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AN ASSESSMENT OF CANCER PATIENTS PERFORMANCE USING SOCIAL NETWORKS: A TASK TECHNOLOGY FIT PRESPECTIVE

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ABSTRACT

Cancer related social network communities have the potential to prepare an interactive environment where the virtual relationships among cancer patients can be established. However, current research into the assessment of cancer patients' performance using Social Network Sites (SNS) continues to be limited. There is still a lack of considering situational factors such as task and technology characteristics. The aim of this paper is to use Task Technology Fit (TTF) Theory to assess the performance of cancer patients using SNS. Based on purposive sampling, questionnaires were distributed to 178 respondents in two hospitals and four cancer support groups in Peninsular Malaysia. The results indicate that cancer patients' performance in using SNS was determined directly by fit between the characteristics of task and technology.

Keywords: *Health 2.0, Patient 2.0, Social Network, Task Technology Fit*

1. INTRODUCTION

Cancer is a leading cause of mortality globally. In 2007, 13% of all deaths worldwide were from cancer [1]. Some studies have described the improvements that Social Network Sites (SNS) could offer to health care [2]. Social network revolutionizes the way people communicate, collaborate and identify information which is useful for them [3]. Studies of internet based interventions have shown a high correlation between behaviour change and site usage [4]. According to Foster and Roffe [5], Internet based intervention could help cancer patients to learn about living with cancer; to understand diagnoses; to increase information about particular conditions and treatments; to gain support from others and tackle isolation by making social connections; and to access other people's experiences.

Perira et al., [6] stated that patients of the 21st century are not like patients of the past. Many patients like to get new and more information about their illness. Therefore, internet based intervention is a means of sharing information with patients. SNS have made more accessible and faster interaction around health issues such as validation of experience, seeking or sharing information and validation of advice, treatment and information obtained [7]. Meanwhile, it can serve as key health communication channels to provide a location for online dialogue and encourage communities and individuals to interact by providing information related to disease treatment, and survivorship [8, 9, 10]. At present, patients and their families often cite difficulties such as lack of information, insufficient psychosocial support, and uncoordinated care [11].

Currently, little research is available concerning how people affected by cancer use SNS. Cancer related social network communities have the potential to develop an interactive environment where virtual relationships among cancer patients can be made. In view of the growing presence of technology, it becomes necessary to explore performance in the context of information systems [12]. The majority of research in social network for healthcare was mainly included limited methodologies and mainly descriptive and exploratory in nature [13]. This study considers whether combinations of Task and Technology Characteristics cause a fit that leads to increased performance using Task Technology Fit (TTF) Theory.

That SNS have an effect on health provides strong practical and theoretical justifications for the field of Health Informatics (HI). The discipline of HI explores the value of applying Information System (IS) theories and methodologies to improve systems' success [14].

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SNS seem to be significant for individuals with cancer and there is a need for more research to understand how SNS affect cancer patients' performance using SNS. Therefore, the main research question of this study is the following:

"To what extent the task and technology characteristics fit to affect on cancer patients' performance using SNS?"

2. LITRATURE REVIEW

The literature review of this research study is divided into three main sections. First, a brief description of Health 2.0 is defined. Second, SNS in health care are described. Finally, the theoretical perspective is explained.

2.1. Health 2.0

Health 2.0 describes the combination of health information and health data with patient experience through the use of information and communication technology which enables users to be responsible and active participants in their own health pathway [15]. The term Health 2.0 can be used when Web 2.0 technologies are applied in health [3].

Van De Belt et al. [15] recognized the seven most important topics of Health 2.0 according to both gray and scientific literature in their systematic review paper which are patients, Web 2.0, professionals, social network, change, collaboration and health information. Eysenbach [3] also stated that SNS is central to many Health 2.0 and Web 2.0 applications consisting of explicit modeling of connections between individuals, forming a complex network of relations that facilitate the collaboration process.

