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# The effect of performance expectancy and behavioral intention on the use of electronic medical record (EMR) in tertier hospital in Indonesia

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**Abstract**---Health and well-being are the third Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development. To accomplish this, Soetomo hospital as the largest referral hospital in the province of East Java is expected to have an Electronic Medical Record (EMR) completeness level of 100 percent by 2024. This study aimed to examine the impact of performance expectancy and behavioral intention on the use of Electronic Medical Record (EMR) in tertiary hospitals in Indonesia.
expectation and behavioral intention on hospital EMR technology usage. This was an observational study with a cross sectional research design. From a population of 390 health workers, a sample of 195 was generated using proportional random sampling. Validity and reliability can be determined using SPSS software. Utilizing SEM PLS software, the analysis is evaluated. Results indicate that performance expectation can have a direct effect on technology use EMR (T Statistic = 21,506) and an indirect effect via behavioral intention (T Statistic = 15,038). The relationship between behavioral intention and technology use EMR is direct (T statistic = 5,475). Conclusion: Performance expectations explain 52% of behavioral intention, while behavioral intentions explain 85% of technology use EMR.

**Keywords**—Performance Expectancy, Behavioral Intention, Technology Use, EMR, Hospital.

**Introduction**

In accordance with The Health Ministry of the Republic Indonesia's Regulation No. 21 of 2020 on the Ministry of Health's Strategic Plan for 2020-2024, the health information system aims to strengthen faster, more accurate health information services, resource sharing, an integrated electronic-based standard health information system, and the application of the health information system in health care facilities. Innovation and the use of technology in health services include the expansion of the online referral system, including the incorporation of private health facilities into the system, the expansion of coverage and the development of types of telemedicine services, the digitization of medical records and online medical records, and the development of telemedicine services. This is one of the sustainable development goals' efforts to meet the 2030 target for the third goal, health and wellbeing. The following describes the government's 2020-2024 strategic plan (Menteri Kesehatan RI, 2020).

Soetomo Hospital is one of the hospitals in Indonesia that has implemented a hospital information system. All transactions can be streamlined through a single entrance. Soetomo Hospital has mandated the implementation of EMR, a component of SIMRS that should facilitate the issuance of both summary and detailed patient medical records. Doctors and other medical personnel can quickly access patient data using their login credentials. Outline of the EMR entry flow at Soetomo Hospital based on initial information from the Information Communication Technology Installation (ICTI) unit: 1) Registration of outpatients; 2) Examination by a physician at the destination unit; 3) The physician enters subjective examination data consisting of complaints, symptoms, anamnesis, causes and locations of complaints.; 4) The physician enters objective examination data consisting of the results of the patient’s physical examination (blood pressure, pulse, temperature), laboratory support, radiology, and microbiology by entering a sign on the image provided to determine the location of the disease with the symbol provided, and medical action outpatient; 5) The physician enters the patient’s assessment or diagnosis by entering the Classification of Disease and Related Health Problem (ICD-10); 6) The physician
includes a plan or action plan to be carried out on the patient, such as the patient’s final condition (control, MRS, recovered) or other plans that are necessary, such as work orders, prescribing, consul plans, control plans for outpatient actions, immunizations, and education, by entering on the ICD-9 menu that will be used for grouping Indonesia Case Base Groups (INA-CBGs) or claiming to the guarantor.

According to minister of health regulation of Republik Indonesia No 269/MENKES/PER/III/2008, medical records have 5 advantages: a) As a basis for health maintenance and patient treatment; b) Evidence in legal proceedings; c) Materials for research; d) The basis for payment of health care costs; and e) Materials for generating health statistics. This document is useful for evaluating the accreditation of a hospital or health center's health services. This is what continues to drive the development of medical record management, given the significance of the role of medical records (Setyawan, 2017). According to Donnelly, (1992) that the Problem Oriented Medical Record (POMR) was initiated by Dr. Donnelly. lawrence L. Weed (1950-1960) was then accepted by the medical community as the Problem Oriented Record (POR), which later evolved into SOAP (Subjective Information, Objective Information, Assessment and Planning). There are four significant steps in the SOAP decision-making procedure (Dwijosusilo & Sarni, 2018).

