Factors Influencing Tele-dermatology Adoption among the Lebanese Youth: A Pilot Study at Saint Joseph University

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Keywords: Tele-dermatology, Technology Acceptance Model (TAM), Mobile Medical Application, Skin Cancer, Consumer Acceptance.

Abstract: The demand and use for Tele-dermatology (TDM) to diagnose skin lesions is rising worldwide. Using the technology acceptance model, we evaluate the factors influencing the acceptance of Tele-Dermatology to diagnose skin lesions among the Lebanese students. We complete a pilot study with Lebanese students from Saint Joseph University of Beirut (USJ). After examining the responses in a descriptive analysis, we develop some initial hypotheses and proceed to build the statistical model to test them using Smart PLS3. Our findings show that 64% of the students are ready to use Tele-Dermatology in their everyday life. Most of those students are females between 18 and 24 years old. Wrapping up our results, information from this study indicates that marital status is most likely a determinant of intention to use TDM among students – whereby, most single students are ready now (65%) while most married students are inclined to use it in the future (67%). The study also suggests that the Lebanese youth prioritize result demonstrability as a factor in their intention to use TDM. Further, mobile TDM must save them time must be easy to use to be perceived useful.

1 INTRODUCTION

"The two areas that are changing... information technology and medical technology. Those are the things that the world will be different from in 20 years from now than it is today"- Bill Gates[1].

Decentralized, mobile and personalized care has improved population access to care. Medical mobile applications are redefining the future of medical consultation; a trend that started at the turn of the century caused the line between physical and virtual care to blur. Before the 2019 COVID-19 pandemic, physicians and patients started using telehealth to care for different conditions including cancer, behavioural health, surgical recovery, substance abuse, home dialysis and more. These telehealth use cases cover the full spectrum of care from acute to post-acute and urgent to managing healthy lifestyles. The demand for telehealth, especially for diseases in which the incidence rate is increasing yearly, such as in the case with cancer, is on a rise[2].

1.1 Mobile Tele-dermatology

Worldwide, 2020 has seen an estimated 19.3 million new cancer cases of which more than 8% were skin related, with loss of life in about 1 in 12 skin cancer patients (Sung et al, 2021), and an increase of 15% in skin cancer cases since 2018 (Ferlay, et al. 2018).

Advancements in technology sought to improve early detection and reduce the mortality rate of the disease through skin cancer screening for early detection of suspicious skin lesions which can potentially lead to skin cancer (Jolliffe et al., 2001). Mobile Tele-dermatology (TDM) is a mobile medical application by which patients can get a diagnosis for their skin lesions, anywhere and anytime (Desai et al., 2010; Massone et al., 2014). The technology is about

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Aroutine, N., Badr, N. and Yeretzian, J.
Factors Influencing Tele-dermatology Adoption among the Lebanese Youth: A Pilot Study at Saint Joseph University.
DOI: 10.5220/0010746400003123
In *Proceedings of the 15th International Joint Conference on Biomedical Engineering Systems and Technologies (BIOSTEC 2022) - Volume 5: HEALTHINF*, pages 15-25
ISBN: 978-989-758-552-4; ISSN: 2184-4305

acquiring images of a suspect skin area and presenting them to a remote attending practitioner for evaluation (Fig 1.). The technology was initially evaluated in treating incidences in rural areas (Sáenz et al, 2018), where dermatology services are commonly managed by healthcare personnel with minimal specialty training.

There are two models for processing these images. One model uses on store and forward mechanisms, which are less expensive, but require more wait time for diagnosis and treatment. The alternative uses a video conference or "synchronous session", between the patient and the specialist. The patient gets an instant treatment plan. The difference lies in the cost of the two methods, and the diagnosis referral time (Livingstone & Solomon, 2015; Vidal-Alaball et al., 2018; Wang et al., 2020a).

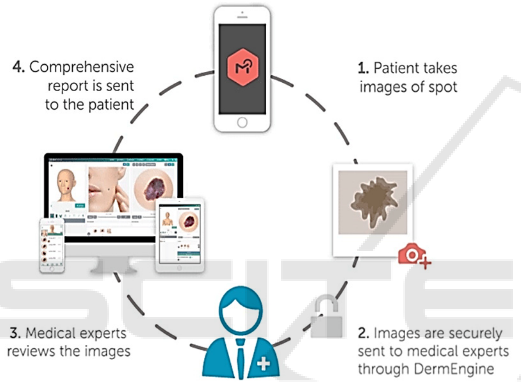

Figure 1: Tele-Dermatology (Source: DermEngine).