2.2. Social Network Sites in Healthcare

SNS are a set of personal contacts that people can use to maintain their social identity and receive many kinds of social supports [16]. Eysenbach [3] stated that social networking is central to many Health 2.0 applications and consists the explicit modeling of connections between individuals, forming a complex network of relations that facilitates collaboration. Luo and Smith, [8] stated that the social network phenomenon is providing an opportunity for patients, physicians, health providers and other stakeholders to effectively share experiences and information in every health context from disease and health to recovery and treatment.

Patient 2.0 emphasizes in active participation of the people in their own health pathway with using information technologies [17]. There is very little literature is known about the advantages of support services for cancer patients. SNS provide the ability for patients to exchange information on subjects such as clinical diagnosis sources of medical evidence, treatment options, adverse treatment effects, the experience of bodily symptoms and experiences with health care providers [18].

2.3. Task Technology Fit Theory

It is useful to apply theories because they provide a framework in research. Few efforts have been done to explain how information technology can be used to measure, monitor and proactively intervene across all of dimensions to continually build an effective system of cancer care and improve performance [11]. Understanding of how SNS effect on cancer patients is limited because of the paucity of studies in the area. Both theory and research suggest that SNS play a critical role for cancer patients.

Goodhue and Thompson [19] take into account the role of technology and the complexity of the clinical tasks which have to be supported by an IT system in Task Technology Fit (TTF) theory. TTF has been used in the area of IS and many of the proposed links within the theory could be validated in many studies [20].

The "Technology" is the interaction of the variety types of tools needed to do a task. "Task" refers to the entire working process that should be completed by the users.This theory describes how technology leads to performance influence at the individual or group level. TTF describe that in order to have a performance impact technologies that fit the task should be utilized. Despite many for the refinements, extensions and variations to TTF, this theory continues to convey a consistent and relatively clear message which is that performance benefits and technology use will result when the technology characteristics are suited properly to the tasks that should be performed [21].

2.4. TTF in Previous Related Research

TTF has been undergoing many modifications to suit the objectives of particular studies [22]. However, a limited number of studies

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have focused on how Task and Technology Characteristics cause a fit in online cancer communities that leads to increased cancer patients' performance using TTF Theory.

There are three types of studies using TTF. First, some of the researches manipulate TTF to investigate the impact of fit experimentally. Second, the individual-level survey research using TTF to enhance understanding of IT adoption. Last but not least, review oriented articles on some form of meta-analysis using this theory [22]. There is some room for works that should investigate the nature of TTF across contexts using a consistent measurement of this theory. Such efforts could generalize understanding of TTF that can be more readily applied to other contexts. These kinds of efforts can also provide valuable insights on how a wide range of contextual factors can affect the nature of TTF [22]. Table 1 illustrates TTF in the previous relevant studies.

Table 1: TTF in Previous Relevant Studies

Researcher(s)	Context	Results
Ammenwerth et al., [20]	User acceptance of computer-based nursing	• Results can be used to assist computer-based nursing documentation systems.
Hsia et al., [23]	Nursing knowledge management systems	• The framework indicates the critical knowledge management activities in nursing process.
Kilmon et al., [24]	EMR	• A useful diagnostic tool for assessing health care information systems implementation.
Yusof et al., [25]	Health information system	• The new framework for health information system evaluation that provides a technological, human and organizational fit.
El-Gayar et al., [26]	Electronic Health Record (EHR)	• The impact on individual performance of EHR.
Karsh et al., [27]	Hospital technologies	• The relationship between self-efficacy and the ability to provide quality care. • Health IT is easy to use, useful, and compatible with health care providers' work style.
Or and Karsh, [28]	Heath IT Acceptance among Patients	• Existing literature focused largely on patient-related factors. No studies examined the impact of social and task factors on acceptance.
Bhargava and Mishra ,[29]	EMR	• The impacts of EMR implementation depend on the duration for which the EMR has been implemented and physician specialties.
Tariq and Akter, [30]	M-Health	• Evaluating the contribution of M-Health in improving the performance of the health workers and its alignment with the current workflows to guide its utilization.
Rho et al., [31]	Physicians' intention to use Tele-Monitoring	• TTF of Tele-medicine had a direct impact on the behavioral intention to use. • TTF also affected the intention to use through perceived usefulness and perceived ease of use.
Laugesen, [32]	Electronic Personal Health Record (EPHR)	• Understanding of PHR adoption by chronic disease patients.
Cady and Finkelstein, [33]	Tele-Health	• Tele-Health must provide the right information and at the right time to the right clinician.
Lin, [34]	Mobile nursing information system	• TTF and organization readiness are the factors that most strongly influence the usage of mobile nursing information system.

