Investigating Arab DHH Usage of YouTube Videos Using Latent Variables in an Acceptance Technology Model

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Abstract. YouTube is one of the more powerful tools for self-learning and entertaining globally. Uploading and sharing on YouTube have increased recently as these are possible via a simple click. Moreover, some countries, including Saudi Arabia, use this technology more than others. While there are many Saudi channels and videos for all age groups, there are limited channels for people with disabilities such as Deaf and Hard of Hearing people (DHH). The utilization of YouTube among DHH people has not reached its full potential. To investigate this phenomenon, we conducted an empirical research study to uncover factors influencing DHH people's motivations, perceptions and adoption of YouTube, based on the Technology Acceptance Model (TAM). The results showed that DHH people pinpoint some useful functions in YouTube, such as the captions in English and the translation in Arabic. However, Arab DHH people are not sufficiently motivated to watch YouTube due to the fact that the YouTube time-span is fast and DHH personnel prefer greater time to allow them to read and understand the contents. Hence, DHH people tend to avoid sharing YouTube videos among their contacts.

Keywords: Social media · Acceptance technology model · YouTube · Deaf and hard of hearing people

1 Introduction

The Internet and its advanced technologies facilitate searching for various knowledge areas in very a short time and this allows self-learning or e-learning through online services and technologies [1]. One of the technologies that facilitate self-learning is YouTube. YouTube is a video-sharing website and application where the users can search, upload, share and view many types of videos, including educational videos, entertainment videos and Vlog videos [1, 2]. YouTube was launched in 2005 and purchased by Google in 2006. Since this time, YouTube has become one of the most powerful Internet technologies and has acquired millions of videos [2]. According to 2015 Arab social media report [3], in Saudi Arabia 6% of total users preference is YouTube, 40% are current subscribers to YouTube, and 70% access it on daily basis. In addition, the Ministry of Communications and Information Technology's website in

G. Meiselwitz (Ed.): SCSM 2017, Part I, LNCS 10282, pp. 3–12, 2017.
DOI: 10.1007/978-3-319-58559-8_1

Saudi Arabia specify that, seven million Saudis watched YouTube clips at a rate of 105,900 h daily in 2016 [4].

Moreover, one of the benefits of YouTube that makes it stand out from other technologies is that the audiences are not only non-disabled people but also people with special needs, especially deaf and hard of hearing (DHH) people. DHH people not only share videos that contain sign language but also, they can understand other videos through captions, which provide textual versions of the dialog or voices. In Saudi Arabia, there are approximately 1.5 million people with disabilities, which comprise 7% of the population [5]. The number of disabled people is expected to increase in the future as 50% of the cases were caused by marriages between relatives [6].

Arab DHH people, especially in Saudi Arabia, there is still an ambiguity in the acceptance of YouTube. Therefore, it is necessary to conduct research that intensively investigates factors influencing YouTube acceptance in self-learning for Arab DHH people. In addition, there is a need to determine the relationship between DHH people's YouTube use and personal factors such as YouTube perceived usefulness (PU), YouTube perceived ease of use (PEOU), attitude toward YouTube (AT), and behavioral intention (BI).

In this study, we focus on understanding the antecedents of YouTube usage as self-learning for Arab DHH people In Saudi Arabia, and assess how the factors of interest interact with each other using the Technology Acceptance Model (TAM). TAM is a well-known theoretical model that helps in explaining and predicting user behavior of information technology [7].

This study is structured as follows: The research problem is stated in the next section, followed by a presentation of the objectives of the study. Next, the study hypotheses are presented related to the latent variables of acceptance of the technology model. Subsequently, related studies are presented in the literature review section. Next, the methodology of the study is established and specified which consists of: the study setting, data collection instruments, design of the study process, and data analysis procedures. Then, the findings of this study are summarized and a meaningful analysis based on DHH people's comments, as well as on regression models, is provided. Finally, conclusion is provided.

