Physicians' Adoption of Electronic Medical Records: Model Development Using Ability – Motivation - Opportunity Framework

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Abstract. The benefits of electronic medical record (EMR) adoption by medical personnel, such as physicians, and medical organizations have been discussed in previous studies. However, most of medical personnel and organizations still use traditional paper-based medical records or use EMR ineffectively. This study aims to develop a model of EMR adoption among physicians and analyse the factors influencing the adoption. The model is developed base on Ability, Motivation, and Opportunity (AMO), adapted AMO, and Motivation-Ability FrameworkTen hypotheses were developed in this study. The next part of the study will be done to operationalize and empirically test the model using a survey method.

Keywords: EMR, Adoption, AMO, physicisians.

1 Introduction

In article 46 paragraph 1 of Medical Practice Law [21], a medical record is defined as "file that contains records and documents about a patient's identity, and also medical examinations, treatments, actions, and other services provided to the patient". Medical records can be used to help physicians in documenting historical records and patient service management [17], [22]. Compared to paper-based medical records, electronic medical records (EMR) give a greater possibility for physicians to improve their work performance quality [17]. The impact of the use of EMR is also mentioed in [13] which stated that 64.3% of studies on EMR found that EMR can improve the performance of medical personnel.

Although benefits of EMR have been scientifically discussed by many studies, most of medical personnels use traditional paper-based medical records or use EMR ineffectively. It may be attributed to the failure in EMR adoption [14] that is related to users' motivation, which consists of internal and external factors [23]. Considering the low adoption rate of EMR among medical personnels, the study reported here aims at developing a model that helps to explain the adoption of EMR by physicians. Although some studies had been done on EMR adoption, most of the respondents in

previous studies are medical personnel or medical organizations that have knowledge and have used EMR in some or all processes of their services [8], [13], [14], [17], [22]. A small number of studies discussed EMR adoption in the preparation stage with personnel or medical organizations who have not adopt EMR as their respondents [4], [6], [11], [19]. Further, most of the medical personnel in previous studies are not physicians [3], [8], [9], [13], [24]. Considering the gap in literature mentioned above, this study aims at developing a model of EMR adoption among physicians with physicians who have adopted and have not yet adopted EMR as respondets and analyze the factors influencing the adoption.

2 Model Development

2.1 Ability, Motivation, and Opportunity Theory

Ability, Motivation, and Opportunity (AMO) theory explains that information processing by a person depends on his motivation, opportunity and ability [10]. In this theory, "Motivation" influences "Behavior" with "Ability" and "Opportunity" as moderating influencing factors. The relationships are presented in Figure 1.

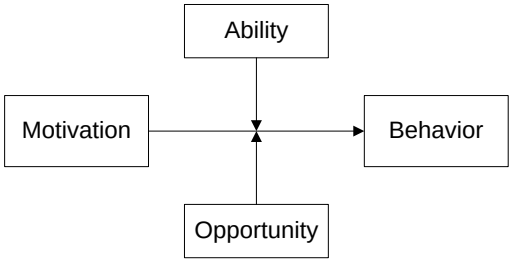

Fig. 1. Ability, Motivation, and Opportunity Theory. [10]

Introduced to model brand information processing from advertisements, the variables in the model were defined in the context of advertisement. Ability is defined as skill or proficiency in interpreting brand information in an advertisement [15]. Motivation is defined as the desire to process brand information in the advertisement [15]. Opportunity reflects the extent to which circumstances evidenced during advertisement exposure are favorable for brand processing [15].

Firstly used in studies on information processing such as study on new product information processing [7] and extended study on brand information processing [16], AMO framework has been used in many studies in different areas of research. In the innovation adoption area, AMO was among others used to understand the individual behavior in the online commerce adoption [23]. AMO was also used to discuss the public health and social issue behaviors [20] and consumer behavior [18].

2.2 Adapted Ability, Motivation, and Opportunity Theory

Among the studies that are based on AMO, there are studies that proposed "Intention" as variable that mediates the influence of "Motivation" on "Behavior" (e.g. Olander & Thogersen, 1995). Further, [18] used "Ability" and "Opportunity to moderate the influence of intention on behavior. The adapted AMO framework developed by Olander & Thogersen (1995) is presented in Figure 2.

