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Analyzing the factors that affect the adoption of mobile services in Taiwan

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ABSTRACT

Most previous research studies on the general factors related to the adoption of mobile services have used multiple regression methods (the technology acceptance mode or structural equation modeling) and some have used MCDM tools. However, these studies still have some shortcomings, so they cannot provide the enough precise information about these factors and their weightings. This information is needed by firms so that they can allocate their limited resources to the most important factors and draw appropriate strategies to improve the content and quality of their mobile services. This study reviewed the literature and constructed a three-layer hierarchical table of the factors that affect consumers' adoption of mobile services. A pair-wise questionnaire was then designed and distributed to managers who are familiar with the mobile services of Chunghwa Telecom, a leading telecommunication company. From the data collected, the weight of each factor was directly calculated, using the fuzzy analytic hierarchy process (FAHP). The paper analyzes the importance of factors and three implications are also discussed. Hopefully, this knowledge will enable firms to better utilize their limited resources, by devising management strategies based on the weights of these factors, and therefore, to meet consumer demand at lower cost and with greater efficiency.

1. Introduction

Since the introduction of mobile broadband wireless access (MBWA) technologies, such as high-speed downlink packet access (HSDPA), wide band code division multiple access (WCDMA), CDMA2000, time division-synchronous code division multiple access (TD-SCDMA), worldwide interoperability for microwave access (WiMAX), and long term evolution (LTE), many mobile service operators have started to provide mobile services to their customers. MBWAs are emerging wireless telecommunication technologies that provide users with high-speed Internet access. More and more customers are now using smart phones to access mobile services, and mobile service is developing rapidly. However, more than 50% of the users of mobile services are still not satisfied with the services they receive in Taiwan [17]. This indicates that the mobile service market still has considerable opportunities for growth. Mobile service operators or handset makers could increase their competitiveness if they were able to improve their performance in meeting consumer demand. Consequently, it is very important that they understand the requirements of mobile service users and the relative weight of each factor that determines the consumers' needs.

A great deal of research has been done in order to fully understand these factors and their significance. However, most previous research in this area has focused on the general factors related to the adoption of mobile services, using multiple regression as the research method [9,11,24,29]. Although the beta value in multiple regression can be expressed as the relative

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weights of the factors, its value is obtained indirectly through testing. Also, due to the measurement errors of independent variables and dependent variables, prediction errors can occur between real dependent value and predicted dependent value, and collinearity problems between independent variables can ensue. Moreover, a minus value of beta could be obtained, making it difficult to judge the importance of the resulting value. Therefore, few studies have used the beta value to measure the weights of the factors.

An MCDM tool can be used to analyze different factors and determine their ranking in order of their importance to the adoption of new services, because factor selection is a multi-criteria decision-making (MCDM) problem. Some independent studies have applied MCDM tools directly, in order to obtain the relative weight of the factors from the viewpoint of experts. Jeng and Bailey [23] also used ANP to find the factors of customer retention in the Canadian mobile telecom market and found that well-financed foreign entrants pose a risk to the major domestic carriers. Thus, successful promotional strategies will require strong leverage of their existing price and quality advantages.

Büyüközkan [7] used the fuzzy analytic hierarchy process (FAHP) to propose an analytic framework based on mobile commerce (m-Commerce) users and area experts and to provide practitioners with a more effective and efficient model for prioritizing m-Commerce requirements. Nikou and Mezei [33] also used AHP, based on students' opinions to understand the adoption of mobile services. However, these studies lack an understanding of the adopted factors from a business perspective. Büyüközkan [7] also suggested that further research could apply FAHP to study the adoption of m-Commerce from the perspective of enterprises.

Moreover, we found that previous studies of using MCDM tools only focus on mobile communications services [10], and thus, lack the factors of handset equipment and the psychology of consumers, and only a fraction of the relevant factors (less than ten) were surveyed [7,10,23].

Also, previous studies provided an imperfect hierarchy structure, in which faulty weightings could occur in the streaming of the weighting if there is different number of sub-criteria under each criterion [7,10,33]. For example, faulty weightings can occur if there are two criteria in the two layer hierarchy table, but criteria 1 has two sub-criteria and criteria 2 has four. The sub-criteria in criteria 1 could have a higher ranking than sub-criteria in criteria 2, even though the weighting of criteria 2 is greater than that of criteria 1, because the weighting of each sub-criterion in criteria 2 has to be shared by more sub-criteria.

Moreover, the AHP method does not truly reflect human cognitive processes — especially in the context of problems that are not fully defined and/or problems involving uncertain data (the so-called, 'fuzzy' problems) [33]. Based on the above shortcomings, these previous studies cannot provide precise information about enough factors and their weightings. This information is required by firms to allocate their limited resources to the most important factors and draw appropriate strategies to improve the content and quality of their mobile services. To address this problem in a different way than in previous studies [7,10,23,33], this study was expanded to include a large amount of literature related to the adoption factors of mobile services and constructed a three-layer hierarchical table of these factors, in which the weighting of each upper layer criterion has been shared by the same number (three) of down-layer criteria, so that the conflict in the ranking of the upper-layer criteria and the sub-criteria layer will not occur. A pair-wise questionnaire was then designed and distributed to managers who are familiar with the mobile services of Chunghwa Telecom, which has a 40% market share of the mobile service users in Taiwan. The weightings of factors were calculated by using the FAHP. The resulting implications for marketing are discussed, based on the results of this study, with the goal of enabling service providers to increase their competitiveness by meeting consumer demand more effectively.

2. Literature review

Many researchers have examined the adoption of mobile services, and most of the related studies can be classified into three categories: those that look at the equipment (hardware) and at general mobile services, those that focus on specific applications, and those that study the psychology of mobile users.

Regarding handsets, the perceived utility of the new handset directly stimulates consumers to purchase 3G mobile phones, which Teng et al. [43] and Pagani [34] think will satisfy the service-expectations of the users. However, the users then require service advantage, such as bandwidth, transmission speed, security and privacy. Biel et al. [3] indicated that users need stable equipment to access mobile applications. Thus, high quality telecommunication equipment is necessary. In addition, Boyd and Mason [5] have verified that the manufacturer's reputation affects the attractiveness of the product and purchase intention.

Besides this requirement for basic equipment, innovation, knowledge, technological cluster, age, gender, perceived usefulness, perceived enjoyment, perceived ease of use, price, and speed of use have been found to be the key factors affecting the adoption of mobile services [21,34,47]. Chong et al. [11] concluded that the perceived advantages, the perceived ease of use, the variety of services and social influence are factors that can influence the adoption of mobile services in Malaysia. Kwak and Yoo [27] also indicated that data rates, the quality of communications service, the number of broadcasting channels, video-on-demand (VOD) service, and supplementary services are attributes of consumers' willingness to pay for fourth generation (4G) technology.

Moreover, Blechar et al. [4] revealed how users' choices of mobile services in Denmark are influenced by their reference situations and the reference prices of the services offered. In addition to the technologies and mobile services offered, standards, infrastructure and content are also key factors influencing the adoption of mobile services [2].

In the special applications of mobile services, most mobile service applications focus on business-to-consumers (B2C). In the applications of mobile payment service, Schierz et al. [41] found that compatibility, individual mobility, and subjective norms are significant factors. In the mobile learning aspect, Chong et al. [12] indicated that perceived ease of use, perceived usefulness, quality of services, and cultural aspects have significant and positive effects on the adoption of mobile learning in Malaysia. In applications of mobile ticketing, Mallat

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