How do Nursing Students Perceive the Notion of EHR? an Empirical Investigation

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Abstract. This paper describes an empirical study aiming to assess nursing students' perceptions on Electronic Health Record (EHR) concepts and their potential future attitude towards use. Based on the theoretical ground of Rogers' Innovation Diffusion Theory and other research works, a formulated model was empirically validated among ninety nursing undergraduates. Data analysis was based on partial least squares path modeling. Results highlighted the very strong significant effect of relative advantage and observability as well as the significant effect of perceived ease of use to attitude towards using EHR systems. The study findings are discussed along with limitations and future work in the current field.

Keywords. Empirical study, Electronic Health Record, partial least squares

1. Introduction

The use of Information and communication technologies (ICT) is important to healthcare [1] with Electronic Health Record (EHR) implementations being within such a scope, as they carry a series of advantages [2]. According to the ISO Technical Report (ISO-TR20514), as cited in Hovenga, Garde and Heard [1], EHR is "*a repository of information regarding the health status of a subject of care (patient or consumer), in computer processable form*". Despite the fact that a variety of studies pinpoint a shift towards EHR implementations in several countries over the last years [1,3,4], results on EHR adoption and use are not always encouraging, as outlined at relevant studies [3,5,6]. Past research highlights the importance of nurses in the context of adoption and use of such systems [1,6], with issues raised by Woodruff and Selway [2], that are both in favor and against the EHR education of nursing students [2].

In that context, the research aim of this study is twofold; Primarily to investigate the understanding and perceptions of Electronic Health Record (EHR) at a preprofessional nursing level, in terms of its potential innovativeness as a remarkably new change on the delivery of healthcare services. Secondly, to draw useful conclusions on aspects to be further revised and refined towards a more concrete nursing informatics educational curriculum. This research work assumes that is of great interest to investigate students' perceptions on key domains of Health Informatics, such as the

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notion of the EHR, both in terms of current appreciation of its advantages compared with past practices, but also in terms of future attitude towards use, as part of their future profession as nursing healthcare professionals.

Related work in the current field includes a series of studies [4-7] that investigate the EHR adoption and use in healthcare settings for a variety of stakeholders, such as physicians [5,7], nurses [6] but also from a citizens' point of view [4]. The pre and post adoption of an EHR system by nurses has been studied [6] whereas other studies performed research on nursing students' attitudes towards different technology related issues [8,9].

The rest of the paper is organized as follows: Section 1, Methods, outlines the formulation of the theoretical framework and the respective hypotheses. Continuously, Section 2, Results, present the study findings whereas Section 3, Discussion, presents the results in terms of the formulated hypotheses significance. Finally, Section 4, Conclusions, provides a discussion on the findings along with study limitations and future work in the current field.

2. Methods

2.1. Research Model

The theoretical research framework utilized at the current study was influenced by Rogers' Innovation Diffusion Theory (IDT) [10] along with the research works of Peslak [11] and Gibson [7]. Past research in the area of healthcare empirical studies is relevant with the use of IDT. IDT has been applied as it is (core adaptation) or as a theoretical synthesis of constructs from various models. In other studies IDT has been applied in the context of Electronic Medical Record (EMR) [7], or in its relation to healthcare systems in general [12-14]. In this study, based on the aforementioned research works [7,10,11], specific modifications were performed. In particular, the dimension of complexity was formulated from an 'ease of use' perspective and the dimension of adoption was empirically substituted with attitude towards use, in order to reflect the pre-adoption nature of the study.

Overall, the following hypotheses were utilized at the proposed model: Relative advantage positively affects attitude towards use (H1+), Compatibility positively affects attitude towards use (H2+), Perceived Ease of Use positively affects attitude towards use (H3+), Trialability positively affects attitude towards use (H4+) and Observability positively affects attitude towards use (H5+).

