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The Conceptualization of Integrated Consumer Health Informatics Utilization Framework

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***Abstract*—**The purpose of this paper is to propose an integrated consumer health informatics utilization framework that can be used to gauge the online health information needs and usage patterns among Malaysian women. The proposed framework was developed based on four different theories/models: Use and Gratification Theory, Technology Acceptance 3 Model, Health Belief Model, and Multi-level Model of Information Seeking. The relevant constructs and research hypotheses are also presented in this paper. The framework will be tested in order for it to be used successfully to identify Malaysian women's preferences of online health information resources and health information seeking activities.

***Keywords*—**Consumer Health Informatics, Consumer Preferences, Information Needs and Usage Patterns, Online Health Information, Women Studies

I. Introduction

Consumer Health Informatics (CHI) is a part of medical informatics that studies consumer (patient and non-patient) needs for health information by means of information and communication technology [1]. Health professionals realize that information technology plays an important role in the area of health [2]. Seeking for health information can increase personal knowledge, thus help better interaction with physicians, promote prevention, and self-care among consumers [3], [4], [5]. Consumers seek health information online as an option to get more information and to better understand their health conditions. Meetings with physicians are often short and thus do not provide sufficient information [6]. This research was proposed in the absence of research understanding on online health information needs and usage patterns in Malaysia. Women were selected as the target group due to their active involvement in online health information seeking activities [7], [8]. The purpose of this paper is to conceptualize a CHI utilization framework to help understand the online health information needs and usage patterns among Malaysian women. Hence from the findings, it is possible to enhance CHI usage as a channel to promote health awareness, disease prevention, and self-health management among women.

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II. Literature Review

A study in Canada was conducted to examine personal, social and cultural factors that influence the use of the Internet as a source for personal health information [7]. The study focused on a specific health website in Canada that is committed towards promoting health and disease prevention. A total of 2,923 out of 36,000 registered users responded to the online questionnaire survey. The study aimed to seek the positive association towards the frequency of health related website usage and found perceived usefulness of the website, importance of health information found in the print media, concern of own health conditions, physicians or health professional intervention, trust in the information, and gender to be significant determinants [7]. User-friendliness and the quality of the website negatively influenced the frequency of usage [7].

A similar study was also conducted in Canada investigating online health information seeking activities among women in terms of source characteristics, situational characteristics, and socio-demographic characteristics [8]. Three types of resources were considered: websites, bulletin boards, and chatrooms. Data was collected using online survey questionnaires resulting in 264 respondents. The results indicate that perceived source reliability, socio-demographic variables such as race, income, and education greatly affect the frequency of seeking health information on the web [8]. Variables in situational characteristics, information need, and family care-giving on the other hand were found not to have strong impact on online health information seeking activities.

Another study to assess the factors that contribute towards online health information seeking activity was conducted in Korea [9]. An extension of Technology Acceptance Model (TAM) and Health Belief Model (HBM) were used, focusing on a total of eight constructs. Four constructs were from TAM (i.e. perceived ease of use, perceived usefulness, attitude and behavioral intention [10]), two from HBM (i.e. health consciousness and perceived health risk [11]), and two more additional constructs as antecedents and mediating beliefs [9]. Data was collected by two means, posting questionnaires on two health information websites in Korea and e-mailing the questionnaires to the websites' members. Of 212 respondents, 62.7% were women. Of 12 hypotheses developed, 10 were empirically supported. Health consciousness and perceived health risk were found to significantly impact perceived usefulness. Consumers' Internet health information use efficacy positively influenced perceived ease of use and perceived credibility. Perceived ease of use also had positive influence on attitude however it did not impact perceived

usefulness. Instead, attitude of using the Internet was found to positively influence the intention to use it [9].

However, reviewed literature did not reveal any studies on the impact of online information resources in terms of information seeking process and users needs. The proposed research aims to fill the gap in this area.

III. Theoretical Framework Conceptualization

The theoretical framework for this research is grounded in the convergence of four main theories/models from social science.

Use and Gratification Theory (UGT) assumes that usage of media is to satisfy users' needs. UGT focuses on consumer motive and their perceive needs. Foundations of UGT are: individuals are goal driven, they are active media users, and alert of their needs [12]. Thus, media selection is to gratify these needs. It stresses on what consumers do to the media or resources. This research will look into consumers' ability to identify their reason for making media choices and satisfy their health information needs. Interactivity of the Internet fulfills individuals' gratification for immediate response. For example, individuals with question in mind can immediately raise their concern via the available websites.

