ I have previously used a Diet and/or Exercise Mobile Application

Note: The term Diet and/or Exercise Mobile Applications will from hereof be referred to as DE Apps.

Please skip questions -, if you have never used a DE Apps.

8. How many DE Apps do you currently use? (Please state a number below)

   [ ]

9. Which of the following DE Apps do you use on your device? (Check all that apply)

☐ 8fit Workouts & Meal Planner

☐ BetterMe: Weight Loss Workouts

☐ BetterMen: Workout Trainer

☐ MyFitnessPal

☐ Female Fitness Women Workout

☐ Noom

☐ Lose It! - Calorie Counter

☐ Carb Manager - Keto & Low Carb Diet Tracker

☐ Fitness Workout by GetFit

☐ Lifesum: Diet & Macro Tracker

☐ GetFit: Calorie Counter & Diet

☐ Fitonomy: Weight Loss Exercise

☐ Freeletics - Workout & Fitness

☐ Sweat: Kayla Itsines Fitness

☐ Runtastic Jog & Running App

☐ BetterMe: Yoga for Weightloss

Others, please specify

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10. In the last 3 months how often have you used a DE App?

☐ Never

☐ Rarely

☐ Sometimes

☐ Often

☐ Very Often

11. On average, how frequently do you open the DE App you use most often?

☐ Less than once a month

☐ A few times a month

☐ A few times each week

☐ About 1 time each day

☐ 2 or more times a day

12. On average, how many minutes do you spend using DE Apps you use most often?

☐ 1-10 minutes

☐ 11-30 minutes

☐ More than 30 minutes

FACTORS INFLUENCING YOUR INTENTIONS TO USE DIET AND/OR EXERCISE MOBILE APPS

On a scale from "strongly agree" to "strongly disagree", please rate the following statements. In case you have not yet used a DE Apps, please rate according to your current expectations.

	#	Items	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Performance Expectancy	14.	I find DE Apps useful for living a healthier life or for my weight loss					
	15.	Using DE Apps will increase my chances of being more healthy and/or losing weight					

	16.	Using DE Apps could be fun and make me happy					
Effort Expectancy	17.	I believe that using DE Apps would always be easy					
	18.	I believe that my interaction with DE Apps will be clear and understandable					
	19.	I could easily integrate the use of DE Apps into my everyday life					
Social Influence	20.	People who are important to me (loved ones: family, friends) think that I should use DE Apps					
	21.	People who influence me (non-relatives: experts, doctors, health/fitness coaches etc.) think that I should use DE Apps					

	22.	Generally, I have had social support (from family, friends, experts or others) in the use of DE Apps					
Facilitating Conditions	23.	I have the necessary resources (eg. access to good internet connection, strong battery power, facilities to eat and exercise well, etc) to be able to use DE Apps					
	24.	I have the required technical know-how to use DE Apps					
	25.	If I had problems using DE Apps, I would know where to get help.					
Perceived Vulnerability	26.	I am at a risk of being unhealthy or gaining too					

		much weight					
	27.	It is likely that I will be unhealthy or gain too much weight					
Perceived Severity	28.	If I become unhealthy or gain too much weight, it would be a severe problem					
	29.	If I become unhealthy or gain too much weight, it would be a serious issue					
	30.	If I become unhealthy or gain too much weight, it would be of a major concern to me					
Usage Intention DE Apps	31.	I intend to search for (more) suitable DE Apps in the future					
	32.	I intend to download (or download more)					

		DE Apps in the future					
	33.	I intend to use (or continue using) DE Apps in the future					
	34.	I will always make an effort to use DE Apps					
	35.	I plan to use DE Apps frequently					

36. Considering that the main health goal you are pursuing (intend to pursue in the future) when using DE Apps is being able to eat healthier and/or exercise efficiently, **how difficult do you think achieving this health goal is/would be for you?**

☐ Very difficult

☐ Difficult

☐ Neutral

☐ Easy

☐ Very Easy

37. If you have any remarks/comments/suggestions, please state them below

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You can get in touch with me through the email address deappssurvey@yahoo.com, if you have any concerns/remarks and if you would want to be informed about the results of this study you can send a request for this as well through the email address above.

THANK YOU!

Appendix 2

1. COMMENTS

Respondents raised concerns and made remarks pertaining to the use or nature of DE Apps in Ghana. The main themes in the comments are divided into concerns and benefits and these are presented below

7. 1. Concerns

This theme refers to issues that hinder the use of these apps and may be looked at for the improvement in the field of health app development

1. Respondents commented that the apps should be made affordable or free for use

   - "I'd suggest that more of such apps should be made free"
   - "Although their subscriptions are outrageously priced, they offer beneficial health content"
   - "More of the apps should be free in the playstore"

2. There was concern about localizing the diet apps by having apps that had healthy Ghanaian meals as options

   - "I need diet app with local dishes"
   - "The meals in the apps are foreign, I can't always find the things needed to make the healthy foods and vegetables are expensive"
   - "This is a good initiative but a Ghanaian diet app will be very effective"

3. There was reports on the repetitive nature of apps, which makes it boring to use

   - "Using DE is sometimes fun and helping though, but sometimes find it boring to do it alone. We enjoy company from keepfit clubs and gym centres exercise"

4. Others mention that the app is not always needed when they exercise due to convenience

   - "I stopped using my app because I ran when I can so I don't need it evertime"
   - "My opinion is Apps are very helpful for staying healthy but you have to use them along with going to the gym"

5. Another concern is that the apps are advertised as easy to use but are not applicable to real life issues
   - "The apps seems to be good but less effective in reality"
   - "The apps in Ghana aren't relatable."
   - "Workout and health apps are good however its not easy following the routine everyday."

6. Others mention that you need external influence outside the persuasive nature of the apps to indulge in its use
   - "It will be a very good app but one must be principled to be able to use it"

7. Concerns were raised on the absence or lack of needed utilities like internet access for using the apps
   - "Using DE app is good but where there's no internet to download and do other related things, then it becomes quite worrying."

8. Also, respondents mention making the apps very easy use, thus creating a friendly user interface
   - "update on the app to make learning more easier"

7. 2. Benefits

This theme refers to the positive perspectives people had about using DE Apps.

1. Respondents say the apps are vital tools in healthy living"
   - "Using exercise apps is very effective in maintaining good health
   - "is good to exercise well to maintain good health and DE will help me gain it"
   - "Using exercise apps is very effective in maintaining good health"

2. Some mention the apps aid in weight loss
   - "Exercise apps are very important for tracking weight"
   - "I am a very big fan of Diet and exercise apps, they have helped me lose weight in the past years"
   - "The lose weight app helped me a lot, I just recently stopped using it"

3. The apps makes exercising interesting

"Personally I am a runner and using apps helps to know how much I run and keeps me interested"