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GPRS TECHNOLOGY AWARENESS AND THE INTEREST TOWARDS POSITION AWARE SERVICES

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LIST OF ABBREVIATIONS

A-GPS	Assisted GPS
AOA	Angle of Arrival
BSS	Base Station System
CDMA	Code Division Multiple Access
CI	Cell Identity
D-GPS	Differential GPS
EDGE	Enhanced Data Rated for GSM Evolution
E-OTD	Enhanced Observed Time Difference
GGSN	Gateway GPRS Support Node
GPRS	General Packet Radio Service
GPS	Global Positioning System
GSM	Global System for Mobile Communications
GTP	GPRS Tunnelling Protocol
HLR	Home Location Register
HSCSD	High Speed Circuit Switched Data
IP	Internet Protocol
LAN	Local Area Network
LBS	Location Based Services
MLP	Mobile Location Protocol
MPSS	Map Positioning Support System
MS	Mobile Station
MSC	Mobile Switching Center
OTDOA-IPDL	Observed Time Difference of Arrival – Idle Period Down Link
PDN	Packet Data Network
QoS	Quality of Service
RFID	Radio Frequency Identification
SGSN	Serving GPRS Support Node
SIM	Subscriber Identity Module

SMS	Short Message Service
TAM	Technology Acceptance Model
TA	Timing Advance
TCP/IP	Transmission Control Protocol/Internet Protocol
TDMA	Time Division Multiple Access
TOA	Time of Arrival
TRA	Theory of Reasoned Action
UMTS	Universal Mobile Telecommunications Systems
VLR	Visitor Location Register
WAP	Wireless Application Protocol
WLAN	Wireless Local Area Networks
2G	Second Generation Mobile Telecommunications Service
2.5G	2.5 Generation Mobile Telecommunications Service
3G	Third Generation Mobile Telecommunications Service

ABSTRACT

Fundamental of this study is relating to LBS which GPRS is one of the networks that can support LBS. It can be as the access technology and deliverable of LBS info using handheld that is GPRS-enabled. There are many GPRS applications such as location tracking and positioning, file transfer, Internet email, web browsing, video messages and many more. However, even though there is many applications can be developed to be used in GPRS-enabled mobile phone, do mobile users used all those kinds of applications? Do they aware with the technology advent? Besides that, have some difficulties while trying to find out the location of where we are especially in area that we are not familiar. With the advance of wireless technology, the location information could be accessed through mobile phone. Location tracking and positioning is a hot area for technological solutions. Introducing such new mobile application based on position-aware requires study to be done on user's awareness of the related technology used and their interest towards the service.

Individual factors and technology characteristics are several factors that influence uptake and use of technology. Therefore, the purpose of study is to examine factors that influence user familiarity and usage of GPRS technology. Many factors covered in the individual factors however, this study focused only on gender, age and education background. This study also identifies level of user's interest with position-aware service. Survey questionnaires in the printed form are used as the primary data collection for this research study.

By using categorical data analysis, this research found that individual factor like gender, age and education background are independent from the familiarity and usage of GPRS. Slow speed, unstable connection, expensive charge, and limited content are some of the factors that make users dissatisfied with GPRS services. From descriptive analysis and hypotheses testing, this research found that respondents are interested towards position-aware services.

CHAPTER 1

INTRODUCTION

This chapter is written mainly to provide with the background of the study. It gives details of the research questions, objectives, significant, scope and limitation of the study.

1.1 Overview

In our daily life we often face problems of finding actual location of ourselves especially in the area that unfamiliar to us. Map is one of the solutions we always use instead of asking people around or going to the police station. In certain areas there may have information centre that can provide us with public information or latest news or events held in that area either in form of banner, pamphlets, leaflets or big screen like television that is always on. But if there is no such information centre, how can we have that info? Sometimes we also face difficulties to find the actual and even the shortest route to reach certain destination. If we are in the unfamiliar area, we have to ask people around or any other ways to have such information.

