**Implementation of SecurePro**

The proctored based e-exam system is an application that runs on a mobile devices. The application was written using JAVA programming language and MYSQL as the database language. The languages were chosen for the purpose of good functionality in graphical outputs, ease in programming and its efficiency when it comes to mobile programming. The Graphical User Interface (GUI) platform of the mobile application enables users check their symptoms after which the system diagnosed the likely disease and prescribe the drug with the details (i.e. the drug to used, the company that produced it and where to obtain the product.). The platforms have some features such as the submit button for sending the symptoms selected by the user in other to diagnosed result. The new diagnosedwhich shows after first diagnosed. This buttons allow users to selects other observable symptoms among the list. Theuser can exit the application using the exit button.

*Figure 5: The mobile application interface where the user scrolls up to selects her observable symptoms.*

*Figure 6: The system prompting the user to submit the observable symptoms selected*

Fig. 5 shows the initial interface that will be displayed for the user so as to make selection of his/her symptoms noticed by checking the necessary check boxes before being prompted if the user is sure of making the submission after pressing the submit button as shown in fig. 6. Fig. 7 shows the result and prescription interface which makes the diseased diagnosed, drug prescription, and manufacturer and address where such drug can be purchased.

*Figure 7: User select an observable symptoms that is not correspond to the one inside the database. (This might be as a result of user actually trying to test the system or her illness not specified in the database).*

*Figure 8: Result when user selects an un- match observable symptoms*.

Fig. 7 and 8 shows the mobile interface of the application when the combined choice of symptoms cannot diagnose any disease and peradventure not able to prescribe any drug. Fig. 8 shows displays on the mobile device when the right combination of symptoms are checked by the user and submitted when the combination of symptoms choices have a resulting outcome from the inference base in the database. Fig. 10 therefore shows the final display of the mobile application which make the user decide if he/she chooses to exit the application or not.

*Fig 9: Mobile Application interface showing the system diagnosing result to the user based on the symptoms selected.*

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*Figure 10: MAPHOG Interface prompting the user to choose whether to exit the application or not*

**MAPHOG USABILITY EVALUATION**

An evaluation was carried out on the mobile application using the Technology Acceptance Model (TAM) (Venkatesh and Bala 2008) which is recognized as one of the main Information Systems (IS) theories that contributes to understanding of users ’acceptance of information systems (IS)/information technology (IT). In this paper, we made use of five factors from TAM: Perceived Ease of Use (PEOU), Perceived Usefulness (PU), Perception of External Control (PEC), Job Relevance (REL) and Behavioral Intention (BI) as follows which was explicitly explained in Abdullah et al. (2016);

(1) PEOU is used to determine to what degree of ease is associated with the use of the MAPHOG;

(2) PU is used to determine the degree to which a person believes MAPHOG would enhance his or her performance in diagnosing obstetrics and gynecology problems.

(3) PEC is used to determine the degree to which an individual believes that organizational and technical resources exist to support the use of the MAPHOG;

(4) REL is used to determine the degree to which an individual believes that the target MAPHOG is applicable to his or her job.

(5) BI is used to determine the degree to which a person has formulated conscious plans to use MAHPOG.

After the development of mobile application, we conducted a validation with twenty-one (21) participants with an aim to study the usability of MAHPOG. Given our aim to develop a health-relevant mobile application that will be acceptable in practice, we believe that the understanding of its quality was insufficient. This is because a high quality or performance does not determine its usefulness to the target users. Feedback gotten from the usability evaluation (conducted with obstetricians and gynecologists, as the summary is seen in table 2) is vital to determining the user’s perception on MAHPOG, for providing insight into the future use of the mobile application.

Table 2 summarizes the overall usability feedback of MAHPOG. This feedback received from the participants showed that perception is evidenced by the 3.54 mean score for perceived ease of use, 3.92 mean score for perceived usefulness, 4.43 mean score for perception of external control, 3.60 mean score of job relevance and 4.04 mean score for behavioral intention. All construct were measured on a 5-point Likert scale through multiple questions in the usability.

