# Usability As A Critical Factor For Successful Deployment Of IT Systems In The National Health Service (NHS)

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# Usability As A Critical Factor For Successful Deployment Of IT Systems In The National Health Service (NHS)

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## Abstract

There are many factors that determine the fate of an IT project of which cost, time, external inputs are no new comers. However, there are other salient factors such as usability which is usually not mentioned at the fore front. This paper aims at analyzing usability as a perquisite for successful deployment of IT systems in the National Health Service (NHS) particularly in the East London and Community Mental Health Trust (ELCMHT) London. It also looks at lessons learnt and critical factors responsible for successfully deploying Health Information and Management Systems (HIMS).

The study is descriptive and quantitative based on primary data collected from respondents. Data was collected by five point Likert scale questionnaire. The following statistics mean, frequency and t-test were used to analyse data. Results were then then presented with a pie chart for clarity and easy understanding.

**Implications:** The results will be useful for other health trust across the United Kingdom whom seek to implement RIO system or other HIS. It also serves as a lessons learned for introducing new technology in a health institution.

**Limitations:** The study is based on data from one care trust where RIO was deployed. It may not give a clear picture of the success or failure of RIO deployment in other health trusts within the United Kingdom.

**Keyword:** Usability, user -training, RIO, IT deployment, learnability

## INTRODUCTION

When it comes to delivering IT for the NHS (National Health Scheme), the Department of Health (DoH) has always been criticized for wasting tax payer's money on ambiguous IT solutions. Right from the 1998 Government  initiative to modernizing of the NHS  by

introducing Information for Health, to the latest transformation of the NHS with the National Programme for IT (NPfIT) (Currie & Finnegan, 2009).

The associated problems with deploying these IT systems vary from either faulty software, poor functionality, system design, change management issues or contractual issues with suppliers. In the heath sector for example, deployment of IT systems has not been properly implemented in the past and thus end-users most times have to put up with systems with poor usability and functionality.

RIO, a new health care system and other prime products like Lorenzo, Cerner Millennium, SystmOne and iPM/iCM were meant to handle care records and bookings in various Trusts across United Kingdom. RIO was specifically designed for the Mental and Community health Trusts in London and was meant to replace the existing CENTRAL RECORD SYSTEM (CRS), which according to users was outdated, limited in functionality and difficult to upgrade (Southwark PCT, 2006). Its business case was meant to ease data sharing across the health trust 24hours a day, improve information gathering methods for clinicians and practitioners, improve monitoring and reporting performance and improve the is user experience for clinicians (Southwark PCT, 2007). So far, RIO was the only Care Record System under the NPFIT that was successfully deployed across major Trusts in the London. According to Gold (2011), over 40,000 clinical staff in the UK are currently using RIO for their care records. For example RIO is fully functional in the East London and the City Mental Health Trusts (ELCMHT), Southwark PCT, Ridgeway Partnership, Lambeth PCT, Dorset Healthcare Foundation Trust, Surrey & Borders Partnership and amongst others.

Despite the track record of RIO deployment, there were certain challenges that were common to most of its deployments ranging from issues of usability, delay in deployments, poor funding and organization work practices with usability as the most re-occurring (Currie & Finnegan, 2009).

**REVIEW OF LITERATURE**

According to Nelson, Bueno and Huffstutler (2000), usability is defined as a measurement of user's ability to easily use computer software to complete a specific task. However, Karat (2001) is of the opinion that measuring usability may be difficult because flexibility of a system cannot be measured numerically or tested.  Nielsen (1993) argues that acceptability is a better definition for usability, explaining that if users don't accept systems then the purpose of deployment is defeated. On the other hand the International Standards Organization (ISO) defines usability as "the degree to which specific users can achieve specific goals within a particular environment; effectively, efficiently, comfortably, and in an acceptable manner" (ISO, 1991b). The usability of a system can be achieved by applying certain methods like are expert reviews, questionnaires and interviews from targeted end-users. The findings of such processes are then implemented during the System Development Life Cycle (SDLC), making sure that user's expectations are met (Nelson, Bueno & Huffstutler, 2000).