Furthermore, it is essential to do study on the effect of performance expectation on EMR technology use via behavioral intention. Based on prior research, performance expectation has a positive effect on the intention to use information systems, specifically in the following studies: telemedicine at 31 telemedicine sites at the Ministry of Health in South Africa (Cilliers & Flowerday, 2013), mobile-banking of bank customers in Taiwan (Yu, 2012), 3G mobile telecommunication users (Wu et al., 2008), and Mobile Health Service (Abdekhoda et al., 2013), Location-Based Services users di China (Zhou, 2012), Hybrid Library Services library users in Uganda (Tibenderana et al., 2010), Adoption of Information Technology Innovation on entrepreneurs in Malaysia (Moghawemi et al., 2012); Electronic-Health (e-Health) (Li et al., 2013).

Behavioral intention is the extent to which a user’s will (purposes and intentions) to use a technology is demonstrated (Venkatesh et al., 2003). Defined as the intensity of an individual’s intent to operate a specific information system (Davis, 1989). Several indications can be used to measure this concept: 1) enthusiasm for utilizing the system, 2) persuasiveness in using the system, and 3) desire to operate a system. In (Venkatesh et al., 2016) is also described as technology utilization or the actual application of a technology. The indicator used to measure use behavior is the intensity of use which describes how often users use information technology (Venkatesh et al., 2003).

Based on research by Rachmawati et al., (2020) technology use can also be defined as behavioral usage with the indicators of being able to use the system without assistance, other people being able to assist when using the system is difficult, and experiencing little difficulty when using it for the first time to employ the system. It also differs from Abdekhoda & Salih, (2017) research which indicates that actual use can be defined as usage in applying PACS (Picture
Archiving and Communication System); with PACS system indicators making work more interesting; using PACS is a good idea; working using PACS is satisfactory; and like work with PACS, this variable can be influenced by behavioral intention.

In the study conducted by Lestari et al., (2022), it was discovered that behavioral intention, in addition to actual technology use, affects the net benefit. Indicators for net advantages include cost savings, time savings, and reduced search cost. The research of Hsu et al., (2021) demonstrates that the determinants of UTAUT, including performance expectancy, effort expectancy, social influence, and facilitating conditions, influence behavioral intention and have an effect on subjective well-being, which is characterized by feeling valued, satisfied, optimistic, happy, and comfortable. The study's findings (Mohamadali & Garibaldi, 2010; Nurlani & Permana, 2017) indicate that behavioral intention has an effect on user satisfaction, with indicators that the information system is perceived to be effective and efficient, and that users are satisfied with the features and the information provided. Indicators of behavioral intention's impact on net benefits include increased individual and organizational performance, more effective and efficient work, and fewer errors.

Method

2.1 Materials

This study used a cross-sectional observational design. The research was conducted at a hospital of last resort in Indonesia. There are 499 health professionals who utilize electronic medical records.

2.2 Data collection procedures

There was 195-person sample obtained through proportional random sampling. Inclusion criteria for health workers who are not ill, have at least one month of experience using EMR while working in a hospital, and are willing to become respondents through a statement on informed consent provided by the researcher were used to collect data. Respondents who voluntarily withdrew from the study were excluded from the inclusion criteria. Letter of Exemption number 0150/LOE/301.4.2.X/2021, Soetomo Hospital Surabaya, Indonesia, has granted ethical approval for this study.

2.3 Data analysis

Statistical analysis by summarizing the characteristics of respondents and all variables, descriptive analysis with univariate was used to obtain a picture of the variables that influence the usage of technology to fill electronic medical records. Calculating the minimum, maximum, mean, and standard deviation of each indicator as a derived composite indicator value. The total score is comprised of four categories: less good, good enough, good, and excellent. Multivariate analysis by used of Structural Equation Modeling (SEM) and Partial Least Squares (PLS). Analysis of the external model using convergent validity, discriminant validity, composite reliability, and Cronbach’s alpha. Analysis of inner loadings using the
goodness-of-fit test on the R-square value, path coefficient estimates, and specific indirect effects.

**Result and Discussion**

Distribution information for the variable’s performance expectation, behavioral intention, and technology use EMR, including frequency, percentage, mean, and original sample estimate, is provided below.