Table 2: Usability evaluation results

|  |  |
| --- | --- |
| Statements | Mean |
| Perceived Ease of Use (PEOU) | 3.54 |
| Perceived Usefulness (PU) | 3.92 |
| Perceived External Control (PEC) | 4.43 |
| Job Relevance (REL) | 3.60 |
| Behavioral Intention (BI) | 4.04 |

In addition to exploring the mean rating for each participant per usability construct, we also explored the median score per usability construct, across all accumulated construct responses. In particular, we found that based on 210 responses for PEOU construct (which was measured with 10 questions, as outlined in table 3, each answered by 21 respondents) the median for overall PEOU is 4. The score support the high agreement received on PEOU, as represented in the overall mean score of 3.54. This findings indicates that the participants agreed that MAHPOG is easy to use. Further exploration of the evaluation of PEOU of the ontology shows that PEOU1 received the highest mean score i.e. 4.57 (see table 3). These scores highlight the participants’ agreement that “Background knowledge of mobile phone is essential to effectively use this application” followed by PEOU2 with mean score of 4.52 which shows that the participants agreed that “Users will understand this application with little effort”. PEOU3 had a mean sore of 4.48 indicating that participants agree that they could easily maser the use of MAHPOG. The mean score of PEOU5 i.e. 4.38 showed the participants’ agreement on the flexibility of the application in terms of usage. PEOU6 shows a mean score of 4.24 which showed the perception of participants in terms of ease of usage is highly positive. The 4.05 mean score of PEOU4 is an indication that the application could easily diagnose obstetrics and gynecology problem. PEOU8 mean score i.e. 3.95 revealed that it could be accepted that the participants agreed that the presentation of the mobile application allowed for easy diagnosis of obstetric ad gynecology problems. PEOU7, PEOU9 and PEOU10 were revere scale questions. The low scores for these questions indicate that the respondents do not consider that MAHPOG is difficult to use (PEOU7), nor unnecessarily complex (PEOU9), nor cumbersome to understand (PEOU10).

Table 3: Perceived ease of use (PEOU) responses

|  |  |
| --- | --- |
| Statements | Mean |
| PEOU1. Background knowledge of mobile phone is essential to effectively use this application | 4.57 |
| PEOU2. Users will understand this application with little effort | 4.52 |
| PEOU3. I can easily master the use of the mobile application | 4.48 |
| PEOU4. I find it easy to use the application to diagnose obstetrics and gynecology problem | 4.05 |
| PEOU5. I find the mobile application flexible to use | 4.38 |
| PEOU6. Learning to use the mobile application is easy for me | 4.24 |
| PEOU7. The application is difficult to use | 2.05 |
| PEOU8. The mobile application is presented in a way that allows me to easily diagnose obstetrics and gynecology problem | 3.95 |
| PEOU9.The mobile application is unnecessarily complex | 1.57 |
| PEOU10. The application is cumbersome to understand. | 1.57 |

Three (3) statements were used to measure the Perceived Usefulness (PU) TAM construct, as shown in table 4. Further investigation of participants’ feedback for PU suggests that MAHPOG is useful diagnosing obstetrics and gynecology problems. This finding is supported by the high mean score for PU1 and PU3 with 4.66 and 4.24 respectively. Considering all accumulated feedback, the PU construct received a median score of 5, which evidences the overall agreement on usefulness of MAHPOG as perceived by the health experts. The participants ‘opinion on the usefulness of MAHPOG is also supported by their shared disagreement on PU2, which indicates the level of interaction required to use MAHPOG (“I need to ask several questions before I could start using the application”), which received a mean score of 2.86, which showed higher tendency towards accepting MAHPOG.

Table 4: Perceived usefulness responses

|  |  |
| --- | --- |
| Statements | Mean |
| PU1.I find this mobile application useful for helping individuals/physicians diagnose obstetrics and gynecology problems | 4.66 |
| PU2. I need to ask several questions before I could start using this application | 2.86 |
| PU3. I find the application useful for my job | 4.24 |

Perception of External Control was measured through two questions, PEC1 and PEC2 shown in table 5. Our findings indicate that participants agree on readily possessing all required resources and knowledge to use the application. In particular, the participants agree that they have the knowledge necessary to use the application. (PEC1 mean of 4.71) and, to a lesser but acceptable extent, the resource necessary to use the application (PEC2 mean of 4.14). PEC has a median score of 4.5 shows a high level of perception of necessary resources had.