**The usability problem:** According to Lavery, Cockton and Atkinson (as cited in Sonderegger, 2010), a usability problem is described as a phase in the system where an end-user experience is unpleasant and inefficient thereby making it impossible to achieve their intended goals in using the system. Usability problems can be classified into severity, frequency, impact, cost or human error (Keenan, Hartson, Kafura & Schulman, 1999). The usability problem can be avoided when health care applications are developed within the guiding principles of health care usability specified by Healthcare Information and Management Systems Society (HIMSS) and the Electronic Health Record (EHR) (Jeffery, Grayson & Barnes, 2009).

**Factors affecting Usability**

Usability of IT systems are determined by many factors. The usability of any software is also dependent on the sector it is being applied to. In other words the usability factors affecting a

hotel management information system will be different form that involving a Healthcare Information and Management Systems Society (HIMSS). According to Nielsen (2003); ISO 9241-11 (1998), the main factors affecting usability of software are learnability, availability of information, efficiency, effectiveness, user's satisfaction, ease of use and learnability amongst others. In other for the above factors to be effective it is expedient for the end-user to be familiar with the proposed new system. Hence, software has to undergo certain usability testing before it is deployed to the client.

**User -training:** User - training is a vital part of usability testing and according to Coombs et al.; Riley and Smith; Skok and Legge ; Sumner; Wastell and Newman  (as cited in McLeod & MacDonell, 2011) user-training can be very crucial to the successful deployment of systems. Although it may be time-consuming in some larger projects (Mabert, Soni & Venkataramanan, 2003b).

 According to it Skok and Legge(2002), user training affects project outcomes through its influence on users' attitudes towards the system. Through a training program, users can gain skills and experience in utilizing the system, potentially increasing their confidence in using it, as well as greater knowledge and understanding of the system, which can influence their acceptance or rejection.  It has also been argued that user education and training may be critical to the long term success of a system, especially when users feel threatened (such as by changed job roles), as incomplete knowledge and understanding of the system and a lack of appreciation of changes could lead to resistance towards new systems (Irani & PED, 2001).Wilson and Howcroft (as cited in  Aikins, 2012) argued that training can also be used to try to persuade users of the benefits of a new system in an effort to enrol them to use it. According to Jiang, Klein and Balloun; Mahmood et al. (as cited in McLeod & MacDonell, 2011), training usually begins after installation has occurred, suggesting that by introducing a training program earlier

in the development process, users may contribute more effectively to the success of the new system.

**Usability of RIO in East London and the City mental Health Trust (ELCMHT):**

According to Gold (2011), both RIO and Lorenzo systems were designed to perform virtually the same functions in different regions and yet, statistics show that as at June 2011 only RIO had been fully implemented in Mental health trusts across London. Gold (2011) was also of the opinion that the reasons why RIO thrived was because the following key factors were taking into consideration: Adoption of lessons learned from other mental health trusts who have previously deployed RIO, effective communication between deployment team and stakeholders, early requirement analysis in order to know what exactly the end user is expecting out of the product and usability testing as a continuous process to make sure deployment of new software is hitch free.

**OBJECTIVES**

The successful deployment of RIO across Mental health trusts in the UK were dependent on certain factors. This paper seeks to investigate the impact of usability as a critical factor in deployment of heath applications in the NHS. It also seeks to investigate the usability factors that were most critical to the successful deployment of RIO in the ELCMHT.

**METHODOLOGY**

This study was carried out with a quantitative approach. This study was carried out with the aid of a well-structured 5 point Likert scale questionnaire. The questionnaire comprised 3 general questions and 7 specific questions on usability. The questionnaires were administered to 60 clinicians of the ELCMHT while the Associate Director of IT in ELCMHT was interviewed via e-mail. Data was collected from both methods and the responses of the 31 clinicians were analyzed with simple descriptive statistics such as tables and bar charts and then with a more complex ANOVA and linear regression. The study analyzed the impact of

usability in the deployment process of RIO with the East London and the Community Mental Health (ELCMHT) as case study.

## EMPIRICAL RESULTS

### Reliability Test
The Cronbach alpha value for the constructs was 0.884 and according to DeVellis (1991), Cronbach alpha scores above 0.60 are deemed accepted and reliable.