TAM was proposed to predict user adoption and usage of information technology [10]. Users' intentions are determined by two beliefs, perceived ease of use and perceived usefulness. The former is defined as users' expectations level that information technology adopted are free of effort, and the latter is defined as personal belief that usage of information technology will bring benefits to them. Another two constructs for the proposed framework, computer self-efficacy and experience were adopted from TAM3 [13] which is an extension from TAM [10] and TAM2 [14].

HBM was developed to explain individuals' health attitudes and beliefs. HBM is used in promoting health actions. HBM assumes that individuals will take health related actions if they can avoid negative health conditions and can successfully perform the health actions [11]. Constructs in the proposed framework that came from the general idea of HBM are perceived threat/risk and health consciousness.

The foundation of online health information seeking activity lies within Multi-level Model of Information Seeking (MMIS) that consist of four levels, namely, grand strategy, strategy, tactics, and operations [15]. In grand strategy, users determine what resources they want to search, their purposes, and their orders. In the strategy level, the focus is searching in a single resource. Tactics intention is to achieve limited results that can be achieved by performing queries such as Boolean AND, OR, or, NOT operators. Operations are more specific as more solid input such as commands, keystrokes, and mouse clicks are used.

IV. Integrated Consumer Health Informatics Utilization Framework

A. Conceptual Framework

The proposed framework, as shown in Fig. 1, consists of two independent variables, namely, consumer state and consumer needs. Consumer state determines selection of resources used in online health information seeking activities. Consumer needs are the characteristics required from the resources. These two independent variables affect resources and level of CHI utilization, which are the dependent variables in the proposed framework.

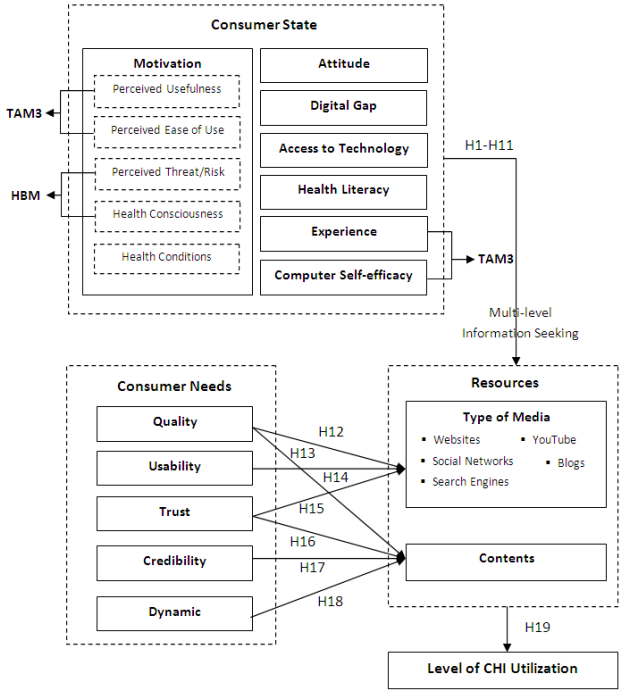

Fig. 1 Integrated CHI Utilization Framework

B. Constructs Definition and Hypotheses

Definition of the constructs and hypotheses are shown in Table I.

