A SUCCESS MODEL OF E-HEALTH IMPLEMENTATION IN THE SERVICE AREA OF DEPARTMENT OF HEALTH OF BANYUMAS REGENCY INDONESIA

Siti Nurhayati1), Dyah Umiyarni P2), Muhammad Syafii3)

1) Department of Biostatistics and Health Information System, School of Public Health, Faculty of Health Sciences, Jenderal Soedirman University, Purwokerto, Indonesia, 53123
2) School of Nutrition Study, Faculty of Health Sciences, Jenderal Soedirman University, Purwokerto, Indonesia, 53123
3) School of Physical, Health and Recreation Education, Faculty of Health Sciences, Jenderal Soedirman University, Purwokerto, Indonesia, 53123

*Corresponding author: Siti Nurhayati, Department of Biostatistics and Health Information System, School of Public Health, Faculty of Health Sciences, Jenderal Soedirman University, Jl. Dr. Soeparno, Karangwangkal, Purwokerto, 53123. Email: unsoedlecturer@gmail.com

Abstract

Background: It is urgently necessary to measure the success of an information technology system for management to examine its added value to institution. It is necessary to examine the success rate to detect any problems which may disturb service, management and decision making processes at health facilities. The Delone and Mc.Lean method is employed to obtain information of how e-health related to hardware, software, brainware and sociotechnical issues performs.

Purpose: Examining the success rate of e-health implementation performs in the service area of department of health of Banyumas Regency Indonesia.

Methods: This cross sectional analytical research has 39 public health centers as its sample and employs linear regression and correlation analyses.

Results: The results of this research state that there is relationship between information system quality and e-health system use; There is no relationship between information system quality and user satisfaction; There is relationship between information quality and e-health system use; There is relationship between information quality and user satisfaction; There is relationship between service quality and user satisfaction; There is relationship between user satisfaction and e-health system use; There is relationship between system use and Net benefit; There is relationship between user satisfaction and Net benefit; There is relationship between organization and Net benefit. The following line equations are generated: e-health system use = 3.008 + 0.117 (Information system quality) + 0.126 (Information quality) + 0.018 (service quality). E-health system use = 3.843 + 0.273 (user satisfaction). User satisfaction = 6.432 + 0.036 (information system quality) + 0.203 (information quality) + 0.317 (service quality). Net Benefit = 10.349 + 0.842 (e-health system use). Net Benefit = 11.786 + 0.343 (user satisfaction).

Conclusion: The determinants success model of e-health implementation of this research are: information system quality, information quality, user satisfaction, system use, and net benefit.

Keywords: e-health, Delone, Mc.Lean, information technology

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Introduction

The communication and information technologies are known to be important instruments in providing health services and public health internationally (Drury, 2007). The use of health information technology provides very great benefits including system efficiency level (reduce costs and improves productivity), providing better services, improving patients’ safety level, better communication between health service providers, and improving access to information (Naylor and Kedlow, 2013). By utilizing information technology, a 9%-20% reduction of health costs is resulted from a decrease of pictures derived from health examination and laboratory test (White, 2008). The use of information technology system may provide as early as possible warning to physician of patient’s abnormal laboratory test result which may be unknown, thus the physician may further handle the patient earlier to reduce the level of patient’s emergency condition (Bates and Gawande, 2003). Information technology may help any kind of business, improve the efficiency and effectiveness of service process, managerial decision making and working group cooperation, and to strengthen the competitiveness of rapid-changing institution (O’Brien, 2006).
Public health service is one of public services. Public service is one mandatory activity to be performed by the Government. A health service innovation is made through electronic government (e-gov) to improve public health services. The development of e-Government in Indonesia has been mandated by the Government through Presidential Instruction No.3 Year 2003 of the National Policy and Strategy. According to this Presidential Instruction, this e-Government development is one of the Government’s efforts to effectively and efficiently enhance the quality of public services in various public sectors. Health service through this e-government is realized in the form of e-health. E-Health according to World Health Organization (WHO) is “the use of information and communication technologies (ICT) for health to, for example, treat patients, pursue research, educate students, track diseases and monitor public health.”

Meanwhile, Decree of Minister of Health Number 192/MENKES/SK/VI/2012 states that e-Health is the utilization of information and communication technology in health sector, particularly to improve health services. According to Eysenbach (2013), the prefix “e” does not only refer to electronic, but describes the following purposes:

a. Efficiency: one purpose of the e-health application is health service efficiency and reduction of health service costs, such as reduction of costs for diagnosis or consultancy between physician and patient.

b. To improve the quality of health services with quality information and trusted sources to expect patient’s faster information acquisition.

c. Evidence-based, in which any information must be based on scientific research.

d. Consumer and patient empowerment with information and knowledge of medicine, treatment, public health and personal electronic health record to expect patient-centered health services.

e. To create new relationship between patient and health professional toward true partnership, in which decision is mutually made.

f. Education for physician and patient from online source

g. To enable standardization of information and communication exchange between companies operating in health industrial sector.

h. To expand the scope of health services globally, since communication technology is currently able to realize it with internet technology.

i. Ethics, there is new challenge in profession ethics and patient’s privacy.

j. Equity, health services should be able to extend to all classes.