However living in the ubiquitous world today, numerous location tracking technologies are available. Location-based applications that focus on position-aware services may help us to solve problems stated above. Moving towards third generation wireless networks, solution for the problems can be accessed by using mobile phone. Position-aware services not only focus on finding other people's location (i.e., Friend Finder), which may concern privacy issues. Actually the position-aware services may help us in finding the exact location of ourselves and in

addition, it can provide us latest news or events held in that area. Besides that, it also can provide us with route direction to go to certain destination. By having those kinds of services directly to our mobile phone, we can save time and in general we can manage our time efficiently. Instead of tracking other people's location, it is beneficial if we can detect our own exact location that may help us from astray and probably may not disturb other people's privacy. Route direction service provided may help in finding the exact path or even the shortest path to go to certain destination and of course when all the services can be accessed directly in mobile phone, paper usage will be reduced.

1.2 Background of the Research

This research is intended to be a pilot study in preparation for a more in depth study of MPSS. MPSS is a mobile application that is based on location positioning. This system is expected to be implemented in third generation wireless telecommunication network. As third generation of wireless telecommunication network in Malaysia is not yet launch while conducting this study and the current wireless telecommunication network is still running under the 2.5 generation, this study is put consideration on user familiarity and use of GPRS. According to Selian (2002), GPRS is an overlay technology that is added on top of existing GSM systems. In other words, the GSM part still handles voice, and mobile phones are capable of supporting both voice and data (via the overlay) functions.

Fundamental of this study is relating to LBS which GPRS is one of the networks that can support LBS. It can be as the access technology and deliverable of LBS info using handheld that is GPRS-enabled. There are many applications can be applied to GPRS such as location tracking and positioning, file transfer, Internet email, web browsing, video messages and many more. However, even though there are many applications can be developed to be used in GPRS-enabled mobile phone, do mobile

users thoroughly used all those kinds of applications? Do they aware with the technology advent?

Besides that, have some difficulties while trying to find out the location of where we are especially in area that we are not familiar. With the advance of wireless technology, the location information could be accessed through mobile phone. Location tracking and positioning is a hot area for technological solutions. Introducing such new mobile application based on position-aware requires study to be done on user's awareness of the related technology used and their interest towards the service.

1.3 Research Questions

This research study will try to answer the following questions.

"Do mobile user aware with the GPRS technology advent?"
"Do mobile user interested to the adoption of position-aware service?"

1.4 Objectives of the Research

By answering the research questions, objective of this study will be reached. The objectives of this study are:

i) To examine factors that influence user familiarity and use of GPRS technology.
ii) To identify level of user's interest with position-aware service.

1.5 Hypotheses of the Research

Hypothesis in statistical theory definition is an unproven proposition or supposition that tentatively explains certain facts or phenomena. In simplest form, hypothesis is a guess. Following are the hypotheses in this research study:

H_0: Gender of respondents and familiarity of GPRS are independent.
H_1: Gender of respondents and familiarity of GPRS are not independent

H_0: Gender of respondents and usage of GPRS are independent.
H_1: Gender of respondents and usage of GPRS are not independent.

H_0: Age of respondents and familiarity of GPRS are independent.
H_1: Age of respondents and familiarity of GPRS are not independent

H_0: Age of respondents and usage of GPRS are independent.
H_1: Age of respondents and usage of GPRS are not independent.

H_0: Education background of respondents and familiarity of GPRS are independent.
H_1: Education background of respondents and familiarity of GPRS are not independent

H_0: Education background of respondents and usage of GPRS are independent.
H_1: Education background of respondents and usage of GPRS are not independent.

H_0: Respondents are interested towards position-aware services
H_1: Respondents are not interested towards position-aware services

1.6 Significance of the Research

The intended research will provide much benefit to researchers as well as content providers and mobile companies in recognizing such service whether it is worth to be implemented in Malaysia.

i) Researchers

It can be utilized as a resource for researchers who deal with matters concerning user awareness of technology advent and their perception about and intension to use new kinds of mobile applications.

ii) Content providers

As for content providers, this research helps them in recognizing such service whether it is worth to be implemented in Malaysia, user's perception about and their intension to use new kinds of mobile applications.

iii) Mobile Companies

The same as content providers, this research helps mobile companies in recognizing whether mobile users are aware of the technology they bring in.