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3. METHODOLOGY

The study was designed as questionnaire-based adopted from the previous research (section 3.1).To ensure the content validity of the survey instrument in the context of this research study, three experts with HI research experience in scale development and quantitative methods have evaluated its content validity.

Based on purposive sampling,178 breast cancer patients who spoke English, Malay, Mandarin and Tamil, were at least 25 years old and had experience using SNS were included in the study. The study was conducted in two hospitals and four cancer support groups in Peninsular Malaysia between January and July 2014. This study used paper based questionnaire to collect data from the respondents. The advantages of paper based questionnaire are not only that they require less time and resources to develop, but are much easier because 'what you see is what you get' [35]. Smart PLS 2.0 M3 was used to analyse two main stages: (1) assessment of the measurement model, including items reliability, discriminant and convergent validities (2) the assessment of the structural model.

Coltman et al. [36] framework for the construct measurement that uses theoretical justification to describe the nature of the focal constructs, and empirical tests to support the causal direction between constructs and their measures has been used in this study.

3.1. The Constructs Definition

The following are the definitions of TTF in this study:

- **Task characteristics** can be defined as actions performed by users in inserting, retrieving or using information from SNS to meet their needs. The task characteristics questions in the current work are taken from [19, 37, 38] modified to fit the current research study.
- **Technology characteristics** refer to four dimensions which are SNS functionality, SNS Integration, information quality and ease of use [37, 38].
- **Performance** is described as behavior and outcome [39, 40, 41, 42]. The behavioral aspect refers to what individuals do in the work situation. The outcome aspect refers to the consequence of the individuals' behavior [40]. The outcome of one's task performance can be assessed in terms of effectiveness [39]. Effectiveness is defined as the kind of support that can be obtained through online interaction in the social network [43, 44, 45]. The manner in which cancer patients want to receive cancer-related information has also been documented [46].

4. RESULTS

The measurement model (Outer model) explores the relationship between a latent variable and its items. In contrast, the structural model (Inner model) specifies to what extent particular variables affect changes in the values of other latent variables in the model. The evaluation of a structural model involves an assessment of the relationship between constructs in the model.

4.1. Assessment of Measurement Model

PLS algorithm was used to assess the reliability and validity of the survey. Cronbach's coefficient alpha, Composite Reliability (CR), Convergent validity, and Discriminant validity were analysed for the measurement model assessment.

4.1.1. The reliability of the instrument

The reliability was tested using Cronbach's coefficient alpha. Cronbach Alpha coefficient is a measure of squared correlation between observed scores and true scores. For most studies, greater than .65 is recommended [47]. Table 2 shows the results of Cronbach's Alpha and Composite Reliability tests.

Table 2:The Results of Reliability Test

Construct	Cronbach's Alpha	Composite Reliability
Performance	0.8960	0.9183
Task Characteristics	0.8492	0.8885
Task Tech Fit	0.8567	0.9127
Technology Characteristics	0.9409	0.9463

Table 2 shows Cronbach Alpha for this study ranges from 0.8492 to 0.9409 and Composite Reliability ranges from 0.8885 to 0.9463 and this is above the recommended value of 0.65. Therefore,

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the items used to represent the constructs are reliable.

4.1.2. Convergent validity

Convergent validity is the extent to which a measure correlates positively with alternative of the second construct [48].

Convergent validity was then tested using Average Variance Extracted (AVE) that should be a value greater than 0.5 to be confirmed [49]. Table 3 shows AVE is greater than 0.5 for all of the main constructs so the value was considered to indicate good convergent validity.