Table 1. The Distribution of Performance Expectancy, Behavioral Intention and Technology Use EMR

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Less Good (1)</th>
<th>Good Enough (2)</th>
<th>Good (3)</th>
<th>Excellent (4)</th>
<th>Mean</th>
<th>Original sample estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td><strong>Performance Expectancy</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived usefulness</td>
<td>4</td>
<td>2</td>
<td>22</td>
<td>11</td>
<td>90</td>
<td>47</td>
</tr>
<tr>
<td>Extrinsic motivation</td>
<td>4</td>
<td>2</td>
<td>24</td>
<td>13</td>
<td>94</td>
<td>48</td>
</tr>
<tr>
<td>Job fit</td>
<td>2</td>
<td>1</td>
<td>27</td>
<td>14</td>
<td>90</td>
<td>46</td>
</tr>
<tr>
<td>Relative advantages</td>
<td>4</td>
<td>2</td>
<td>31</td>
<td>16</td>
<td>88</td>
<td>45</td>
</tr>
<tr>
<td>Outcome expectation</td>
<td>2</td>
<td>1</td>
<td>28</td>
<td>15</td>
<td>94</td>
<td>48</td>
</tr>
<tr>
<td><strong>Behavioral Intention</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antusiasme</td>
<td>3</td>
<td>2</td>
<td>25</td>
<td>13</td>
<td>107</td>
<td>55</td>
</tr>
<tr>
<td>Willingness</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>7</td>
<td>121</td>
<td>62</td>
</tr>
<tr>
<td>Persuasiveness</td>
<td>1</td>
<td>1</td>
<td>13</td>
<td>7</td>
<td>116</td>
<td>59</td>
</tr>
<tr>
<td>Behavioral Intention</td>
<td>2</td>
<td>1</td>
<td>17</td>
<td>9</td>
<td>115</td>
<td>59</td>
</tr>
<tr>
<td><strong>Technology Use EMR</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subjective</td>
<td>1</td>
<td>1</td>
<td>18</td>
<td>9</td>
<td>101</td>
<td>52</td>
</tr>
<tr>
<td>Objective</td>
<td>1</td>
<td>1</td>
<td>16</td>
<td>8</td>
<td>99</td>
<td>51</td>
</tr>
<tr>
<td>Assessment</td>
<td>3</td>
<td>2</td>
<td>14</td>
<td>7</td>
<td>100</td>
<td>51</td>
</tr>
<tr>
<td>Plan</td>
<td>3</td>
<td>1</td>
<td>16</td>
<td>9</td>
<td>99</td>
<td>51</td>
</tr>
<tr>
<td>Technology Use EMR</td>
<td>2</td>
<td>1</td>
<td>16</td>
<td>8</td>
<td>100</td>
<td>51</td>
</tr>
</tbody>
</table>

According to the data in the table, all of the indicators utilized in this study have achieved convergent validity with an original sample estimate value is greater than 0.5. Behavioral intention has the highest original sample estimate value among the other variables in this study at 0.904, indicating that indicators on behavioral intention, such as enthusiasm, willingness, and persuasiveness, contribute the most to behavioral intention in comparison to other indicators of performance expectancy variables and other indicators of technology use EMR.
Table 2. Construct of Validity and Reliability

<table>
<thead>
<tr>
<th></th>
<th>Cronbach's Alpha</th>
<th>Rho_A</th>
<th>Composite Reliability</th>
<th>Average Variance Extracted (AVE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>0.888</td>
<td>0.891</td>
<td>0.931</td>
<td>0.818</td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td>0.897</td>
<td>0.911</td>
<td>0.925</td>
<td>0.713</td>
</tr>
<tr>
<td>Technology use EMR</td>
<td>0.885</td>
<td>0.892</td>
<td>0.920</td>
<td>0.743</td>
</tr>
</tbody>
</table>

Table 2 displays that behavioral intention, performance expectancy, and technology use of EMR show the value of cronbach’s alpha, Rho_A, AVE > 0.8, and composite reliability > 0.9 indicating that all variables have good reliability.