## DISCUSSIONS

The reliability of the questionnaire was determined using Chronbach's alpha and was then analysed in SPSS (Statistical Package for Social Sciences). All the factors were examined and their Cronbach values were above 0.7 which is said to be acceptable. Hence the constructs in the questionnaire have a high reliability score as shown in **Table 1**. It can also be observed that the lowest score of 0.830 for design can be attributed to the fact that many users have different opinions when it comes to design and aesthetics of software applications. Also the high Cronbach values above 0.7 (0.839, 0.931, 0.879, 0.823, 0.830, 0.860). From the statistics of the individual items, (64.5%) of participants agreed that RIO was learnable as seen in **Figure 1**,(35.5%) agreed that it was efficient as seen in **Figure 2**, (61.3% ) agreed that it was effective as seen in **Figure 3**, (48.4%) were satisfied with it as seen in **Figure 4**, (41.9%) were okay with the design as seen in **Figure 5** and ( 41.9%) agreed that there were minimal errors as seen in **Figure 6**. The high percentage of participants that found RIO learnable is an indication that learnability played a major part in the deployment of RIO followed by effectiveness. Other factors like satisfaction, design and error had an average percentage of 40% indicating that users were not fully satisfied with the user interface design of RIO. Efficiency had the lowest ranking of 35.5% indicating that a great number of participants were not satisfied with the efficiency of RIO. **Figure 7** shows the evaluation of usability factors by different participants for RIO deployment. Usability factors were ranked based on the mean response of participants

as follows: Learnability (4.45), satisfaction (4.16), design (3.87), effectiveness (3.58), error (3.32) and efficiency (3.16). From the above results in Figure 7 it can be deduced that users are more concerned with the learnability and satisfaction of RIO.

## CONCLUSION

As important as usability is in the IT deployment it is still an area that is overlooked either by reason of limited time for testing or the cost of usability testing. From the findings of this research some important facts were brought to light, firstly: it was discovered that learnability played a major role in the usability of RIO care system and secondly it was observed that adequate user training enhanced the learnability of RIO. Finally, the responses of most of the clinical staff on the ease of usage and learn ability of the RIO care system is a reflection of how sufficient and useful the level of training is in software project environment.

## MANAGERIAL IMPLICATIONS

Seeing that the successes of deploying usable systems does not lie solely in the hands of the designer or usability engineer but rather in the hands of all parties involved in an IT project, it is therefore recommended that software developers imbibe the culture of rigorous testing of software before deployment and at intervals during the project cycle. Also these results will enable software vendors to take into consideration the necessary facts before proposing a new HIMS to hospitals.

## ACKNOWLEDGEMENT

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Southwark PCT R&D Annual Report .(2007).Retrieved from http://www.researchdevelopmentcentre.nhs.uk/downloads/research-governance/DH-AnnRpt-2007.pdf.

# Tables and Figures

**Table 1: Cronbach Alpha Reliability Test**

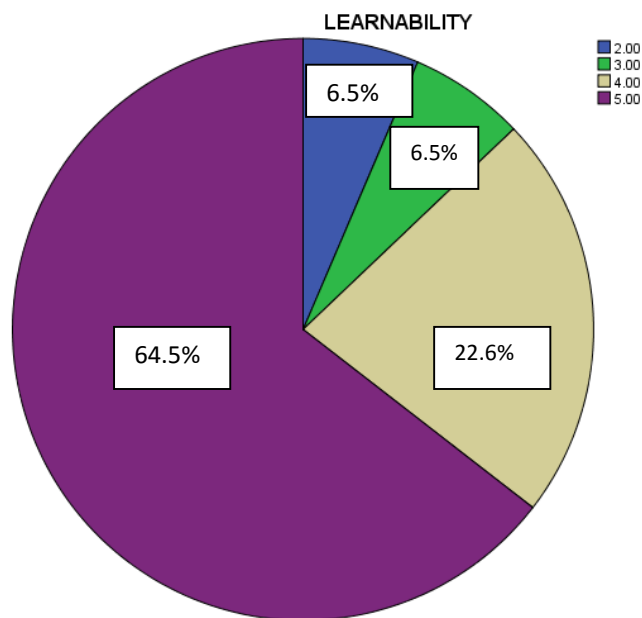| USABILITY | Cronbach Alpha |
|---|---|
| Learnability | 0.839 |
| Efficiency | 0.931 |
| Effectiveness | 0.879 |
| Satisfaction | 0.823 |
| Design | 0.830 |
| Error | 0.860 |