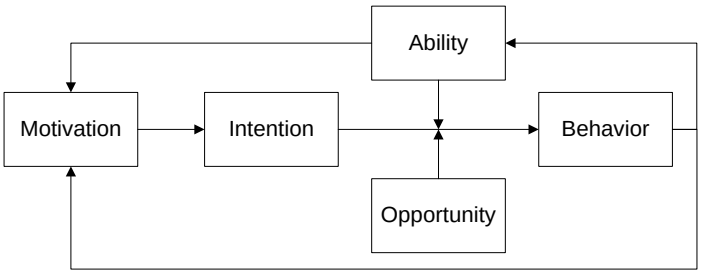

Fig. 2. Adapted Ability, Motivation, and Opportunity Framework [18]

2.3 EHRS Adoption Model

Anderson et.al [2] stated that in an innovation adoption, individual behavior is influenced by ability and motivation. The Electronic Health Record System (EHRS) Adoption Model developed by Anderson et.al [2] is presented in Figure 3. In the case of technology adoption, ability is related to a person's information system skill and is defined as "Practice ability". In the model, "Practice Ability" consists of "IT infrastructure", "IT related intangibles", and "Physician IT readiness". In addition to "Practice ability", "Practice Motivation" is argued to have an influence on EMR adoption. Motivation pushes a person to give responds. The respond possibilities are willingness to adopt or to not adopt EMR. Motivation sources are external and internal factors. Motivation from external factors, which is called extrinsic motivation, is classified into "Extrinsic coercive pressure" and "Extrinsic normative pressure". Meanwhile, intrinsic motivation from internal factors is called "Intrinsic perceived value".

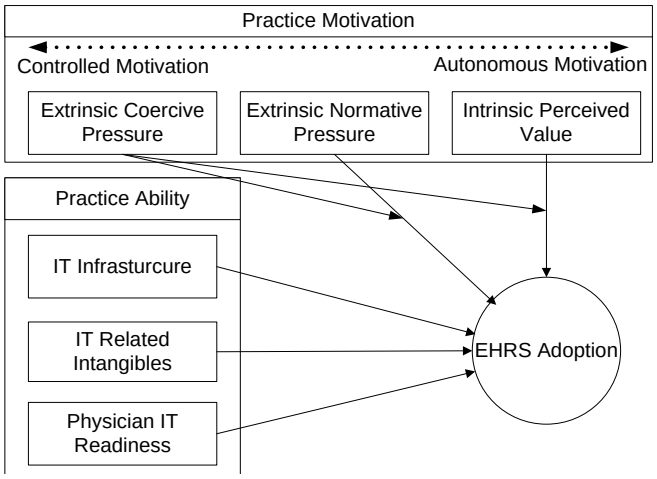

Fig. 3. EHRS Adoption Model [2]

2.4 Research Model Development

Based on AMO framework, Adapted AMO, and EHRS Adoption Model, this study developed a model of EMR adoption among physicians. In general, AMO was used as the main theoretical foundation in building the research model. In this study "Motivation", "Opportunity", and "Ability" were defined as physicians' motivation, opportunity, and ability to adopt EMR. AMO theory is used as a foundation in building the model because it is believed that in the context of EMR adoption, "Motivation" is considered as the drives, urges, wishes or desires which initiate the physician intention to use EMR [15]. "Ability" can facilitate physician in performing adoption of EMR and "Opportunity" is interpreted as situational factors that encourage physician adoption of EMR.

"Behavior" in MOA was changed into "EMR adoption". "Behavior" can be achieved through "Intention" which is controlled by conscious motivation by the physician [1]. Thus, "Intention" was added to mediate the relationship between "Motivation" and "Behavior"/"EMR Adoption". It is in line with the concept used in [10] and adapted MOA model used in [18], which are originated from the Theory of Planned Behavior (TPB). TPB stated that "Intention" is indication of how hard people are willing to try in order to perform a behavior [1]. In line with [18], we argue that "Ability" and "Opportunity" moderate the influence of "Intention" on "Adoption". "Ability" is defined as the capabilities that facilitate physician in performing adoption of EMR whereas "Opportunity" is defined as situational factors that encourage physicians to adopt EMR.