1.7 Scope of the Research

Seeing that current wireless telecommunication networks in Malaysia still running under the 2.5 generation, this study is focus on the factors that influence user familiarity and use of GPRS technology. Factors that influence uptake and use of technology are broad, research on factors that influence user familiarity and use of GPRS technology however focused on first - individual characteristics on the demographic information such as gender, age and educational background and second - technology characteristics on the network capabilities. Target group of

respondents are varies in education background, age and gender. The two most common types of location-based services are location-tracking services and position-aware services. In this research, study on user's interest of such mobile application is focus on the position-aware service. Level of user's interest is scaled into five different value which are highly uninterested, somewhat uninterested, neutral, somewhat interested and highly interested.

1.8 Limitation of the Research

While conducting this research, location based services is not wide implemented and used in Malaysia, some of the respondents did not understand what position-aware service is all about. Besides that, some mobile phone users did not familiar with the GPRS technology, its usage and applications related to it either in the case their mobile phone is GPRS enabled or not. Therefore much missing value indicated in the set of data that is analyzed using SPSS for Windows software version 11.5. From the total of three hundred questionnaires distributed, only hundred and sixty were analyzed. This is due to the unanswered and unreturned questionnaires from respondents.

CHAPTER 2

THEORETICAL CONSIDERATION

This chapter discusses the theoretical behind of the study and their relationship with the conceptual framework or research design of the study.

2.1 Technology Acceptance

Well established perspective exist such as TAM which offer factor such as ease of use and usefulness, relative advantage, compatibility that can, in very general terms help explain the adoption of technologies including, perhaps, mobile devices (Sarker & Wells, 2003).

Kwon and Chidambaram (2000) wrote that similar to TRA, TAM, which is specifically meant to explain computer usage behavior, theorizes that actual computer usage is determined by behavioral intention, but differs in that the intention is jointly determined by the person's attitude toward using the system and perceived usefulness. The attitude toward computers is also jointly determined by perceived usefulness and perceived ease of use.

Study by Kwon and Chidambaram (2000) suggests that user acceptance of new technology is affected directly and or indirectly by individual characteristics; perceived ease of use; perceived usefulness (i.e., extrinsic motivations); enjoyment or fun (i.e., intrinsic motivation) and social pressure.

2.2 Technology Acceptance Model

Study done by Kwon and Chidambaram (2000) was a test of The Technology Acceptance Model: The Case of Cellular Telephone Adoption. Research model presented in this study suggests that user acceptance of new technology is affected directly and / or indirectly by following factors - Individual Differences, Perceived Ease of Use, Apprehensiveness, Extrinsic Motivation, Intrinsic Motivation and Social Pressure.

2.2.1 Individual Differences

Studies have shown that individual differences like gender, age, education, and professional orientation play an important role in the how information technology is used (Zmud, 1979). Studies in the area of marketing have also confirmed the importance of demographic variables in studying adoption (Assael, 1981). In an analysis of diffusion research, Rogers (1995) found that early adopters of an innovation had higher socioeconomic status than later adopters. Status was typically indicated by such variables as income, education and occupational prestige.

2.2.2 Perceived Ease of Use

Perceived ease of use is defined as "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989). A construct that is the opposite of perceived ease of use is perceived complexity, which is defined by Rogers (1995) as "the degree to which an innovation is perceived as difficult to understand and use." Rogers suggests that his research and experiences lead to the conclusion that the more complex a technology is perceived as being, the slower will be its rate of adoption.

2.2.3 Apprehensiveness

The concept of apprehensiveness is similar to "computer avoidance" (Moore, 1989), which results in individuals avoiding the use of computers due to their innate fear of the technology. Even telephones in the early days of their adoption aroused apprehension. Mcluhan (1964) explained such apprehension by labeling the telephone an "irresistible intruder in time and space." Similarly, Mitchell (1984) noted, "a ringing telephone is an intrusion into personal privacy and individual predictability." Pool (1983), while partly agreeing with previous assertions, indicated that the telephone can increase apprehension in some ways while it can decrease apprehension in other ways.

2.2.4 Extrinsic Motivation

Extrinsic motivation refers to the source of behavior prompted by a person's need for external rewards, such as how useful the technology would be (Igbaria, 1993). According to Rogers (1986), relative advantage and compatibility are two important attributes of innovations that affect adoption. He suggested a number of sub dimensions of relative advantage such as the degree of economic profitability, a decrease in discomfort, and savings in time. A study by Tannenbaum (1991) found that people perceived cellular phones as advantageous when they wanted to exert more control over their work environment or to manage their family responsibilities. In a related finding, cellular adopters indicated they had more opportunities to “deal with others” than did non-adopters (Hsu, 1992).