Table 5: Perception of external control responses

|  |  |
| --- | --- |
| Statements | Mean |
| PEC1. I have the knowledge necessary to use the application | 4.71 |
| PEC2. I have the resources necessary to use the application | 4.14 |

Job Relevance of the application to the context of the participant was measured through three statements, REl1, REL2, and REL3 as shown in table 6. For REL construct, high scores were received for REL1 and REL2. Participants agreed that the arrangement of operation (the progressive specialization of concepts) in the application is helpful (REL1), as indicated by the mean score of 4.43. Likewise, REL2 recorded a slightly higher mean score of 4.05. this score indicates that agreement achieved by the participants with respect to the application being able to address the entire symptoms necessary (i.e. “The application is able to address the entire symptoms necessary”). Similarly, the response to the reverse scale question REL3 (i.e. “The application is not in adherence to current practices”), indicates that the respondents agree that the mobile application is compatible with current practice in the health domain.

Table 6: Job relevance responses

|  |  |
| --- | --- |
| Statements | Mean |
| REL1.The arrangement of the operation of the application is helpful | 4.43 |
| REL2. The application is able to address the entire symptoms necessary | 4.05 |
| REL3. The application is not in adherence to current practices | 2.33 |

Finally, Behavioral Intention is measured through five questions, BI1, BI2, BI3, BI4, and BI5 as depicted in table 7. The highest mean score of 4.00, received for BI1, indicates agreement on participants’ belief that it will be a good idea to use MAHPOG for health application. BI2 received mean score of 4.14 and BI4, 3.95, indicating that the participants have an overall favourable attitude to the use of MAHPOG. The participants also agreed or strongly agreed that they intend to use the application for physician practice (BI3 of 3.71), however, they were highly sure in their willingness to refer to the application once in use (BI5 mean score of 4.8). overall, a median score of 4 was recorded from the Behavioral Intention assessment, evidencing a high level of agreement among participants with respect to the BI construct.

Table 7: Behavioral intention responses

|  |  |
| --- | --- |
| Statements | Mean |
| BI1. I believe it would be a good idea to make this application for health organizations | 4.00 |
| BI2. I have generally favorable attitude toward using this application | 4.14 |
| BI3. I intend to use this mobile application for my physician practice | 3.71 |
| BI4. I like the idea of using this application | 3.95 |
| BI5. I will refer to this application often | 4.43 |

**Concluding discussion**

This research paper presented the implementation of a mobile application on herbal medicine prescription for obstetrics and gynecology (MAHPOG) developed to address an urgent and crucial need in the medical domain. MAHPOG is a result of a study that has gone through various phases of problem identification, feasibility study, information gathering, system design and implementation, expert feedback and the usability evaluation, has positioned MAHPOG as a mobile application that provides needful solution in the medical domain. The experts has indicated that they consider the application as highly useful and effective in diagnosing obstetrics and gynecology problems. This will be of great advantage for the usage of females whose environment are far from a medical center or those who can’t avoid visiting the medical center. The mobile application will aid prescription of herbal medicine for obstetrics and gynecology problems which will help diagnose their ailment with ease. This will also help ensure first aid treatment to users. In addition, unsolicited feedback from the experts has also demonstrated the potential of this application. Finally, we also provided a detailed approach for MAHPOG usability evaluation based on Technology Acceptance Model.

As pervasive technologies become a more integral part of everyday life, attention is now being paid to how these ubiquitous computing systems can be used to monitor and contribute to herbal healthcare services. This paper diagnosed obstetrics and gynecology problem, prescribing herbal medicine with their production company, where it can be found and related diseases. We intend carrying out further research by enabling users input their symptoms so as to diagnose result, which will be more efficient and reliable.