2 Research Problem

YouTube was launched in 2011 in Saudi Arabia [2] and some DHH users have embraced the technology while others have not. DHH people have experienced low motivation toward the use and adoption of this technology in their self-learning. This investigation is about understanding reasons for the lower rate of YouTube usage in self-learning for DHH people. The level of acceptance and the causes of resistance must be identified to provide insights to encourage awareness of YouTube as a self-learning technology. Based on previous studies [7, 8] motivation was generally determined by PEOU and PU [8]. Although similar attempts have been made in previous research, to the best of our knowledge, there are no studies that have examined the specific factors simultaneously, as external variables influencing YouTube

acceptance as postulated in TAM. We hope this study will provide additional insights into PEOU, PU, AT and BI relationships and their role in YouTube usage.

3 Research Objectives

In this study, we use the TAM model to determine the variables, which most significantly affect the acceptance of YouTube among DHH people. Thus, the objective is to analyze the relationship of DHH people with YouTube usage while offering some videos that could be classified as educational. The selected constructs are perceived usefulness, perceived ease of use, user attitude, and behavioral intention. In Table 1, shows variables in this study, we then indicate the number of items (questions) used to measure each variable along with its theoretical support, and last we provide references from previous studies.

Table 1. Variables of TAM Model

Variables	Definition	Previous studies
Perceived ease of use (PEOU)	Measures the degree to which a person believes YouTube usage will be free of effort	[7, 8]
Perceived usefulness (PU)	Measures the degree to which a person believes YouTube usage will enhance job performance	[7, 8]
Attitude toward (AT)	Measures DHH people's attitude toward YouTube	[7, 8]
Behavioral intention (BI)	Measures DHH people's behavior to using and sharing YouTube links in the future	[7, 8]

4 Research Hypotheses

The purpose of our study is to investigate DHH people's acceptance of YouTube videos using the following variables: perceived usefulness, perceived ease of use, user attitude and behavioral intention. We asked several questions to find out the variables that have an impact on DHH acceptance of YouTube videos as learning media. Then, we have derived the following hypotheses (see Fig. 1):

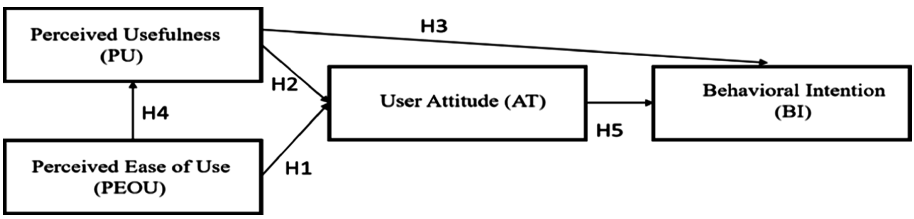

Fig. 1. Technology Acceptance Model of YouTube

Perceived Ease of Use (PEOU)
H1: Perceived ease of use (PEOU) will positively influence DHH people's attitude towards YouTube.

Perceived Usefulness (PU)
H2: Perceived Usefulness (PU) will positively influence DHH people's attitude towards YouTube.

H3: Perceived Usefulness (PU) will positively influence DHH people's behavioral intention to use YouTube.

Perceived Ease of Use (PEOU) and Perceived Usefulness (PU)
H4: Perceived Ease of Use (PEOU) will positively influence Perceived Usefulness (PU) of YouTube.

Attitude (AT) and Behavioral Intention (BI)
H5: Attitude towards YouTube will positively influence users' behavioral intention to use YouTube.

5 Literature Review

The literature addressing the acceptance of technology has undergone a significant increase in recent years. Moreover, there is much research studying the usage of YouTube as a tool for self-learning purposes.

There are several studies that use the TAM model as a way to investigate acceptance of any information system. In [9] the authors investigated the acceptance model of (university) course websites. They used constructs of perceived usefulness and perceived ease of use to assess university students' acceptance of course websites as an effective learning tool. A survey instrument was distributed to 450 university students and a total of 403 usable responses were obtained. They implemented exploratory and confirmatory factor analyses using structural equation modeling techniques. This was subsequently used to fit and validate the Course Website Acceptance Model (CWAM) designed for their study. Their model indicated a good fit to the data. The causal relationships between the constructs considered by this model were well supported, accounting for 83% of the total variance in the course website acceptance and usage.