2.2.5 Intrinsic Motivation

Intrinsic motivation is induces activities where "there is no apparent reward except the activity itself" (Deci, 1975). Intrinsically motivated behavior arises from people’s need to feel competent and self-determining in dealing with their environment (Deci,

1975). Previous research on traditional phone use suggests that telephones can reduce loneliness and anxiety, promote a sense of security and well being, increase social interactions, and maintain cohesion within family and friendship groups (Dordick and LaRose, 1992; Williamson, 1993). Other studies (e.g., Pool, 1977) also confirm that intrinsic motivations such as increased freedom and a reinforced sense of existence are instrumental in people choosing to use telephones.

2.2.6 Social Pressure

Social pressure includes the motivations of individuals who believe they should use cellular telephones for obtaining a higher social status or a more important position in their society. The study of microcomputer usage by Igbaria (1993) reports that social norms have significant effects on system usage. Rogers (1995; 1986) also indicates the importance of social norms on the rate of the diffusion of innovations. He defines a norm as "the most frequently occurring pattern of overt behavior for the members of a particular social system." Thus, an important motivation for individuals to adopt an innovation is the desire to gain social status. For certain innovations, the social prestige that the product conveys to its user may be the sole benefit that the adopter receives (Rogers, 1995).

Following Figure 2.1 shows the Research Model in study done by Kwon and Chidambaram (2000).

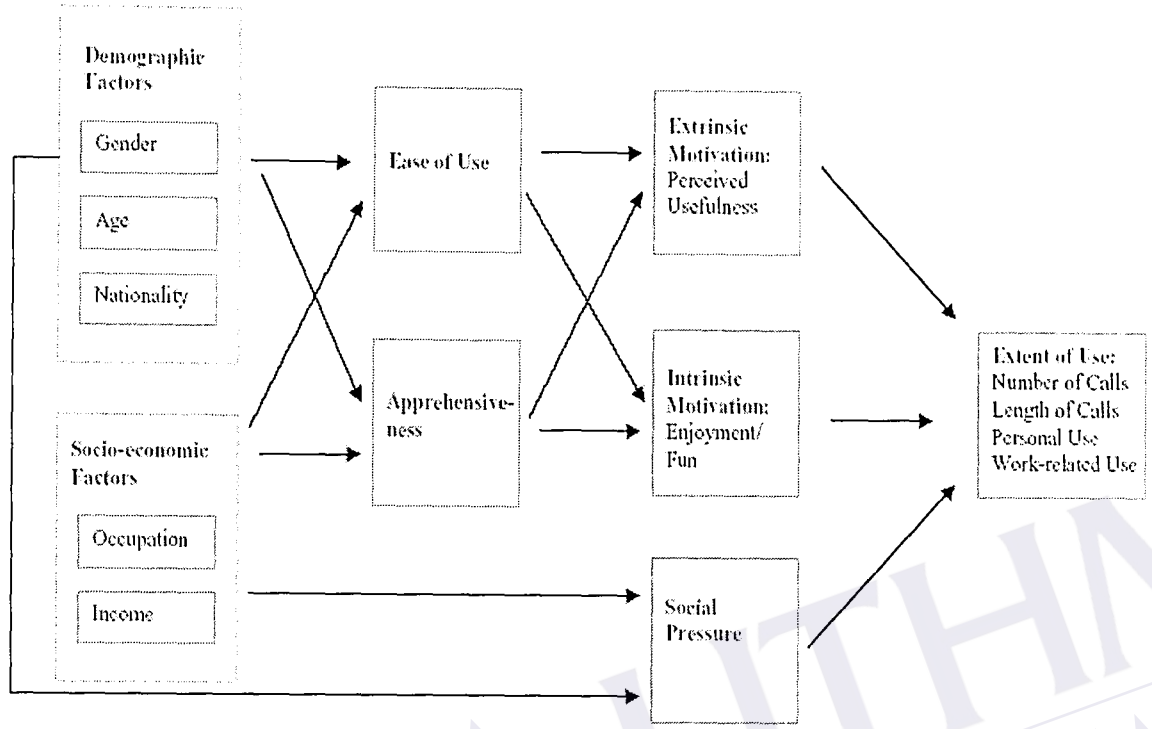

Figure 2.1: **Research model of test on Technology Acceptance Model (Ref: Kwon & Chidambaram 2000)**