Table 3:The Results of Convergent Validity

Constructs	AVE
Performance	0.8315
Task Characteristics	0.5712
Task Tech Fit	0.6850
Technology Characteristics	0.5699

4.1.3. Discriminant validity

Discriminant validity tests whether the items do not unintentionally measure something else [50]. Discriminate validity was tested by evaluating AVE and comparing the square root of its value to the latent variable's inter-correlations with other latent variables [51]. Table 4 shows the results of Fornell-Larcker's criterion test for the main constructs.

Table 4 illustrates that the square root of AVE is greater than the latent variable inter correlations with other latent variables.

4.2. Assessment of Structural Model

Once the construct measures are reliable and valid the structural model is assessed. This involves examining the model's predictive capabilities and the relationships between the constructs [48]. Task characteristics and Technology characteristics should fit to have (β=0.122, t value=2.389) significant positive relationship with performance. In conclusion, the research model as a whole explains 53% of the variance in cancer patients' performance in using SNS.

TTF effects on individuals' performance are considered in HIS research [30, 52]. However, there is no research available which considers TTF theory in the context of cancer patients' performance using SNS and most researches are descriptive on the potential benefits of SNS for cancer patients.

5. DISSCUSSION

Cancer related social network communities have the potential to develop an interactive environment where virtual relationships among cancer patients can be made. In view of the growing presence of technology, it becomes essential to explore performance in the context of information systems [12]. Most of the studies on SNS for cancer patients are descriptive and studies on cancer patients' behavior in SNS should be explored [10]. Interestingly, literature shows that despite huge amounts of research situational factors such as task and technology characteristics are rarely included [53].

The hypotheses of this study consider whether combinations of Task and Technology Characteristics cause a fit that leads to increased performance. TTF is one of the well-known theories in IS used to study the relationship between Task and Technology Characteristics.

Table 4:The Results of Fornell-arcker's Criterion Test

	Performance	Task Characteristics	Technology Characteristics	Task Technology Fit
Performance	0.9118			
Task Characteristics	0.6192	0.7558		
Technology Characteristics	0.6343	0.6159	0.7549	
Task Technology Fit	0.6417	0.6484	0.6595	0.8276

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TTF theory defines that when the characteristics of individuals' tasks and characteristics of the technology integrate well together, the individuals' performance will be high [17]. Therefore, the following hypotheses were examined:

H6: Task Characteristics of cancer patients in using SNS has a significant effect on TTF.

H7: Technology Characteristics of SNS has a significant effect on TTF.

H8: TTF has a significant effect on cancer patients' performance in using SNS.

Empirically, the results show that TTF factors directly affect performance [54]. The consistency of the characteristics of the technology with the individuals' tasks requirements leads to the enhancement of performance [19]. The findings of this study provide evidence to support hypotheses in which Task Characteristics of cancer patients in using SNS has a significant and positive effect on Task Technology Fit (TTF), (β=0.390, t value=4.967), Technology Characteristics of SNS has a significant and positive effect on TTF, (β=0.419, t value=4.956), and TTF has a significant and positive effect on cancer patients' performance in using SNS, (β=0.122, t value=2.389) accordingly.

The need for further investigation into factors that could affect cancer patients' performance in using SNS is extremely valuable, for both practitioners and academics, which might help online cancer support groups obtain a more comprehensive view about the way SNS effects on cancer patient' performance.

6. CONCLUSION

The factors that affect the performance of cancer patients is investigated using 178 respondents in two hospitals and four cancer support groups in Peninsular Malaysia. Most of the studies on SNS for cancer patients are descriptive and studies on cancer patients' behavior in SNS should be explored [10]. Therefore, there is a need for conducting more research to understand factors that can potentially affect cancer patients' performance in using SNS. Active use of SNS by health care institutions could also speed up information and communication provision to patients, thus increasing quality even more [15].The results show that cancer patients' performance in using SNS was determined directly by fit between task and technology characteristics.

In future studies the survey instrument can be tested further with larger sample involving more respondents and different cancer support groups and hospitals. Since SNS seems to be significant for individuals with cancer there is a need for more research in order to understand the ways SNS affect cancer patients' performance in using SNS.

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