2.2. Procedure and Measures

Based on the formulated research model, a relative study questionnaire with the following elements was constructed: relative advantage (coded as RA), compatibility (coded as COMP), ease of use (coded as EOU), trialability (coded as TRIA), attitude towards use (coded as ATT) and observability (coded as OB). Each questionnaire item was adapted from previous research works [7,11,13,15,16], thus the most possible standardized and validated measures were utilized. Questions were translated into Greek and refinements were made in order to reflect the study context and language, where applicable. All items followed a 7-Likert scale from strongly disagree to strongly agree along with a section for "do not know/do not answer". The questionnaire was

anonymous and was distributed to third-year nursing undergraduates of the Faculty of Nursing at the University of Athens, Greece. With respect to the data analysis approach, it was performed using SPSS [17] for the demographics and Partial Least Squares path modeling, with SmartPLS 2.0 M3 [18].

3. Results

A total of 90 valid questionnaires were completed (18 male and 72 female participants). Responders had a certain Health Informatics series of classes' background, in relation with three specific modules. Apart from the compulsory attendance of the module 'Health informatics', 73.3%, 82.2% and 98.9% of the sample attended the optional modules of 'Introduction to Informatics', 'Hospital Information Systems' and 'Biomedical Informatics' respectively. Thus, it was assumed that they have received a sound theoretical background experience in EHR practices.



Figure 1. Results of the structural model

With regard to the partial least squares analysis, the assessment followed the investigation of the measurement and the structural model. Concerning the measurement model, individual item loadings, internal consistency, convergent validity and discriminant validity were investigated. In specific, individual item loadings produced reliable results (>0.7) [19] except the value of the first question of OB which however exceeded 0.6 and decided to remain at the model [20]. For internal consistency, the values of composite reliability exceeded 0.7 [21], thus considered reliable [21]. Furthermore, convergent validity was assessed based on the Fornell and Larcker [22] cut-off value of 0.5 for the Average Variance Extracted (AVE), being greater than 0.5 thus considered reliable [22]. At last discriminant validity was assessed based on the squared root value of the AVE for each construct [21,22] and produced reliable results. Continuously, the structural model was investigated by applying a bootstrapping technique (with 1000 resamples) and three statistically significant levels: p<0.05(*), p<0.01(**) and p<0.001(***), based on a two-tail test. Results are shown at Figure 1. Dotted lines emphasize the hypotheses that were not confirmed.

4. Discussion

The results of the structural model highlight the very strong significant effects of relative advantage (H1 at p<0.001) and observability (H5 at p<0.001) to attitude towards using an EHR along with the significant effect of perceived ease of use (H3 at p<0.05) to the dimension of attitude towards use. Such results underline the positive perceptions and the appreciation of students with regard to the added value of EHR, as compared to previous practices. The positive attitude of students towards an EHR may also be explained by their experience and exposure with technology from a young age, thus being non-reluctant in adopting technology-oriented ideas. In addition, the key role of the dimension of relative advantage is in line with Gibson [7] findings in real healthcare settings.

On the other hand, the non-significant effect of trialability and compatibility may be interpreted in the context of the students' limited experience in terms of an actual EHR system use while it may also pinpoint the need for a more pragmatic interrelation of EHR philosophy and applicability within the nursing science at the educational level. At last, the R^2 value was found to be equal to 0.6823, thus explaining 68.23% of the variance at the construct of attitude towards use of EHR.

5. Conclusions

This study attempted to assess the perception of nursing students with regard to EHR initiatives. An empirical investigation was conducted and certain outcomes were produced and presented.

However, the current study does not come without limitations. In specific, nursing students, who constituted the study sample, did not have an actual/real-world experience of an EHR implementation and consequently, the study findings are restricted within a limited theoretical and contextual scope. The study limitations outline the future work in the current field. In particular, a more detailed analysis in real healthcare environments that have deployed and operate EHR systems may be conducted, with a clear separation of healthcare professional groups that have an actual experience with such computerized environments. These types of investigations will assist further to the understanding of the factors that affect the adoption and use of EHR in healthcare settings.

Despite the aforementioned limitations, the current study attempts to shed light in health informatics aspects in relation to nursing science. In that context, it was decided to assess the perceptions of future stakeholders on such concepts since the positive opinions and beliefs may lead to an overall positivism towards EHR and potentially to future actual acceptance and use. The study results reveal the positive perceptions of nursing students against EHR, and their appreciation of the added value EHR may provide to healthcare services. Assessments of this kind may be applied at a preprofessional level in order to record the dominant trends and opinions for a variety of Health Informatics conceptual domains in general.

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