It is necessary to examine the success rate to detect any problems which may disturb service, management and decision making processes at health facilities. These problems may arise from hardware, software, brainware, data communication and sociotechnical components. Other research state that problems in health information technology implementation are not always associated to the technology itself, but also lack of sociotechnical consideration (Yee, et al., 2008). Evaluation from user perspective or ‘demand’ perspective is highly important considering that it lacks researches pertaining to this matter (Gauld, Goldfinch and Horsburgh, 2010).

We must admit that it is not easy to determine and measure the success of a system, particularly to measure the success of an information system of which output is intangible. Evaluation is necessary to examine whether an e-health has been used properly, requires improvement or renewal. Examining the success rate of implementation is also useful to examine how an implemented e-health performs. It is urgently necessary to measure the success of an information technology system for management to examine its added value to institution. Many researches have been performed to identify factors to lead to success of an information technology system. One research renowned in this area is that conducted by DeLone and McLean (2003) which reflects the dependency of six success measurements of information system, which are: System quality, Information quality, Service quality, User satisfaction, Use and Net benefit.

Figure 1. DeLone and McLean’s Implementation Success Model
Methods

This analytical research employs a cross sectional approach. The scope of this research is 39 public health centers in the service area of the Department of Health of Banyumas Regency which have applied e-health. The respondents of this research are all staffs of public health centers that have used e-health available at the public health centers. The primary data are used in this research obtained from the questionnaires filled in by the public health centers’ staffs. The data collected from the 207 questionnaires are analyzed by employing a correlation test, linear regression analysis.

Results and Discussion

According to the results of univariate analysis: most of the respondents’ are female (64.3%); most of respondents are 31-40 years old (34.8%); most of respondents’ period of work is 1-5 years (21.8%); most of respondents’ educational level is D3 (61.8%); experience of using simpus is more than 1 year (67.6%); and most of daily use of simpus is 5 hours (24.6%).

Based on Table 1, the correlation value is shown as r-value, of which significance level as shown as \( p \) value is \( \leq 0.05 \), which means that there is significant relationship between the two analyzed variables.

<table>
<thead>
<tr>
<th>Relationship</th>
<th>p-value</th>
<th>r-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-health use and system quality</td>
<td>0.000</td>
<td>0.472</td>
</tr>
<tr>
<td>E-health use and information quality</td>
<td>0.002</td>
<td>0.455</td>
</tr>
<tr>
<td>E-health use and service quality</td>
<td>0.514</td>
<td>0.317</td>
</tr>
<tr>
<td>E-health use and user satisfaction</td>
<td>0.000</td>
<td>0.506</td>
</tr>
<tr>
<td>User satisfaction and system quality</td>
<td>0.452</td>
<td>0.366</td>
</tr>
<tr>
<td>User satisfaction and information quality</td>
<td>0.003</td>
<td>0.488</td>
</tr>
<tr>
<td>Net benefit and use</td>
<td>0.000</td>
<td>0.518</td>
</tr>
<tr>
<td>Net benefit and user satisfaction</td>
<td>0.000</td>
<td>0.392</td>
</tr>
</tbody>
</table>

To answer the hypotheses, the results are as follows:

a. There is relationship between system quality and e-health system use
b. There is no relationship between system quality and user satisfaction
c. There is relationship between information quality and e-health use
d. There is relationship between information quality and user satisfaction
e. There is no relationship between service quality and e-health use
f. There is relationship between e-health use and Net benefit
g. There is relationship between user satisfaction and Net benefit

The results of correlation and regression analyses are as follows:

Table 2. Correlation and linear regression analyses on e-health use and information system quality, information quality

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>( R^2 )</th>
<th>Linear Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-health use</td>
<td>0.525</td>
<td>0.275</td>
<td>E-health use = 3.008 + 0.117 (System quality)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>E-health use = 3.008 + 0.126 (Information quality)</td>
</tr>
</tbody>
</table>

With the correlation and regression analyses on e-health use with information system quality, information quality and service quality, the line equation will be:

E-health use = 3.008 + 0.117 (System quality) + 0.126 (Information quality).