**Source: Researchers Construct (2019)**



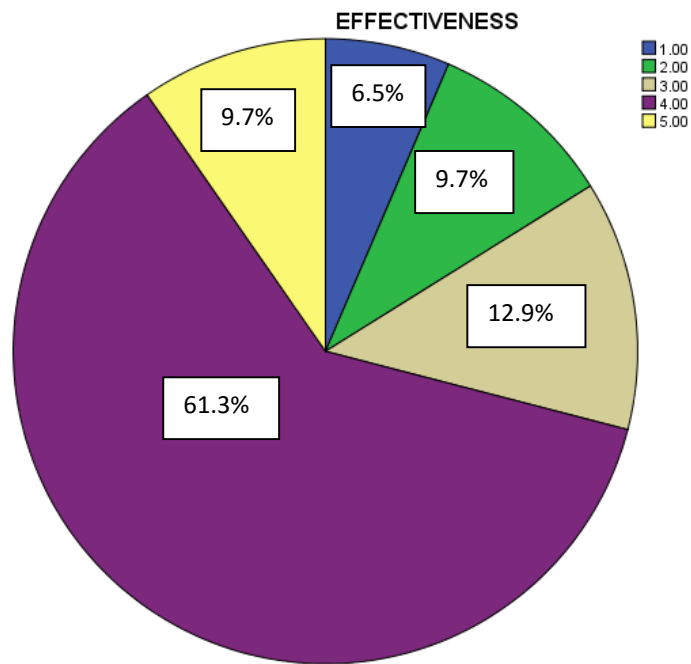**Figure 1: Responses in percentage on the Learnability of RIO**

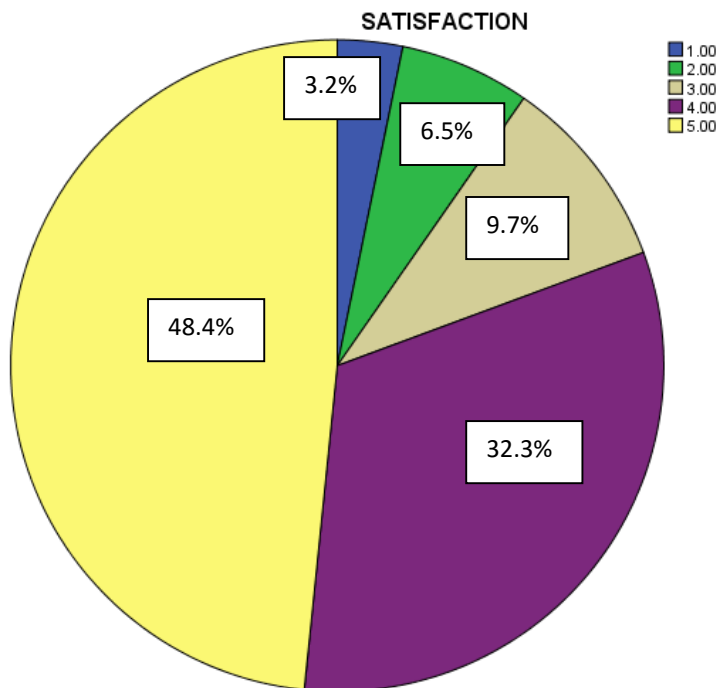**Figure 2: Responses in percentage on the Effectiveness of RIO**



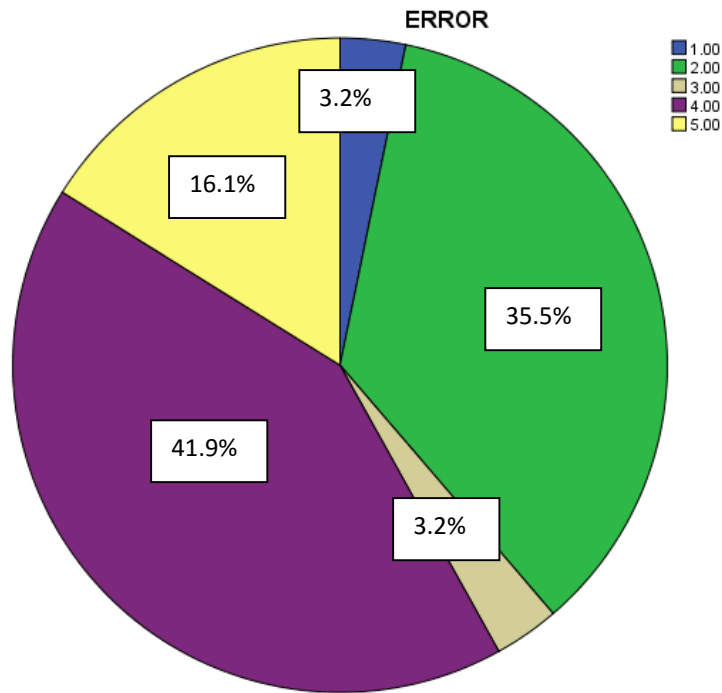**Figure 3: Responses in percentage on the Satisfaction of RIO**