Moreover, the authors in [10] examined the motivations, perceptions and adoption of users towards a taxi-hailing app based on the Technology Acceptance Model (TAM). A survey instrument was distributed to 208 taxi-hailing app users in a large metropolitan setting. The survey was about their patterns of usage, demographic, perceptions about the technology, and their behavioral intentions to use the online taxi-hailing service. The results confirmed that users' perceptions are significantly associated with their intentions to use mobile phones. Moreover, perceived usefulness is the strongest determinant of users' attitudes and intentions towards the taxi-hailing app, followed by perceived ease of use.

The following two studies [11, 12] and were related to deaf students' needs in accessing online resources. In [11], the target student group was deaf or hard of hearing (DHH) students in science, technology, engineering and mathematics (STEM). The

authors studied the general challenges that were faced by DHH people when using social media. The main finding was that DDH person has challenges associated with Accessible Media that is available on the Internet. They found that rules for captioning only pertain to those videos originally aired on TV, which means that videos produced for online access may not have captioning. The automatic captioning option on YouTube is one solution that is often offered. However, in many cases captioning is inaccurate, which is especially problematic when viewing technical content with specialized vocabulary. Following these findings, STEM has created an online community, using off-the-shelf social media tools to promote socialization opportunities and to share accessible STEM-related media with its participants.

The authors in [12] tested if YouTube's auto-generated captions meet deaf students' needs. They assessed a particular type of video. These videos were weekly informal news updates created by individual professors for their online classes. The authors' goal was to see if automatic captions are sufficiently accurate to meet the needs of deaf students. They analyzed 68 min of video captions and 525 phrase -level errors were found. On average, there were 7.7 phrase errors per minute. The results confirmed that auto-generated captions are too inaccurate to be used exclusively.

The study in [1] examined the use of YouTube as a learning resource in higher education using the TAM model. The authors developed scales to measure the different variables of TAM for YouTube as a learning resource. They investigated a sequence of qualitative and quantitative experiments, which resulted in valid scales and a reliable model. Furthermore, they investigated an additional construct, which was exploratory factor analysis (EFA) to identify new factors that may explain the intention to use YouTube as a learning resource. They found that (PU), (PEU), (UA), and (BI) were important constructs for YouTube users. The findings of the study were used as a basis for further research.

6 Research Methodology

We adopt the Technology Acceptance Model (TAM) to test DHH people's acceptance toward YouTube. Our aim was to validate our hypothesis of DHH people's YouTube usage among Arab DHH personnel. We distributed survey questions among Arab DHH people that were aligned with the questionnaires in reference [1].

Based on the previous studies, we focused on the antecedents of constructs that demonstrated the influence of usefulness, ease of use, user attitude and behavioral intension on the usage of YouTube as self-learning in our study. We also focused on (1) understanding the personal factors that influence YouTube usefulness and which play an important role in the acceptance or rejection of the technology and (2) examining the relationship among (PU), (PEOU), (AT) and (BI).

The following subsections will present the TAM experiment and its results for Arab DHH people's acceptance toward YouTube.

6.1 TAM Model Experiment

This study measured a sample of Arab DHH people's acceptance of YouTube videos for learning and entertainment. The chosen videos contained sign language and captions that were designed for DHH people to increase their knowledge and information.

Thus, the measures to be assessed in this study were as follows:

- Perceived Usefulness of YouTube for DHH people.
- DHH people's Attitude to YouTube.
- Perceived Ease of Use of YouTube for DHH people.
- Behavioral Intention of DHH people with YouTube.

6.2 TAM Experiment Description and Material

We distributed an online survey for the TAM experiment using a Google docs form. The survey had three main sections. The first section contained general questions that measured the awareness of YouTube usage and options. The second section requested Arab DHH people to watch three YouTube videos designed specifically for them (videos that contained sign language and captions), and to measure their understanding, they were asked questions about these videos. The third section consisted of questions that measured DHH people's acceptance of YouTube videos. We also included an open-ended question to collect participant opinion and feedback. The experiment lasted between 15–20 min.

6.2.1 Participants

We recruited 8-DHH female participants to conduct our experiments. One of whom was less than 17 years old, two of whom were more than 30 years old, and five of whom were between 17 and 30 years old. All of them were deaf or hard of hearing people and all of them were YouTube users.

