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Developing, applying and measuring an e-Prescription Information Systems Success Model from the perspectives of physicians and pharmacists

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Confirmatory factor analysis;
Health information systems

Abstract
This study aims to empirically test an e-prescription success model with 8 constructs consisting of Information Quality, System Quality, Service Quality, Social Impact, Facilitating Conditions, Use Dependency, User Satisfaction and Net Benefit. A total of 254 participants including physicians and pharmacists in 3 different provinces of Turkey were included in the study group by simple random sampling method. Measurement instrument was found to be reliable. SPSS 19 package was used to determine construct validity of the model and AMOS 22 software was used to determine model data fit after explanatory factor analysis. CFA showed that fit indices of the model were within the desired intervals. The success model developed was tested using correlation and regression analyses to determine the relationship between the observed variables. It was found that the pharmacists and physicians were moderately satisfied with the e-prescription system and there was no statistically significant difference between their total scores for perceived Net Benefit. Facilitating Conditions for the system and Social Impact had a significant impact on User Satisfaction. It was found that Use Dependency and User Satisfaction were important predictors of Net Benefit. It can be stated that User Satisfaction and indirectly Net Benefit of e-prescription system will increase when Facilitating Conditions are created for the users.

Introduction

Developments in information technologies at a global level have affected the health sector like many other fields making the use of information technologies in hospitals

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compulsory [1]. In this respect, a need has arisen for Turkey to use a Hospital Information System (HIS) at national standards [2]. Policies such as HITECH that are extensively used in the USA have made it inevitable to use a similar system in Turkey. HIS is designed to perform hospital functions related with patient-care such as patient management, financial and legal transactions of the hospital [3]. Therefore, a HIS is an integrated information system that plays a crucial role to support hospital works by the use of appropriate hospital information systems [4]. A successful HIS application perspective is crucial to provide developed health services [5]. However, although health organizations use HIS, the physicians have used handwritten prescriptions during medication selection for the treatment of their patients. Handwritten prescriptions have been associated with certain problems such as the risk of misinterpretation and falsification of handwritten prescriptions and the difficulties of legibility, which prompted the use of electronic prescriptions (e-prescriptions) [6]. e-Prescription systems are considered as an instrument to minimize medication errors in pharmacies [7]. Electronically produced prescriptions are transmitted to pharmacists by the physicians over a safe network [8].

e-Prescription system was introduced in Turkey in 2013 with the aim of improving the quality health services provided by healthcare institutions. Thus developing a method to measure the success of this relatively new system will guide policy makers in their future decisions to enhance this system.

The purpose of this study is to empirically test the theoretically developed e-prescription success model considering the developments in healthcare sector in the first sub-problem of the study. The study used e-Prescription Information Systems Success Model (EPISSM) developed from Clinical Information Systems Success Model (CISSM) [10] that was based on DeLone and McLean's Updated Information Systems Success Model [7]. The second sub-problem of the study attempts to reveal that high-quality information is attainable by the individuals who provide and receive health services and to measure User Satisfaction from e-prescription system that is used by the pharmacy personnel and physicians. To this end, a group of 254 pharmacists, pharmacist assistants, practitioners, physicians and professors in Aydın province of Turkey were administered a questionnaire for data collection.

Concepts and literature

e-Prescription and information systems

In health sector, which has intensive information needs, hospitals needed to use various IT applications that offer solutions to meet their administrative needs, to enhance operational effectiveness and efficiency with a reasonable cost and to provide timely and accurate information. Rapid developments in IT applications have led to extensive use of IT to support special health tasks and services [11]. Hospital information systems (HIS) are believed to enable faster access to hospital data and to enhance efficiency in communication [12]. Despite significant user resistance to HIS [13] these developments have revealed the necessity of user adoption dimension in information technologies to evaluate the success of IT applications. When compared to the information systems used by the hospitals, the positive relationship between information systems and organizational performance gained importance to understand user behavior of healthcare personnel to use hospital information systems. Previous research has shown that health professionals play a vital role in adoption and assessment of HIS [14,15].

Medication errors are frequent in prescriptions, which are one of the most important outputs in health sector. [16]. 20% of medical negligence treatment claims result from medications errors. Prescription errors bring extra costs for individuals and have financial impacts on the government. These errors can occur in various stages such as prescription, transcription, dispensing and drug administration and the effects of these errors have varying levels of severity [17]. In parallel to the developments in technology, e-prescription, which has been developed to prevent errors, involves direct transmission of prescriptions from the working environment of physicians to pharmacies via computers [18]. e-Prescription systems record all format information of a prescription in electronic environment. Health institutions, pharmacy, refunding institution and other individuals/stakeholders can access prescription data to the extent they are authorized to, and thus all operations regarding the supply, refund, register and follow-up of medications can be performed in electronic environment [19]. In other countries such as the United Kingdom, e-prescription can be made in two methods: 1) a mechanism in which prescribers can download a prescription automatically from a central network or a mechanism in which the prescribers can produce an e-prescription. However, the system uses paper in prescription infrastructure. 2) A mechanism in which the prescribers can produce an electronically coded signature and can electronically transmit the prescription to the pharmacy rather than physical transport made by the patient [20]. Although verbal prescriptions or those sent by facsimile are legal in the United States, only electronic or handwritten prescriptions are valid in countries like United Kingdom and Holland. Pharmacists can save time by processing the prescriptions which they do not have to manually enter pharmacy information system [21].

MEDULA (MEDikal Ulak) system which was initiated by Social Security Institution of Turkey (SGK) in 2006 to accelerate and regulate paybacks in health system was one of the first applications of technology in Turkish health system. MEDULA is an integrated system in which information about health services are transferred in electronic medium between SGK and hospitals, invoice information are collected and paybacks are made. MEDULA aims to organize payback in health expenditures in electronic media. MEDULA was begun to be applied in state hospitals on 1/9/2006 as per articles 78 and 100 of Law on Social Security and General Health numbered 5510. All billing transactions have been made over MEDULA system since 1 September 2007. e-Prescription system between HIS, MEDULA and pharmacies is presented in Figure 1. In Turkey, e-prescription project was initiated by the SGK on 1 July 2012 with the purpose of collection the prescriptions which are paid by the SGK electronically. e-Prescription project

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