At the turn of the 21st century, even prior to the recent COVID-19 pandemic, tele-dermatology (TDM) had received acceptance among patients, because of the instantaneous nature of the diagnosis and management regimen for the condition, and because it had educational value to the primary care physician (Eedy and Wootton, 2001). Initially, diagnostic reliability, image quality and storage requirements were central notions to the adoption conversation (Whited, 2006). Web consultations in dermatology became possible shortly after (Massone et al, 2008). The continued evolution in technology improved TDM accuracy and its cost effectiveness brought the product to the mainstream of practice (Lee and English, 2018). The main advantages were prioritization in cancer screening and rapid screening for trivial conditions (Romero et al, 2018), as administrative, regulatory, privacy, and reimbursement policies surrounding this dynamic field continued to evolve (Lee and English, 2018).

During the Covid-19 pandemic, TDM was seen as an alternative to in-person visits, as the number of people using medical applications increased by 50% compared to 2019 (Koonin, 2020). Many specialists encouraged patients to perform Telehealth from the comfort of their homes (McGee et al., 2020), to minimize unnecessary clinical visits and avoid endangering their lives through transmission with the virus (Mostafa & Hegazy, 2020). Therefore, TDM was considered effective in decreasing the risk of Covid-19 transmission by minimizing clinical visits and avoiding overcrowdings of the hospitals both in private and public facilities (Cartron et al, 2020).

1.2 Motivation

The global TDM market accounted for US$ 4.5 billion in 2019 and is estimated to be US$ 44.8 billion by 2029 and an anticipated CAGR of 26.0%.

Studies conducted in several countries, such as the United States (Cartron et al, 2020), United Kingdom (Nicholson et al, 2020) and Australia (Abbott et al, 2020) have shown how people embraced TDM as a mobile application to diagnose their skin lesions.

Patients with better health status, those of younger age and those with less frequent visits to a dermatologist were more accepting of Tele-Dermatology (Nicholson et al, 2020); noting that issues of image quality, privacy concerns, image storage and retention are indicated as impediments to wider use (Abbott et al, 2020). In countries where they have adopted Mobile TDM for skin diagnosis, users have reported the technology to be a cost-effective application, which they would prefer using rather than face-to face clinical visits to reduce cost and waiting time (Wang et al., 2020b).

In the country of Lebanon, a developing country where cases of skin cancer have been doubling over 10 years (2006-2016) (*Moph*, n.d.) there has been little insight on the adoption of TDM. Telehealth adoption in Lebanon has been informal and TDM has not reached mainstream use by practitioners (Shaarani et al, 2021). We therefore, find it interesting to investigate this phenomenon and evaluate the factors that could influence the adoption of mobile medical application.

In our study, we intend to answer the question: ***What are the factors that can influence the intention to use of TDM in Lebanon?***

2 BACKGROUND

Technology acceptance models (TAM) is a theoretical framework to assess people's perception regarding the adoption of new technologies. It is a tailored representation of factors influencing one's intention to use a certain technology, in our case, this technology is TDM.

Technology Acceptance Model (TAM) has been used to investigate how perceived usefulness of a technology and its perceived ease of use, can influence the users' intention to use that technology (Fig. 1) (Davis, 1989; Szajna, 1996; Venkatesh and Davis, 2000). TAM suggests that an individual's technology usage behaviour is determined by the attitude toward technology usage, predicted by the extent to which an individual believes that using a technology will enhance his or her task performance (perceived usefulness) and the extent to which an individual believes that using a technology will be free of significant effort (perceived ease of use).

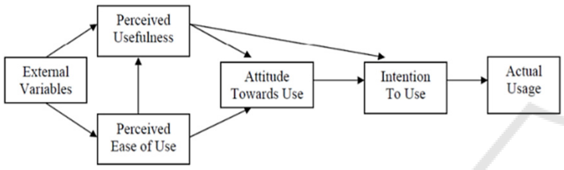

Figure 2: Simplified Technology Acceptance Model.