6.2.2 Data Analysis and Results

We entered the survey data in SPSS Version 16 software to perform further analysis using Cronbach's alpha regression and descriptive statistics. The reliability analysis was conducted in order to check the internal validity and consistency of the items used for each factor. The results of the reliability analysis are presented in Table 2. According to Nunnally (1978), the questionnaire used for the various factors of YouTube usage was judged to be a reliable measurement instrument, with the Cronbach's alpha scores all above 0.7.

Table 2. Internal consistency reliability testing

Cronbach's alpha	Cronbach's alpha based on standardized items	N of items
0.794	0.776	19

In Table 3, detail the Cronbach's alpha calculation for each factor by listing the factors (PU, AT, PEOU, and BI) that were measured in this experiment. All the coefficients exceed 0.70. Thus, all of these four measures were deemed acceptable and valid.

Table 3. Cronbach's alpha

Factor	Items	Cronbach's alpha (average)
Perceived usefulness (PU)	6	0.78
Attitude (AT)	6	0.77
Perceived ease of use (PEOU)	5	0.79
Behavioral intention (BI)	4	0.79

6.2.3 Reliability Statistics

Furthermore, we conducted correlation analysis among the variables as shown in Table 4. The aim of the correlation matrix is to avoid multicollinearity among the variables and to build an accurate regression model. A high correlation value indicates redundancy among the input variables, as observed in PU. Table 4 shows that the correlations between the PEOU, PU, AT and BI are positive and significant. This confirms the original hypothesis made in the literature concerning the Technology Acceptance Model. PU is more influenced by PEOU than by AT, and least influenced by BI, since PEOU has the highest score, which is 0.244. AT is more influenced by PU than by BI and least influenced by PEOU since PU has the highest score, which is 0.255. PEOU is more influenced by PU than by AT and least influenced by BI since PU has the highest score, which is 0.126. BI is more influenced by AT than by PU and least influenced by PEOU since AT has the highest score, which is 0.208. As shown in Table 4, the PU variable has the most impact on the other factors.

Table 4. Correlation matrix

Factor	PU	AT	PEOU	BI
PU Pearson correlation (average)	1	0.241	0.244	0.043
AT Pearson correlation (average)	0.255	1	0.026	0.208
PEOU Pearson correlation (average)	0.126	0.026	1	0.038
BI Pearson correlation (average)	0.043	0.208	0.010	1

6.3 Hypotheses Testing

A standard regression analysis was performed between the dependent variable (one of each of the variables) and the independent variables (the remaining variables). Analysis was performed using SPSS regression as shown in Table 5. This table presents the result of simple regression of the interaction variables. The first column refers to the hypothesis, the second refers to the dependent variables, and the third column refers to the independent variables. Also, the table includes values for multiple regression analyses for each hypothesis along with its validation result.

Table 5. Direct effect between independent constructs

Hypothesis	Dependent variables	Independent variables	R2	F-value	β	P-value	Validation
H1	AT	PEOU	**.644**	4.514	−.355	**.293**	Not supported and the influence is not significant. (β = −.355, p > 0.05)
H2		PU			**.905**	**.030**	Supported and the influence is significant. (β = .905, p < 0.05)
H3	BI	PU	.444	1.985	.462	**.394**	Not supported and the influence is not significant. (β = −.462, p > 0.05)
H4	PU	PEOU	.220	1.688	.469	.242	Supported but the influence is not significant. (β = .469, p > 0.05)
H5	BI	AT	.444	1.985	.929	**.120**	Supported and the influence is not significant. (β = .929, p > 0.05)

As shown in Table 5, the value of R square for H1 and H2 indicates that the two predictors (PU, PEOU) explained 64.4% of the variation in attitudes to use. This indicates that this model is a rational one, although there are other unknown factors, which may impact the users' attitude to use YouTube, which are not accounted for in this model.