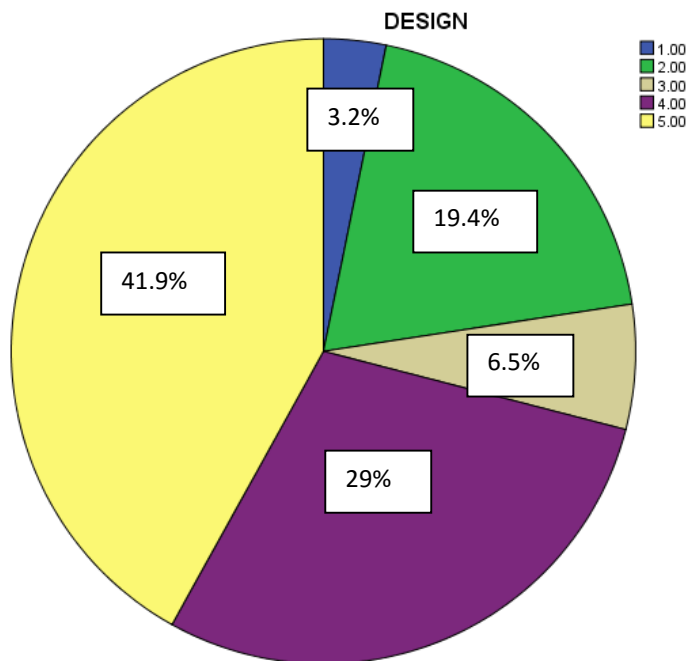**Figure 4: Responses in percentage on the Errors in RIO**
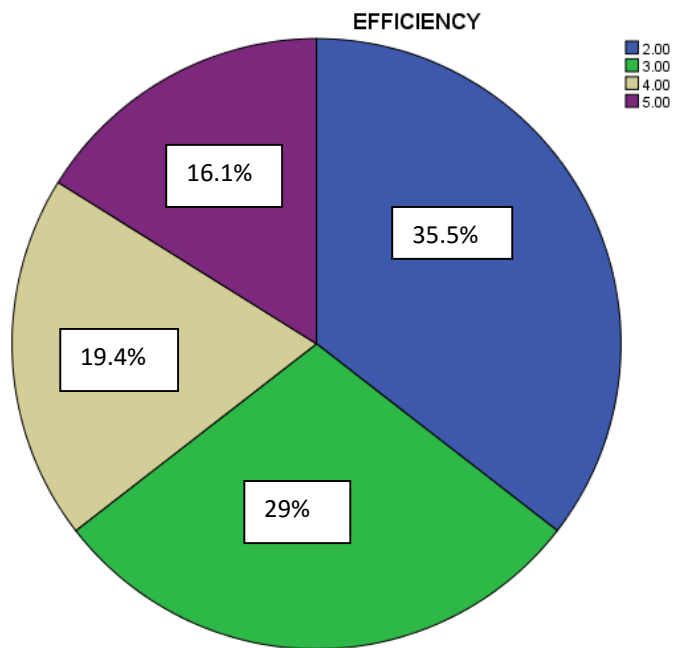


**Figure 5: Responses in percentage on the Design of RIO**

**Figure 6: Responses in percentage on the Efficiency of RIO**

**Table 2: Descriptive statistics of Usability factors**

| Usability Items | Mean | Std.Dev |
|---|---|---|
| Learnability | 4.4516 | 0.888396 |
| Efficiency | 3.1613 | 1.09839 |
| Effectiveness | 3.5806 | 1.02548 |
| Satisfaction | 4.1613 | 1.06761 |
| Design | 3.8710 | 1.25809 |
| Error | 3.3226 | 1.22167 |
| | | |