Studies using TAM have extended the model to cover multiple contexts (TAM2, etc.), indicating the usage and acceptance behaviour towards technology (Venkatesh et al, 2003). Certain TAM relationships were found to be significant, whereas others were inconsistent (Holden & Karsh, 2010). Others have connected ease of use and usefulness to social impact, facilitating conditions, attitudes and behaviour of users in measuring intention to adopt of health information technologies (Garavand et al, 2016). In telemedicine, we can find long-standing evidence of TAM use, for physician acceptance of telemedicine and the related technologies (Hu, et al, 1999; Chau and Hu, 2002; Kamal et al, 2020), implying that acceptance of this technology was a major challenge in the context of adoption. While the model has been widely tested, validated and extended in health informatics applications used by medical professionals (Ketikidis et al, 2012; Rahimi et al, 2018) they have seldom been applied to the modelling of consumer (patient) acceptance of health informatics applications (Rahimi et al, 2018).

3 RESEARCH MODEL

3.1 Antecedents and Hypotheses

Based on previous evidence with TAM and the extended model of Venkatesh and Davis (2000), we developed our model to test the stated hypotheses and learn about TDM usage and factors of acceptance. Factors influencing the intention to use are therefore: Social determinants, medical factors, result demonstrability, perceived risk, subjective norms, perceived usefulness and perceived ease of use.

We consider the following variables as latent variables (Section 4):

- SI: Subjective norms (Q: 29 and 30);
- SDH: Social determinants (Q: 3 thru 5);
- MED: Medical factors (Q: 1, 2, 6 thru 10);
- RD: Result demonstrability (Q: 15, 17, 31, 32);
- PR: Perceived risk (Q: 18, 20 thru 22, 25, 26, 33 thru 35);
- PU: Perceived usefulness (Q: 11 thru 14, 19, 27 and 28);
- PEOU: Perceived ease of use (Q: 16); UI: Intention to Use (Q: 23 and 24).

3.1.1 Social Determinants

We identified social determinants as indicators of educational level, work and marital status[3]. The descriptive analysis found some relevance of education specialty, and marital status, etc. (Table 2). The technology acceptance model developed by Davis et al. (1989) supports education specialty that may indicate a varied experience with technology. Consequently, we state our first hypothesis as

H1: Social Determinants such as marital status and education specialty affect perceived usefulness of mobile TDM by students

3.1.2 Medical Factors

Medical factors are included to examine the potential significance of the existence of family cancer history in the adoption context. Family history of skin cancer, previous skin cancer removed and presence of moles larger than 2 mm were considered significant in an earlier study (Horsham et al., 2016). Therefore, we included them in the initial model, as they are contextual to the setting of TDM. We also included age and gender, as potential indicators of the adoption dynamics - as it was observed in the descriptive

[3] https://www.who.int/health-topics/social-determinants-ofhealth#tab=tab_1

analysis (Table2) and is also supported by Venkatesh & Morris (2000). Therefore, we formulate our second hypothesis as:

H2: Medical factors such as family cancer history, age and gender affect perceived usefulness of mobile TDM by students

3.1.3 Result Demonstrability

Supported by Modified TAM (TAM2) model (Venkatesh and Davis, 2000), the factor of result demonstrability indicates the effectiveness of the TDM in the early detection of the onset of the disease, the user's trust in technology. In the literature, some studies reported that users expressed their concern regarding their privacy if the application were to be hacked, they also shared their anxiety of waiting for the final diagnosis, and their doubt about the accuracy of the image (Abbott et al, 2020). On the other hand, medical practitioners expressed their concern towards overloading their system with images, yet 55% of informants in our study found TDM beneficial for monitoring and self-examining skin lesions to detect any suspicious lesions. About 40% of the students in our study have expressed confidence in the accuracy of the mobile application compared to face-to-face diagnosis; and only 34% believed that a suspicious mole or lesion diagnosis would be understandable (thus able to provide the value expected). Therefore, for our model, result demonstrability also relates to the confidence of the user to receive comprehensible prognosis – i.e. "the technology has to work, so that it can be useful" –Survey Question (15, 17, 31 and 32). Therefore, we formulate our third hypothesis as:

H3: Results Demonstrability (or effectiveness) indicated by the user's trust in technology performance and the perceived ability of mobile TDM to offer early detection, with accurate information and an understandable outcome affects perceived usefulness of mobile TDM by students

3.1.4 Perceived Risk

Perceived risk is an antecedent and a moderator of user acceptance (Im et al, 2008; Kamal et al, 2020) – as a moderator, it can either increase the strength of the correlation or decrease it. In our model, we depict three indicators for perceived risk:

a) The resistance to use (Im et al, 2008) (Q. 21); and
b) The efficiency of use in the context of selfservice technology – i.e. saving time (Yang et al., 2019) and money (Q. 25); and
c) Technology anxiety, learnability and reliability (Mostafa & Hegazy, 2020) which characterizes the user's reluctance to use driven by lack of familiarity with the technology (Q.33).

Therefore, for our model, we can define perceived risk as factors of efficiency (saving time and money), technology anxiety (training, technical assistance and skill acquisition), presence or absence of facilitating conditions (here shown as professional assistance with the required dermatologists support to realize the benefits from their mobile TDM APP (Gorrepati and Smith, 2020; Giavina Bianchi et al, 2019). Hence, we conclude that perceived risk can be conceived as an antecedent for intention to use, and would have the potential to moderate the association between perceived ease of use and intention to use, similarly between perceived usefulness and intention to use of mobile TDM by students. We then state our next three hypotheses as follows:

H4: Perceived risk, indicated by the resistance to change, efficiency and technology anxiety affects intention to use of mobile TDM by students

H5: Perceived risk, indicated by resistance to change, efficiency and technology anxiety moderates the relationship between perceived ease of use and intention to use of mobile TDM by students

H6: Perceived risk, indicated by resistance to change, efficiency and technology anxiety moderates the relationship between perceived usefulness and intention to use of mobile TDM by students

3.1.5 Subjective Norms

The descriptive analysis of the survey data indicated that almost half (47%) of the sampled population would be influenced by their family and friends to use TDM. This phenomenon invokes the theory of planned behaviour (Ajzen, 2011), where subjective norms (indicated here by social influence) are believed to shape an individual's behavioural intentions, here the intention to use TDM. Our seventh hypothesis therefore posits that:

H7: Subjective norms, indicated by social influence, affects the intention to use of mobile TDM by students.

3.1.6 Perceived Ease of Use and Perceived Usefulness

Lastly, adapted from Venkatesh and Davis (2000) and based on our background in Section 1, we defined perceived ease of use as an indicator of user perception of mobile TDM and perceived usefulness as the perception of how useful the functionality of TDM would be for the user. As a result, these two latent variables directly affect a person's intention to use TDM to diagnose skin lesions. In addition, perceived ease of use directly affects the usefulness of the application, in other words, if a consumer finds the application easy to use, then it would be considered useful. Consequently, the following final three hypotheses are:

H8: Perceived usefulness, indicated by the perception that the technology will serve the best interest of the user, in a rapid, self-examination, affects intention to use of mobile TDM by students.

H9: Perceived ease of use affects intention to use of mobile TDM by students

H10: Perceived ease of use affects perceived usefulness of Mobile TDM by students

We differentiated between two outcomes: (1) "I will use Mobile TDM when it's offered to me," – which implies readiness now (Q. 23); and (2) "I will use Mobile TDM in my routine self-skin examination in the future" – which implies readiness in the future (Q. 24). The loading of UI1 and UI2 respectively then assesses these outcomes, to their strengths and relevance in indicating the "intention to use".

4 MATERIALS AND METHODS

4.1 Approach and Study Design

We started our study on USJ students, after getting the approval of the USJ ethics committee in February 2021. This pilot study, completed on May 2021, aims to inform about assumptions and conditions for a larger project scope (Hazzi and Maldaon, 2015). The survey of TDM consumer acceptance was inspired from an Australian study from Horsham et al. We reformulated the questionnaire on Google docs. USJ administration has approached students virtually. All USJ students from different faculties, received emails of the self-administered survey, only 89 participated. After finishing data collection, we extracted the answers on excel. Demographics were analysed by descriptive statistics. Since the participant number was not significantly high, we used SMART PLS 3 to construct reliability and validity, path coefficient and then we initiated the structural model to be able to test for factors that influence the intention to use of the participants.

