The Case for IT Training within Guinea's Ministry of Agriculture: Evaluating Performance and Usability

Maurice Dawson
University of Missouri – Saint Louis, maurice.dawson@ieee.org

Damon Walker
University of Missouri – Saint Louis, dlw7wb@mail.umsl.edu

Simon Cleveland
City University of Seattle, simoncleveland@cityu.edu

The Case for IT Training within Guinea's Ministry of Agriculture: Evaluating Performance and Usability

Maurice Dawson
University of Missouri – Saint Louis
maurice.dawson@ieee.org

Damon Walker
University of Missouri – Saint Louis
dlw7wb@mail.umsl.edu

Simon Cleveland
City University of Seattle
simoncleveland@cityu.edu

ABSTRACT

This article critically analyzes a project executed for the The John Ogonowski and Doug Bereuter Farmer-to-Farmer Program which provides technical assistance with volunteers from the United States to farmers, agricultural institutions, and government organizations involved in agriculture such as the Ministry of Agriculture. In Guinea, the focus is on computer literacy as more sectors of agriculture rely on computing technology. These skills needs range from basic computing tasks such as creating databases to more advanced items such as programming Global Positional Systems. This study looks at findings, based on the analysis of the System Usability Scale results from a sample of 16 participants. The findings demonstrated that the training proved to be effective for the participants and continued training is necessary. As a result of training 62.5% of the participants ranked above average, as opposed to 43.6% prior to training.

Keywords

Usability, systems usability, human computer interaction, global information systems.

INTRODUCTION

The agriculture industry is rapidly changing and requiring the use of modern technology. The incorporation of computing has transformed the way in which crops are tracked. Included in this development has been the wireless application sensors for food development, and application of the Internet of Things (IoT) technologies such as Radio Frequency Identification (RFID) allowing integration with mobile devices (Wang, Zhang, & Wang, 2006; Zhao, Zhang, Feng & Guo, 2010). As the Ministry of Agriculture realizes the benefits to the use of computing, they have reached out to USAID to request expert technical volunteers to provide training and support of these technologies.

COMPUTING ENVIRONMENT

The training occurred in a training lab on a desktop computer with the Windows 7 Operating System (OS). Microsoft Office 2013 was the installed productivity suite. The machine had an Intel(R) Core™ 2 Duo CPU on a 32 OS. The computer laboratory had two rows of four devices on each side.

TARGET POPULATION AND DATA SIZE

The target population for this study consisted of 16 participants from Conakry. However, the course contained 20 total course participants but only 16 surveys were fully completed. Each participant was familiar with the use of a computer. Six participant ages ranged from 18-29 which were classified as youth. The remainder were classified as adults per societal norms in Guinea.

SYSTEM USABILITY SCALE (SUS)

To determine usability, integration, and need for technical support, this study used the System Usability Scale (SUS). SUS was created in 1986 by John Brooke (System Usability Scale, 2014). The scale has been used to evaluate a wide range of products and services, including software, mobile devices, hardware, websites, and applications. The reliability of SUS has been demonstrated with smaller sample sizes (Bangor et al., 2009). The participants were given paper copies of the SUS on June 14, 2017. The participants were asked to remain anonymous and to enter a date on the top of the document. The survey

was administered the same way on the last day of the course, June 21, 2017. In this study, the participants were asked the following ten questions adapted from the SUS, with responses ranging from Strongly Agree to Strongly Disagree on a 5-point Likert scale:

1. I think that I would like to use this system frequently.

2. I found the system unnecessarily complex.

3. I thought the system was easy to use.

4. I think that I would need the support of a technical person to be able to use this system.

5. I found the various functions in this system were well integrated.

6. I thought there was too much inconsistency in this system.

7. I would imagine that most people would learn to use this system very quickly.

8. I found the system very cumbersome to use.

9. I felt very confident using the system.

10. I needed to learn a lot of things before I could get going with this system.

To interpret the results, participant's scores for each question were converted to a new number, added together, and then multiplied by 2.5 to convert the original scores of 0-40 to 0-100 (Sauro & Lewis, 2011). The scores were considered in terms of percentile ranking. A SUS score above a 68 is considered above average, while anything below 68 is regarded as below average. Scores were normalized to produce a percentile ranking.