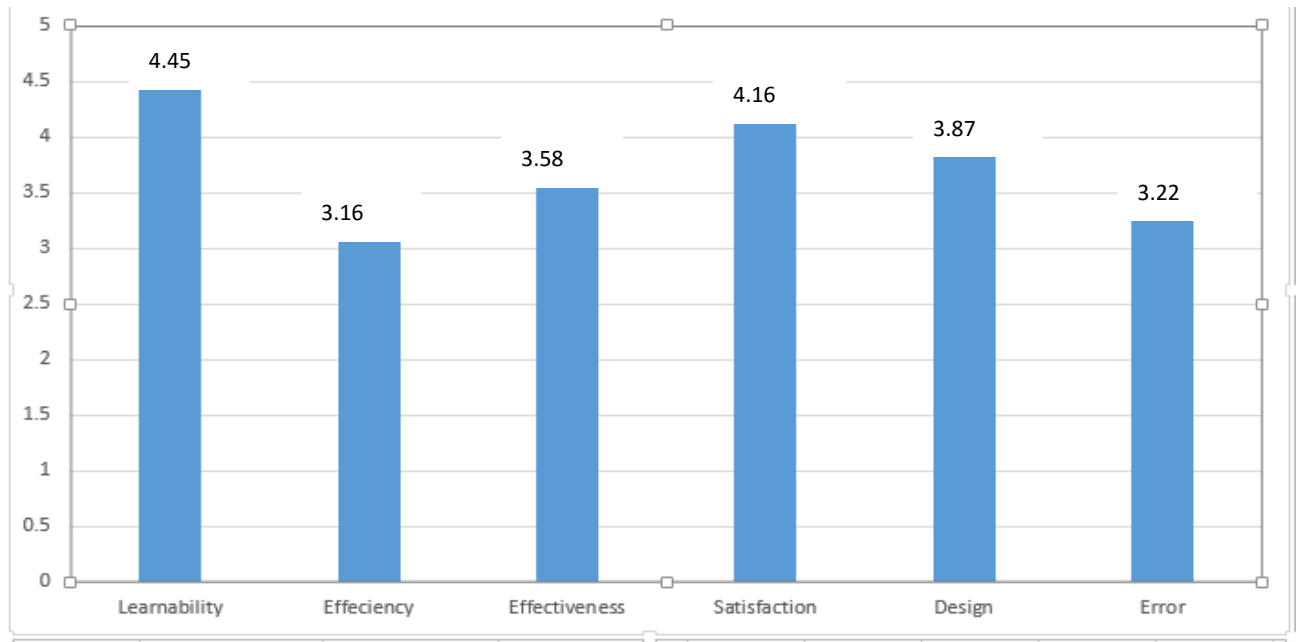**Source: Researchers Construct (2019)**

**Figure 7**. Evaluation of usability factors by different participants for RIO adoption in ELCMHT

**Appendix**
**Questionnaire**

| Questions | Description | Strongly Agree | Agree | Not sure | Disagree | Strongly disagree |
|---|---|---|---|---|---|---|
| | **Learnability** | | | | | |
| Q1 | Training I got was sufficient | 19 | 5 | 2 | 3 | 1 |
| Q2 | I found the system easy to use | 20 | 7 | 1 | 2 | 0 |
| | **Efficiency** | | | | | |
| Q3 | The system gives a true picture of flow workflow in the hospital | 9 | 16 | 2 | 3 | 0 |
| | **Effectiveness** | | | | | |
| Q4 | The system helps me perform tasks easily and faster | 11 | 14 | 2 | 1 | 2 |

14

| | | | | | | |
|---|---|---|---|---|---|---|
| | **Satisfaction** | | | | | |
| Q5 | Overall I am satisfied with the system | 20 | 9 | 0 | 0 | 0 |
| Q6 | The user experience is engaging | 16 | 11 | 2 | 1 | 0 |
| | **Design** | | | | | |
| Q7 | I am familiar with the users interface | 13 | 10 | 2 | 5 | 0 |
| Q8 | I believe the interface should be improved upon | 13 | 8 | 3 | 5 | 1 |
| | **Error** | | | | | |
| Q9 | I encountered bugs while using the system | 5 | 15 | 0 | 10 | 0 |

**Source: Researchers Construct (2018)**