4.2 Sample and Participants

We set out to investigate the use of TDM, a form of telemedicine among the youth in Lebanese Universities. We conduct this pilot at the University of Saint Joseph in Beirut Lebanon. Eighty-nine (89) students took part in this survey. Their demographics are presented in Table 1.

Table 1: Sample description.

		N=89
Gender	Male	17%
	Female	83%
Age	< 20 years	25%
	21 - 25	48%
	26 - 30	13%
	31 - 35	6%
	36 - 40	2%
	41 - 45	2%
	Over 46	3%
Education	Business Management	6%
	Engineering & Sciences	16%
	Humanities	20%
	Medical & Health	47%
	Political Science & Law	4%
	Other	7%
Status	Single	90%
	Married	10%

The participants (N=89) with an average age of 25, were essentially females (n=74, 82%). Almost half of the participants were from the Faculty of Medicine (n=42, 47%). Slightly more than half the participants work, either full time or part time, (n=52, 58%), while the majority of the participants were single (n=80, 90%). Only 4 participants had skin cancer history and only 3 had skin cancer previously excised.

4.3 Survey Design

We developed a survey questionnaire of 27 questions with two parts (Appendix) The first part, captured the demographic and personal information of the participants and the second explored the TDM context using a 5-point Likert scale. We collected demographics information about gender, age, field of education, marital status as the literature indicated a possible relation with intention to use (Section 4). We also captured the prevalence of medical history of cancer (Section 4.1.2), subjective norms (Section 4.1.5), and factors of risk (Section 4.1.4). We exported the survey results to excel and normalized the data in preparation for the descriptive and statistical stages of the analysis.

4.4 Descriptive Analysis

Indications from the descriptive analysis (Table 2) show that, both genders are more or less equally ready to embrace TDM now, but females are more prone to use it in the future (12% more than males).

Table 2: Descriptive Analysis.

Readiness to Use (N=89)	**Now**	**Future Intention**
Among all participants	64%	57%
Gender		
Male	**60%**	**47%**
Female	**65%**	**59%**
Age		
< 20 years	**77%**	**64%**
21 - 25	**60%**	**56%**
26 - 30	**67%**	**58%**
31 - 35	**60%**	**60%**
36 - 40	**0%**	**0%**
41 - 45	**50%**	**50%**
46 - 50	**67%**	**67%**
Education		
Business Management	**60%**	**60%**
Engineering & Sciences	**71%**	**50%**
Humanities	**67%**	**67%**
Medical & Health	**64%**	**62%**
Political Science & Law	**50%**	**25%**
Marital Status		
Single	**65%**	**56%**
Married	**56%**	**67%**

Students aged less than 20 years old have reported the highest intention to use. Engineering & Sciences students are mostly ready to use TDM now (71%) while political science students demonstrated the lowest appetite (25%) Most single students are ready now (65%), while the majority of married informants were inclined towards future adoption (67%).

4.5 Statistical Data Analysis

We developed our model (Section 4) using SEM-PLS via SmartPLS3.0, following the example of Aggelidis & Chatzoglou (2009), Cepeda-Carrion et al. (2019) and Kamal et al. (2020). Our sample (n=89) meets the minimum sample size of 59, using the inverse square root method (Kock and Hadaya, 2018). For reporting purposes, we transformed the data captured on a Likert scale to binary variables, where neutral answers signified disagreement. That is, we regrouped the results as either Agree (4-Agree, 5-Strongly Agree), or Disagree (1-Strongly disagree, 2-Disagree, 3-Unsure).

5 EVALUATION OF THE MODEL AND RESULTS

5.1 Technology Acceptance Model

We loaded our model in SmartPLS3.0 and ran the PLS algorithm. We then reduced the indicator variables in order to reach convergent validity and reliability. We accepted only the indicators with loadings ≥ 0.708 as significant (Hair et al, 2019). Figure 3 shows our valid model - with outer loading factors.