2.3 Framework for the Use and Adoption

Study by Sarker and Wells (2003) offered a framework providing an integrative view of the key issues related to mobile device use and adoption by individuals. The framework is structured as an I-P-O (Input-Process-Output) model, and consists of: *Inputs* such as User characteristics, Message / task characteristics, Technology characteristics, Modality of Mobility, and the Surrounding Context; *Process*, consisting of two interacting use subprocesses of Exploration and Experimentation, and Assessment of Experience; and *Output*, referring to the outcome of the use process, specifically, the actual Adoption Decision/Behaviors. Figure 2.2 below illustrates the integrated framework for the use and adoption of mobile handheld devices.

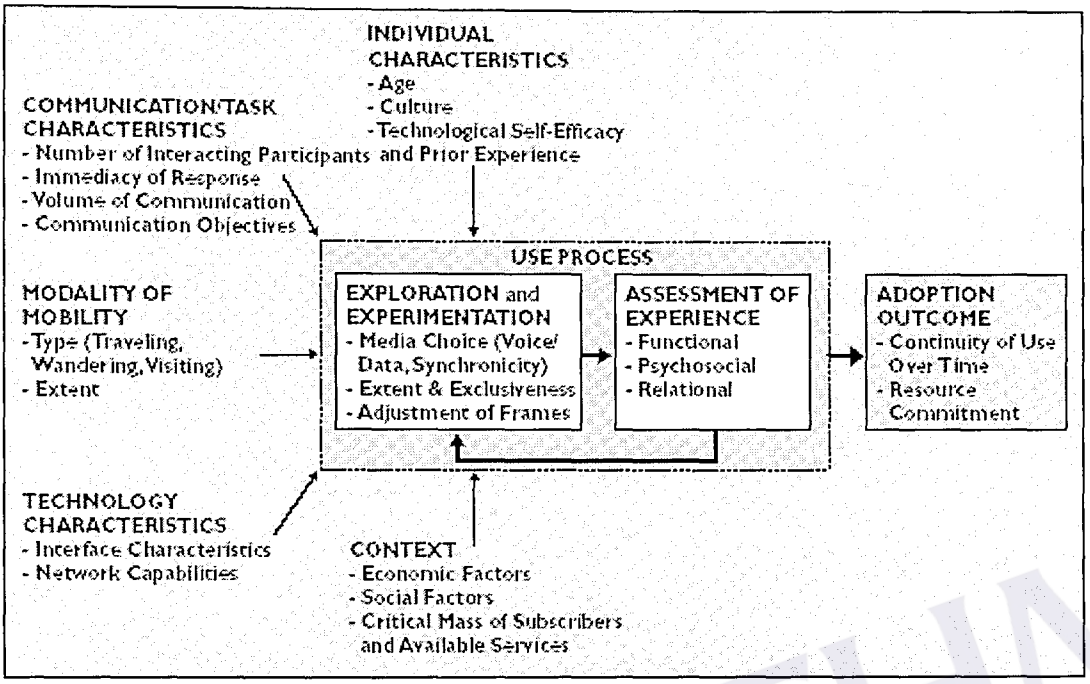

Figure 2.2: **An integrated framework for the use and adoption of mobile handheld devices (Ref: Sarker & Wells, 2003)**

2.3.1 Input: Factors Influencing Use

There are five factors considered as the factors that influencing use, which are Individual Characteristics, Technology Characteristics, Communication or Task Characteristics, Modalities of Mobility and Context.

2.3.1.1 Individual Characteristics

Various factors such as demographics, technology-related skills, and culture were identified as important determinants influencing the implementation and acceptance of wireless handheld phones; three of the most prominent follow.

i) *The age of the potential adopter*, which often can predict whether or not an individual is likely to use mobile technology, especially its data

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