Based on the equation, variables known to be correlated to e-health use are Information quality and System quality. A 1 score increment of information quality may increase the score of e-health use for 0.126, while a 1 score increment of Information system quality may increase the score of e-health use for 0.117.

According to Chen (2010), it is found that information system quality is a measure of the information system itself which is focused on interaction between user and system. Information system users certainly hope that, using information system, they will have access to any information they need. An information system which is able to generate timely, accurate and relevant information which fulfills criteria and other measures of information quality will
have an impact on its users. Considering the description above, we may conclude that applying an information system, system quality and information quality generated may give an impact on system use.

**Table 3. Correlation and regression analyses on e-health use with user satisfaction**

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>Line Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-health use</td>
<td>0.506</td>
<td>0.275</td>
<td>E-health use = 3.843 + 0.273 (user satisfaction).</td>
</tr>
</tbody>
</table>

With the correlation and regression analyses on e-health use with user satisfaction, the line equation will be:

E-health use= 3.843 + 0.273 (user satisfaction).

Based on the equation, each 1 score increment of user satisfaction may increase the score of e-health use for 0.273. User satisfaction after using any software will increase user necessity and use intensity of the software. According to Hsu et al (2009), there is a positive relationship between use satisfaction and information system use.

**Table 4. Correlation and regression analyses on user satisfaction with information system quality, information quality**

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>Line Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>User satisfaction</td>
<td>0.616</td>
<td>0.379</td>
<td>User satisfaction = 6.432 + 0.036 (information system quality)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>User satisfaction = 6.432 + 0.203 (information quality)</td>
</tr>
</tbody>
</table>

With the correlation and regression analyses on user satisfaction with system quality, information quality and service quality, the line equation will be:

User satisfaction = 6.432 + 0.036 (system quality) + 0.203 (information quality)

Based on the equation, a variable known to be correlated to user satisfaction is Information quality. A 1 score increment of information quality may increase the score of user satisfaction for 0.203. If users are certain of the quality of an information system, they will more frequently use the system, because of its satisfactory information processing results. If information generated by an information system gets more accurate, timely, and has good reliability, user satisfaction and trust will increase. The results of research conducted by Floropoulos (2010) show that there is a strong relationship between system quality, information quality and user satisfaction, in information system success and e-gov effectiveness tests.

**Table 5. Correlation and regression analyses on net benefit with e-health use**

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>Line Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net benefit</td>
<td>0.518</td>
<td>0.268</td>
<td>Net benefit = 10.349 + 0.842 (e-health use)</td>
</tr>
</tbody>
</table>

With the correlation and regression analyses on net benefit and e-health use, the line equation will be:

Net Benefit = 10.349 + 0.842 (e-health use). Based on the equation, each 1 score increment of e-health use may increase the score of net benefit for 0.842. If information system users feel benefits/advantages of a system used, they will continuously use it. Based on the description above, we may state that the higher the benefit/advantage, the more software users will be. Users must be aware of any effect of an information system in working process and a clear understanding of an information system may create a sense of possessing the information system and mutual ownership among users, Blake et al. (2010) and Meneklis and Douligeris (2010).

**Table 6. Correlation and regression analyses on net benefit with user satisfaction**

<table>
<thead>
<tr>
<th>Variable</th>
<th>R</th>
<th>R²</th>
<th>Line Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net benefit</td>
<td>0.392</td>
<td>0.154</td>
<td>Net benefit = 11.786 + 0.343 (user satisfaction)</td>
</tr>
</tbody>
</table>
With the correlation and regression analyses on net benefit and user satisfaction, the line equation will be:
Net Benefit = 11.786 + 0.343 (user satisfaction).

Based on the equation, each 1 score increment of user satisfaction may increase the score of net benefit for 0.343.

A research of the success of a newly applied information system to information system users in an organization is mandatory. The research results for the relationship of benefit and user satisfaction variables show that both variables have influence. According to Livari (2008), if users feel the benefits of software, user satisfaction value will increase.

**Conclusions**

The results of this research are: There is relationship between information system quality and e-health system use; There is no relationship between system quality and user satisfaction; There is relationship between information quality and e-health system use; There is relationship between information quality and user satisfaction; There is relationship between user satisfaction and e-health system use; There is relationship between system use and Net benefit: There is relationship between user satisfaction and Net benefit; The following line equations are generated: E-health system use = 3.008 + 0.117 (information system quality) + 0.126 (information quality). E-health system use = 3.843 + 0.273 (user satisfaction). User satisfaction = 6.432 + 0.036 (system quality) + 0.203 (information quality). Net Benefit = 10.349 + 0.842 (e-health system use). Net Benefit = 11.786 + 0.343 (user satisfaction).

**Conflict of Interest**

The authors declare that they have no competing interest.

**ACKNOWLEDGEMENT**

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