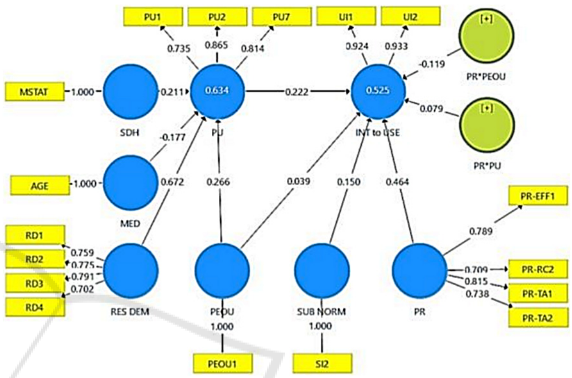

Figure 3: Valid Model - with outer loading factors.

The model is of a reflective construct, therefore, construct validation can be obtained through Confirmatory Factor Analysis (CFA) (i.e. convergent and discriminant validity) and reliability testing (i.e. Cronbach's Alpha) (Hair et al, 2019). We find that the model has good discriminant validity since the AVE squared value of each exogenous construct (the value on the diagonal) exceeds the correlation between this construct and other constructs - see Fornell-Larcker Criterion Values in Table 3 (values below the diagonal).

Table 3: Discriminant Validity.

Discriminant Validity

Fornell-Larcker Criterion | Cross Loadings | Heterotrait-Monotrait Ratio... | Heterotrait-Monotrait Ratio... | Copy to Clipboar

	INT to USE	MED	PEOU	PR	PR*PEOU	PR*PU	PU	RES DEM	SDH	SUB NOR...
INT to USE	0.929									
MED	0.272	1.000								
PEOU	0.316	0.278	1.000							
PR	0.667	0.383	0.375	0.764						
PR*PEOU	0.061	0.300	0.322	0.285	1.000					
PR*PU	0.207	0.221	0.057	0.404	0.482	1.000				
PU	0.585	0.297	0.487	0.612	0.045	0.014	0.807			
RES DEM	0.512	0.357	0.342	0.558	0.111	0.086	0.744	0.757		
SDH	0.244	0.758	0.194	0.161	0.052	-0.043	0.270	0.209	1.000	
SUB NOR...	0.450	0.239	0.211	0.415	0.010	0.067	0.433	0.290	0.242	1.000

Subsequently, following Hair et al (2019), we perform a **convergent validity** test by looking at the loading factor value of each indicator against the construct. We accept the indicators with loadings of

≥ 0.708 as significant (Figure 2) with an AVE value for each construct > 0.5. Subsequently, we assess **the construct reliability**. The reliability test results in table 4 show that all constructs have composite reliability and Cronbach's alpha values greater than 0.7 (Hair et al, 2019). In conclusion, all constructs have met the required validity and reliability.

Table 4: Construct Reliability and Validity.

Construct Reliability and Validity

Matrix | Cronbach's Alpha | rho_A | Composite Reliability | Average Variance Extracted (AVE)

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
INT to USE	0.841	0.844	0.926	0.863
MED	1.000	1.000	1.000	1.000
PEOU	1.000	1.000	1.000	1.000
PR	0.762	0.768	0.848	0.584
PR*PEOU	1.000	1.000	1.000	1.000
PR*PU	1.000	1.000	1.000	1.000
PU	0.735	0.758	0.848	0.650
RES DEM	0.752	0.758	0.843	0.574
SDH	1.000	1.000	1.000	1.000
SUB NORM	1.000	1.000	1.000	1.000

5.2 Hypothesis Testing

We carried out the effect test using the p value tests and t-statistics in the partial least squared (PLS) analysis model of the SmartPLS 3.0 software (Table 5). A pvalue less than 0.05 (typically ≤ 0.05) is considered statistically significant (Hair et al, 2019). T-statistics show how many standard errors the coefficient is away from zero. In our model, the t-statistics are within the acceptable range. For the hypotheses where p-values are ≤ 0.05, any t-value greater than +2 or less than – 2 is acceptable (Hair et al, 2019). The higher the T-value, the greater the confidence we have in the coefficient as a predictor, especially pointing to a significantly high confidence (t=11.124) in the hypotheses of results demonstrability – perceived usefulness (H3).

Table 5: Path Coefficient.