Table 3. Discriminant Validity

<table>
<thead>
<tr>
<th></th>
<th>Behavioral Intention</th>
<th>Performance Expectancy</th>
<th>Technology use EMR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention</td>
<td>0.904</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Performance Expectancy</td>
<td></td>
<td>0.726</td>
<td>0.845</td>
</tr>
<tr>
<td>Technology use EMR</td>
<td>0.766</td>
<td>0.911</td>
<td>0.862</td>
</tr>
</tbody>
</table>

Table 3 illustrates that the AVE square root value of a construct is bigger than its correlation value with other constructs; specifically, the value of behavioral intention has an AVE square root value that is greater than both the correlation value and the values of the other constructs. This demonstrates that the standards for discriminant validity have been met.

Table 4. Distribution of Estimate for Path Coefficients and Total Indirect Effects

<table>
<thead>
<tr>
<th></th>
<th>Original sample Mean</th>
<th>Sample Mean Coefficients</th>
<th>Standar Deviation</th>
<th>T Statistic</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Behavioral Intention ➔ Technology Use EMR</td>
<td>0.222</td>
<td>0.223</td>
<td>0.040</td>
<td>5.475</td>
<td>0.000</td>
</tr>
<tr>
<td>Performance Expectancy ➔ Behavioral Intention</td>
<td>0.726</td>
<td>0.726</td>
<td>0.048</td>
<td>15.038</td>
<td>0.000</td>
</tr>
<tr>
<td>Performance Expectancy ➔ Technology use EMR</td>
<td>0.750</td>
<td>0.750</td>
<td>0.035</td>
<td>21.506</td>
<td>0.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.161</td>
<td>0.162</td>
<td>0.033</td>
<td>4.930</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Total Indirect Effects
Based on the calculation of the path coefficient, there are three significant paths, including performance expectation's indirect effect on technology usage via behavioral intention and a direct significant effect on technology use with a p-value of 0.000.

The data presented in Figure 1 suggests that the performance expectation and behavioral intention variables have a considerable effect on technology use, accounting for 85% of the variance, indicating a strong influence. The correlation between performance expectation and behavioral intention is 52%, indicating that performance expectation has a moderate influence on technology use via behavioral intention.

Performance expectancy had an indirect effect on the use of technology through behavioral intention. T-statistics of 4,930 > 1.96 and P-value of 0.000 indicate a statistically significant influence of the indirect effect of performance expectation on technology use through behavioral intentions. The structural model had a value of 1,698 (0.726 performance expectancy to behavioral intention and 0.750 performance expectancy to technology use and 0.222 behavioral intention to technology use).

Good performance expectancy with indicators of perceived usefulness, extrinsic motivation, job suitability, relative advantage, and expectations of the results of filling in patient health data into the EMR would cause the health professions to have the intention and commitment to carry out work that will ultimately fill the EMR. The results of this study also indicated that performance expectations have a direct, partial effect on behavioral intentions, such as enthusiasm, persuasion, and willingness (Emmanuel et al., 2015); (Tarhini et al., 2016); (Ramdhani et al.,

Figure 1. Result of Bootstrapping PLS Algoritma
Fostering trust and optimism for the greater benefits of EMR compared to manually recording patient health conditions, such as saving time, increasing productivity, data accuracy, facilitating information transfer, individual performance appraisal, and better hospitals, as well as meeting the requirements of the health professions, are important steps hospital administration could take to increase the intention to use EMR. In agreement with theory (Davis, 1989; Thompson et al., 1991; Venkatesh et al., 2003), the success of increasing optimism and confidence in the scale of the benefits received from the health professions influences the intention to explore EMR and the benefits of providing quality services to patients.

**Conclusion**

The usage of EMR technology by health professionals can be influenced by two significant factors: performance expectation and behavioral intention. There include markers of perceived usefulness, extrinsic motivation, job fit, result expectation, and relative advantages within performance expectations. Job fit is the factor that has the most impact on performance expectations. Indicators of enthusiasm, eagerness, and persuasion are present in behavioral intention. Willingness is the indicator that has the greatest impact on behavioral intention. There are subjective, objective, evaluation, and planning indicators for technology use. Physical examinations, which comprise measurements of body temperature, blood pressure, disease history, and symptoms of disease, are the subjective indicators that have the most influence on the application of EMR technology. 85% of technology use is influenced by performance expectancy and behavioral intention, while 52% is influenced by performance expectancy.

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