The standardized coefficients (β) show that Perceived Usefulness (β = 0.905) has larger impact than the Perceived Ease of Use (β = −0.355) where β is a positive value for PU and a negative value for PEOU. Also, the results indicate that PU has a significant impact on AT since the score is less than 0.05, and PEOU does not have a significant impact on AT since the score is more than 0.05. Hence, if DHH people feel that YouTube is useful for them then they are more likely to use it. On other hand, if DHH people feel that YouTube will be easy to use and reduce the effort of learning, they will be likely to adopt it. Subsequently, a linear regression model was also used to test H3 and H5, which are the impact of Perceived Usefulness and Attitude on users' behavioral intention towards YouTube.

As shown in Table 5, the results confirmed H3 that Perceived Usefulness (PU) had a negative and not significant effect on Behavioral Intention (BI), with β = −0.462, Significant = 0.394 (more than p = 0.12). While Attitude Toward (AT) had a positive and not significant influence on the dependent variable BI, with β = 0.929,

Sig = 0.120. If the DHH person recognizes that YouTube has some useful functions, they perceived that these functions would be shareable to other DHH people.

Finally, another linear regression model was used to investigate the influence of Perceived Ease of Use (PEOU) on Perceived Usefulness (PU) H4. The results showed an R Square value of 0. 220 which is low; this indicated that PEOU explained only 22.0% of the variation in PU. Based on the Standardized coefficient value ($\beta = 0.469$), Perceived Ease of Use (PEOU) had a positive but not significant impact on Perceived Usefulness (PU), with $\beta = 0.469$, Significant = 0.242 (more than 0.05). Also, the deaf recognized that YouTube has some useful functions, but they perceived that this application is not intuitive for them to use.

In summary of the four hypotheses, Perceived Usefulness (PU) had a negative impact on Behavioral Intention (BI), this was followed by a strong positive influence of Perceived Usefulness (PU) on Attitude Toward (AT) using YouTube. Perceived Ease of Use (PEOU) had a negative impact on users Attitude Toward (AT) YouTube. Finally, users' attitude had a negative impact on their Behavioral Intention (BI).

Some of the DHH participants' Comments:

"I find YouTube useful and it provides much functionality but not for all topics."
"I like it as a tool to watch useful videos, especially if it offers Edit Arabic caption."
"I think YouTube's Auto-generated Captions does not meet deaf students' needs."
"I share videos that have understandable caption."
"I don't know caption is existing before, and I will use it in the future."

6.4 Key Findings and Recommendations

The results of the TAM model experiment showed that DHH people pinpoint some useful functions in YouTube, such as the captions in English and the translation to Arabic. However, Arab DHH people are not motivated enough to watch YouTube because it is lacking Arabic videos for DHH people. Due to the fact that the YouTube time-span is fast for DHH people, they prefer a slower time-span to allow them to read the captions and understand the content of the videos. Hence, DHH people avoid sharing YouTube videos among their contacts except if the videos were from DHH care institutions. In addition, 75% of the participants did not know about the auto-caption and edited-caption features that YouTube provides for some of its videos. Also, for the participants who knew about them, they gave their opinions of the need to improve these and the need to have auto-captions for Arabic videos. This is to allow them to watch and understand the content of Arabic videos rather than just watching English videos that have Arabic captions translated from English captions on YouTube.

7 Conclusion

Since YouTube has become one of the self-learning resources for individuals, and the huge usage of YouTube in Saudi Arabia, there is still an ambiguity regarding DHH people's acceptance of YouTube. Thus, this study has attempted to uncover this

ambiguity by adopting the TAM model, which is a well-known theoretical model that helps to explain and predict user behavior related to information technology [7].

The results of the TAM experiment showed that DHH people identify some useful functions in YouTube, such as the captions in English and the translation to Arabic. However, Arab DHH people are not excited to watch YouTube because of the lack of Arabic videos designed for DHH people.

Some of results of interest from this study are:

- 76 out of 80 of the DHH people in King Saud University female students cannot read and write Arabic as well as other institutions. Therefore, they are not an audience of YouTube.
- 75% of the participants did not know about the auto-caption and edited-caption features that YouTube provides for some of its videos.
- DHH people need more time more than non-disabled people to read and understand video captions using their smartphone. Therefore, there is a need to implement the slow time-span of YouTube videos in Android and iOS platforms on smartphones.

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