Path Coefficients

Mean, STDEV, T-Values, P-Values | Confidence Intervals | Confidence Intervals Bias Correcte... | Sa

	Original Sample ...	Sample Mean...	Standard Deviation...	T Statistics ...	P Values
MED -> PU	-0.177	-0.176	0.114	1.548	0.122
PEOU -> INT to USE	0.039	0.049	0.116	0.339	0.735
PEOU -> PU	0.266	0.253	0.077	3.431	0.001
PR -> INT to USE	0.464	0.470	0.132	3.518	0.000
PR*PEOU -> INT to USE	-0.119	-0.118	0.098	1.220	0.223
PR*PU -> INT to USE	0.079	0.072	0.114	0.693	0.489
PU -> INT to USE	0.222	0.223	0.131	1.693	0.091
RES DEM -> PU	0.672	0.687	0.060	11.124	0.000
SDH -> PU	0.211	0.210	0.096	2.209	0.028
SUB NORM -> INT to USE	0.150	0.133	0.096	1.554	0.121

6 FINDINGS

6.1 Supported Hypotheses

Four Hypotheses are supported (H1, H3, H4 and H10):

H1: Social determinants such as marital status were found as antecedent to perceived usefulness (p=0.028; t=2.209) with a predictability of 21.1 % (path coefficient = 0.211). This makes sense as in the descriptive analysis, we had observed that most single students are ready now (65%) while most married students will tend to use it in the future (67%). The education indicator was is excluded from this finding since it had to be removed to reach construct validity.

H3: The study results suggested that respondents linked "results demonstrability" with "perceived usefulness" of mobile TDM by students (p=0.000) with a very high level of confidence (t= 11.124) and with a very strong predictor of 67.2% (path coefficient = 0.672).

Result demonstrability is indicated by the effectiveness of mobile TDM to help detect skin cancer in early stages, where the tool provides a quality image, for an accurate assessment and diagnostic by the practitioner reviewing the images. This finding is aligned with the literature, where patients have shown their willingness to use a medical application if it's beneficial for them. Moreover, experts believe that comprehensibility and functionality of the application play an important role in encouraging people to adopt a certain technology in their everyday life (Deng et al, 2018).

H4: Perceived risk is a strong antecedent to intention to use of mobile TDM by students (p= 0.000; t= 3.518) with a predictability of 46.4% (path coefficient = 0.464).

Hypothesis H4 is therefore supported. Perceived risk (resistance to use, efficiency and technology anxiety) predict the outcome by 46.4%. The informants would use TDM if it is convenient (loading factor = 0.773), and if it saves time (0.834) as long as they receive the adequate training (0.776). In this study, the indicator which weighed the most as indicator of the risk variable was the technology anxiety, which means professional assistance could reduce the anxiety and may influence the behaviour of the consumer in using TDM.

H10: Perceived ease of use is an antecedent to perceived usefulness of mobile TDM by students (p=0.002; t= 3.192) with a predictability of 26.6% (path coefficient = 0.266). This finding agrees with the theory of technology acceptance (Venkatesh and Davis, 2000).

6.2 Other Findings

We can also observe three findings that surprised us:

Medical factors do not appear to relate to the perceived usefulness of mobile TDM by students (H2). What is surprising here is that existing conditions of cancer risk have not persuaded the use of mobile TDM as a screening tool for early skin cancer detection. Whilst dermatologists found TDM useful for triage and diagnosis of most types of skin conditions followed at primary care (Giavina et al, 2021), the patients use of the technology do not seem influenced by their condition, in our study.

Perceived usefulness was not found to affect intention to use (H8) – This is at odds with the essential TAM theory. In our setting, even if the application is thought of to be useful, the findings inform that the Lebanese youth would not develop an intention to use mobile TDM to diagnose skin lesions. Similarly, as shown by hypothesis H9, perceived ease of use was not a factor of intention to use in our context.

6.3 Relevance of the Model

Our model produced R2 values of .634 and .525 for perceived usefulness and intention to use respectively. These moderate to substantial values reinforce the value of our study and the findings (Hair et al, 2019). They indicate that 63.4% of the variability in the outcome in perceived usefulness and 52.5 % of the variability in the outcome in intention to use may be explained by this study. In other words, the information included in this study describes the outcome at a considerable level. These results showed up in similar studies, where the hypothesized model accounted for 56 % of the variance in behavioral intention to use by young users' of a health information portal (Tao et al, 2020) and elsewhere 57.1% of the variance in behavioral intention to use diabetes management apps (Zhang et al, 2019).