As presented in Figure 4, there are 10 variables and 3 variable groups in the model. In the next part, the development of the hypoteses will be discussed. The discussion will be presented in the following four different parts:

1) Intention.

The first hypothesis in this study is that "Intention" to use EMR will have an impact on "EMR Adoption" (behavior).

H1: Physicians' "Intention" to use EMR positively influences their "EMR adoption".

2) Motivation.

The first variable group is "Motivation" which is adapted from [15] and [2]. In this model, "Motivation" consists of "Extrinsic coercive pressure", "Extrinsic normative pressure", and "Intrinsic perceived value". "Extrinsic normative pressure" is is normative in nature and addresses the question of how many other practices with which the focal practice routinely interacts have already adopted EMR [2]. In a study of interorganizational linkages adoption, normative pressure exhibited the strongest influence on organization-level technology adoption" [2]. Intrinsic motivation from internal factors is called "Intrinsic perceived value". Intrinsic motivation involves an individual acting out of an internal belief that the activity is interesting, good, satisfying or right. Intrinsic motivation is inherently autonomous and the behavior showed by it is characterized by individual choice and volition [2]. This form of motivation tends to yield positive outcomes in terms of job satisfaction, effective performance and feelings of competence [2].

H2: "Extrinsic normative pressure" felt by physicians positively influences their "Intention".

H3: Physicians' "Intrinsic motivation" positively influences their "Intention".

A physician will be eager to adopt EMR, if he often interacts with external stakeholders who also use EMR [2], [12], [23], [25]. As an example is a situation in a clinic in which medical services have already been done with the support of EMR. Physicians who work at the clinic receive pressure to adapt and follow the technology development. In this situation, the physicians are usually more cooperative to adopt EMR.

H4: "Extrinsic normative pressure" positively moderates the influence of "Intrinsic perceived value" on "Intention" to use EMR.

"Extrinsic coercive pressure" is defined as pressure to adopt EHRS from external entities [2]. The forceful characteristic of "Extrinsic coercive pressure", which examples are government laws, hospital regulations, and medical association standards, influences physicians to respond negatively to the pressure itself [2], [5], [17]. In line with [2], this research also addresses interactive relationship between motivating factors. "Extrinsic coercive pressure" may be a motivating factor, but this motivation is a form of controlled motivation that undermines the positive influence of intrinsic motivation. It means that "Extrinsic coercive pressure" is a factor that reduces the influence of physicians' "Intrinsic perceived value" on "intention" to use EMR [2].

H5: "Extrinsic coercive pressure" negatively moderates the influence of "Intrinsic perceived value" on "Intention" to use EMR.

The influence of "Extrinsic normative pressure" on "EMR adoption" is also influenced negatively by "Extrinsic coercive pressure" [2]. It is based on the assumption that the "Extrinsic coercive pressure" reduces the positive influence of "Extrinsic normative pressure" in a similar way it influences the positive influence of "Intrinsic perceived value" on "EMR adoption".

H6: "Extrinsic coercive pressure" negatively moderates the influence of "Extrinsic normative pressure" on "Intention" to use EMR.

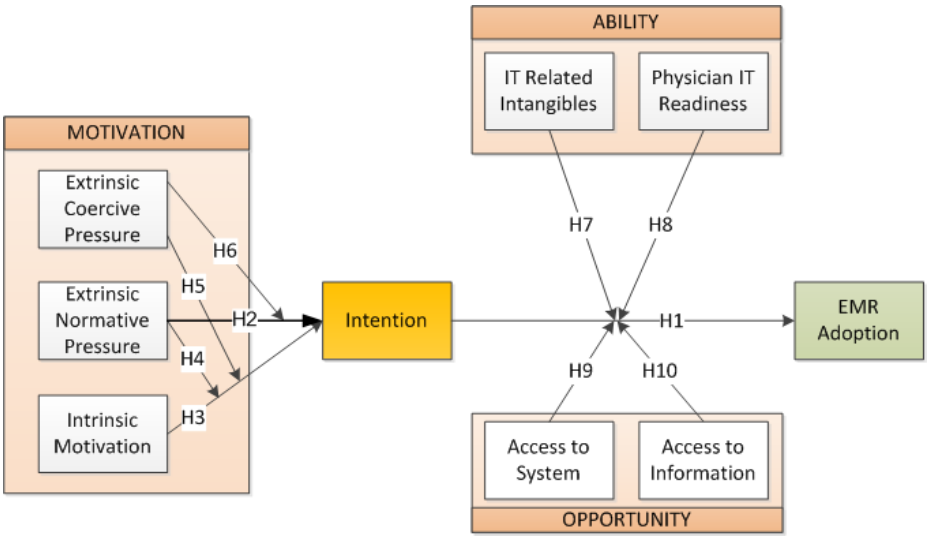

Fig. 4. EMR Adoption Model

3) Ability.