TABLE I
CONSTRUCTS DEFINITIONS AND HYPOTHESES

Independent Variables	Definition	Dependent Variables	Definition	Hypotheses
Consumer State				
1. Motivation				
(i) Perceived Usefulness (derived from TAM3)	Perceived usefulness is the probability that searching for health information online will increase consumers' health knowledge [10], [14], [13].	**Resources**	Gratification sought determines types of media selection [12]. Focus of the research is digital media utilization in the area of health informatics.	H1: There is a positive relationship between perceived usefulness and use of resources in online health information seeking activity.
(ii) Perceived Ease of Use (derived from TAM3)	Users' expectation levels that systems use are free of effort [10]. Selection of resources depends on perception that least or no effort required from the user.			H2: There is a positive relationship between perceived ease of use and use of resources in online health information seeking activity.
(iii) Perceived Threat/Risk (derived from HBM)	Consumers' confidence of how susceptible they are towards certain health condition and how they measure the seriousness of the condition [11].			H3: There is a positive relationship between perceived threat/risk and use of resources in online health information seeking activity.
(iv) Health Consciousness (derived from HBM)	Seeking for health information online is driven by personal belief that negative health conditions can be avoided if they take recommended health actions [16].			H4: There is a positive relationship between health consciousness and use of resources in online health information seeking activity.
(v) Health Conditions	Concern about own health and/or other people's health motivates consumer to seek for health information online [8].			H5: There is a positive relationship between health conditions and use of resources in online health information seeking activity.
3. Attitude	The state of feeling, whether positive or negative towards action that the person is going to conduct [17], [18].			H6: There is a positive relationship between attitude and use of resources in online health information seeking activity.
4. Digital Gap	Disparities that exist in accessing information and communication technologies (ICTs) and Internet connectivity that are often described by income, education, age, and race. [19].			H7: There is a positive relationship between digital gap and use of resources in online health information seeking activity.
5. Access to Technology	Consumers with Internet access and computers at home are more likely to use the Internet for health information seeking activities [20].			H8: There is a positive relationship between access to technology and use of resources in online health information seeking activity.
6. Health Literacy	The ability of individuals to understand health information, have knowledge and skills needed to effectively use the information gained to make proper health decisions [6].			H9: There is a positive relationship between perceived health literacy and use of resources in online health information seeking activity.
7. Experience (derived from TAM3)	Familiarity in using the Internet and searching skills may change over time and may affect			H10: There is a positive relationship between experience and use of

Independent Variables	Definition	Dependent Variables	Definition	Hypotheses
	perceived ease of use towards resources [13].			resources in online health information seeking activity.
8. Computer Self Efficacy (derived from TAM3)	The extent to which an individual believes that he or she has the ability to perform specific task/job using computer [13] may influence the tendency to seek health information online.			H11: There is a positive relationship between computer self-efficacy and use of resources in online health information seeking activity.
Consumer Needs				
1. Quality	Quality of the contents measured by relevancy of the information, understandable, usefulness, and how well it's being organized. Demonstration of using the resources can help inexperienced users [21].			H12: There is a positive relationship between quality and type of media selection in online health information seeking activity. H13: There is a positive relationship between quality and contents of the media in online health information seeking activity.
2. Usability	The characteristics of the websites such as design, navigation, and function determine the usability of a website [22]. Consumers should be able to seek for health information on the Internet with ease.			H14: There is a positive relationship between usability and type of media selection in online health information seeking activity.
3. Trust	Resources valued as trustable if items such as privacy policy, disclaimer, reachable contact persons, and the likes are provided [23].			H15: There is a positive relationship between trust and type of media selection in online health information seeking activity. H16: There is a positive relationship between trust and contents of the media in online health information seeking activity.
4. Credibility	Credibility is evaluated from the content of the resources, state of the information; whether it is current or not, scope covered, and accreditation obtained by the resources [24].			H17: There is a positive relationship between credibility and contents of the media in online health information seeking activity.
5. Dynamic	Resources designed must cater to diverse needs such as language preferences, diverse contents that are not limited to text only but provide images, audio or video which will benefit people [25].			H18: There is a positive relationship between dynamic and contents of the media in online health information seeking activity.
		Level of CHI Utilization	Usage pattern of online health information resources.	H19: There is a positive relationship between use of resources and level of CHI utilization in online health information seeking activity.

V. Future Implementation

Future work will test the relationships identified in the hypotheses by using mixed research. Quantitative method (questionnaire surveys) will be the priority and the subsequent qualitative method (interviews) will help explain the quantitative result. Number of participants in quantitative method will be approximately 450 females (18 – 65 years of age) from various states in Malaysia. The target population sampling is using random sampling technique. The quantitative method will quantify positive or negative relationships between the proposed constructs, and thus proving the validity of the proposed framework.

Quantitative results that require further exploration will be investigated via semi-structured interviews. This method provides opportunity to explore new themes or additional constructs that can improve the proposed model. The number of participants in this stage will be approximately 20 respondents.

It is believed that the integrated CHI framework will benefit online health information providers, responsible agencies in public health and consumers themselves, as the proposed framework view consumer circumstances in online health information seeking activities and characteristics needed in the resources.

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