7 CONCLUSION AND LIMITATIONS

Wrapping up our results, the descriptive analysis followed by a statistical study were successful in detecting that the intention to use TDM among the Lebanese youth is considerable – 64% of the informants have indicated their readiness to use today and 57% stated their intent to use it in the future.

Information from this study indicates that marital status is most likely a factor for intention to use of TDM among students – whereby, most single are ready now (65%) while most married students will tend to use it in the future (67%). The study also informs that the Lebanese youth prioritize result demonstrability as a factor in their intention to use TDM. Further, Mobile TDM must save them time must be easy to use to be perceived useful.

The manuscript has merit in addressing an interesting topic through an empirical pilot research. That said, the fact that the sample is composed by students at a single university is a limitation of the study. Other limitations are related to the gender distribution (83% female and 17% male) to the prevalence of medical and health students (i.e., almost 50% of the sample). This pilot survey adds observations and findings that should be useful among researchers and practitioners. A qualitative study is encouraged to extend this pilot into a deeper understanding of factors that influence the intention to use. This work is extensible to a wider population of different age groups and occupations, in a valuable comparative of addressable markets and target user base that could provide insight for manufacturers and practitioners alike.

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APPENDIX

Survey Questions and Possible Answers

1- Gender: Male, Female
2- Age: < 20 years; 21 – 25; 26 – 30; 31 – 35; 36 – 40; 41 – 45; Above 46
3- Education specialty: Business Management; Engineering & Sciences; Humanities; Medical & Health; Political Science & Law; Other
4- Work: Part time; Full time; Other or Null
5- Marital status: Single; Married
6- Skin colour: Fair; Medium; Dark
7- Eye colour: Brown; Hazel; Blue; Green; Other or Null
8- Family history of skin cancer: No; Yes
9- Previous skin cancer removed: No; Yes
10- Presence of moles larger than 2 mm: None; Less than 10; 11+
11- Mobile Teledermatology will help me examine my skin more rapidly: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
12- Mobile Teledermatology will improve my self-skin examination: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
13- Mobile Teledermatology is useful to diagnose moles on my skin for suspicious lesions: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
14- Mobile Teledermatology will help save time: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
15- Mobile Teledermatology will help detect skin cancer in early stages: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
16- Mobile Teledermatology will be easy to use: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
17- A suspicious mole or lesion diagnosis through Mobile Teledermatology will be understandable: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
18- Mobile Teledermatology users will easily acquire the skills to preform it: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
19- Mobile Teledermatology will encourage me to examine my skin thoroughly: Strongly agree; Agree; Unsure; Disagree; Strongly disagree

20- The use of Mobile Teledermatology will change my self-skin examination practice: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
21- The use of Mobile Teledermatology can fit in my skin examination habit: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
22- The use of Mobile Teledermatology may interfere with my work: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
23- I will use Mobile Teledermatology when its offered to me: Strongly agree; Agree; Unsure; Disagree; Strongly disagree 24- I will use Mobile Teledermatology in my routine self-skin examination in the future: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
25- I will use Mobile Teledermatology if it will save me time: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
26- I will use Mobile Teledermatology if it will save me money: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
27- Mobile Teledermatology will be useful to diagnose skin cancer in general: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
28- Mobile Teledermatology will be for my best interest: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
29- Health professionals (nurses, physicians...) will welcome the fact that I use Mobile Teledermatolog: Strongly agree; Agree; Unsure; Disagree; Strongly disagree y
30- My friends and my family will welcome the fact that I use Mobile Teledermatology: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
31- I will completely trust the diagnosis of the dermatologist based on a photo I've sent using Mobile Teledermatology: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
32- I will rely on the Teledermatology process to supply accurate information about a mole or a spot: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
33- I will use Mobile Teledermatology if I receive adequate training: Strongly agree; Agree; Unsure; Disagree; Strongly disagree
34- I will use Mobile Teledermatology if I receive technical assistance when I need it : Strongly agree; Agree; Unsure; Disagree; Strongly disagree
35- There are health professionals available who will help me with Mobile Teledermatology: Strongly agree; Agree; Unsure; Disagree; Strongly disagree