"Intention" to adopt EMR has to be supported by sufficient "Ability" and "Opportunity" in order to establish a behavior of EMR use. In this research model, "Ability" consists of "IT related intangibles" and "IT readiness". "IT related intangibles" is defined as a condition that users have already used IT and obtained benefits [2]. The last component is "Physician IT readiness". This variable is defined as a condition in which existing knowledge gives physicians responsive and agile abilities in adopting a new technology [2]. As explained in MOA, "Ability" moderates the relationship between "Intention" and "Behavior". In line with that, in this research model, the two components of "Ability" also influence the relationship between "Intention" and "Behavior". The related hypotheses are stated below.

H7: "IT related intangibles" positively moderates the influence of "Intention" to use EMR" on "EMR adoption".

H8: "Physician IT readiness" positively moderates the influence of "Intention" to use EMR on "EMR adoption".

4) Opportunity.

"Opportunity" is an uncontrollable aspect for a person [7]. "Opportunity" in this study is also reffered to as aspects that could encourage adoption of EMR, indirectly. "Opportunity" can be defined as external conditions and situations that cannot be controlled by a person and moderate the desires to adopt EMR to occur [7], [15]. The general ideas of "Opportunity" in previous studies are: (1) the contact between the subject, which is the customer, and the object, which is the advertisement; and (2) the object's characteristics. In the context of public relation message processing behavior studied in [7], examples for the first type opportunity are exposure time and the absence of distractions that detract from message processing, and examples for the second type opportunity are message length and the number of arguments. In the context of EMR adoption, physicians' opportunity is not only about their contact with EMR system. Physicians always have opportunity to use EMR as long as the organization's EMR system is accessible. If the system is accessible, they may have contacts with the system directly or indirectly through the peer practices. Further, the accessibility of EMR system is also affected by its' characteristics, such as the IT infrastructure and the system functions. Therefore, the first variable in "Opportunity" is "Access to system". In addition, in this model "Access to information" is included as an opportunity variable. This variable represents physicians' opportunity to get in contact with any information media or other sources. However, the opportunity is not affected by the physicians' available time. "Access to information" means access to information from which the physicians can improve their ability and knowledge, as well as their motivation. Examples of the information sources are training, knowledge sharing forum, and information media. Thus, in this model, "Opportunity" consists of "Access to system" and "Access to information". Both the factors support the establishment of "EMR Adoption" from the existing "Intention".

H9: "Access to System" positively moderates the influence of "Intention" to use EMR on "EMR adoption".

H10: "Access to Information" positively moderates the influence of "Intention" to use EMR on "EMR adoption".

3 Methods and Discussion

This paper presents a preliminary study to develop a model of EMR adoption. In the next step, the defined hyphoteses will be tested using an empirical. Before collecting data, the model will be operationalized based on earlier published literature, and the measured variables will be defined. Then, data collection process will be done using a questionnaire survey method. The quantitative data will be analyzed using statistical approach with Partial Least Square and resulting qualitative data will be used to infer the results of research. The sampling method in this study will be purposive sampling in which sampe will be chosen considering the study's objective.

This study's objective is to develop a model of EMR adoption among EMR physicians and analyse the factors influencing the adoption. However, as discussed in the model development, there are two extrinsic motivation variables in the model. As we want to get a better understanding about these variables, this study will be focused on

EMR adoption by physicians who join in medical organizations. In this study the empirical data will be collected from physicians working in small group practices of twenty or fewer physicians, in which EMR use are encouraged, but not mandatory. We use small group practices because this form of medical service arrangement is popular in Indonesia. Questionnaires will be sent to physicians who join these small group practices providing. These small group practices usually facilitate the physicians with EMR systems to support the administration of the health care services provided to the patients.

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