INSTRUCTIONAL CHALLENGES

A difficulty with content delivery was maintaining Internet access at the government location. Internet speeds across the continent vary and inconsistent from region to region (Gelvanovska, Rogy, & Rossotto, 2014; Oyelaran-Oyeyinka & Lal, 2005). To address this issue for training module requiring the use of the Internet, students brought in access WiFi data cards. There was also a language barrier between the Anglophone trainer and 16 Francophone student participants. A translator was used to mitigate this significant risk. The module lectures were presented in 30 seconds to a period of two minutes to allow for proper translation of technical material. Due to a limited number of available desktops two learners were on a computer rotating use, and with one taking detailed notes.

EXPLANATION OF RESULTS

The use of the SUS method has been demonstrated to be effective in extant literature (Haji & Ahmed, 2017). The measure is used to assess perceived ease-of-use of an application as well as system usability, satisfaction and learnability (Sauro, 2011). The SUS scales are reliable in that they demonstrate consistent participant response on each question. Furthermore, SUS produces reliable data with small sample sizes. Moreover, SUS scales are valid as they illustrate the differences between usable and unusable systems while demonstrating high concurrent validity.

In this study, the SUS scale test was administered to participants before the training was conducted. Before the training was held, the students did not display a strong level of comfortability with Windows products. There was apprehension to the instructor as they were unsure of teaching style, and being able to grasp the techniques. This created a stage that the instructor had to reassure students that the environment was one for learning and that they will work as a unit throughout the hands-on exercises. A SUS survey was captured before the training started to compare later with students' progression. This was used as an indicator of a successful training event. If unsuccessful then the delivery of training would be modified for future assignments.

$$\Sigma Q4 = 64; \Sigma Q10 = 69$$

Figure 1. SUS Formula

The preliminary testing revealed that 56% of the participants scored at the D level or below (as noted in the figure below). This suggests that the over half of the participants had a low level of perceived ease-of-use with the system. Furthermore, questions four and ten of the SUS scale, which indicated the level of difficulty with learnability and usability with the system, indicated that participants required a lot of support from technical staff as well as a lot of training before getting comfortable with the system.

Participant	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	SUS Score
P1	4	1	5	4	2	3	5	4	4	4	60
P2	5	1	3	5	3	1	4	3	5	5	62.5
P3	5	2	4	3	5	2	5	2	5	3	80
P4	5	3	1	2	3	1	5	1	5	5	67.5
P5	4	5	5	3	5	5	5	4	5	5	55
P6	5	1	5	1	5	1	5	1	5	1	100
P7	4	1	2	4	5	1	3	3	2	4	57.5
P8	5	3	4	4	3	3	4	1	4	4	62.5
P9	5	1	4	5	5	1	4	2	4	5	70
P10	5	1	5	5	5	4	5	1	5	5	72.5
P11	5	1	5	5	2	1	5	1	5	5	72.5
P12	5	3	5	5	4	1	4	3	5	5	65
P13	5	1	4	5	5	3	5	1	5	5	72.5
P14	5	4	5	5	4	4	3	5	5	5	47.5
P15	5	3	2	5	4	2	3	4	4	5	47.5
P16	5	1	5	3	2	1	5	2	3	3	75

Descriptive statistic of SUS (n = 4)											
Statistic	n	Total	Mean/Average	Min	Max						
	16	1067.5	66.71875	47.5	100						

Table 1. SUS Results – Before Training

After the training was conducted, the SUS scale test was administered once again. This time, 63% of the participants scored in the range of C or higher, suggesting the training helped them achieve greater perceived ease-of-use with the system (see results in the figure below). Additionally, the total scores for questions four and ten decreased, which suggests that the participants achieved greater learnability and usability of the system.

$$\Sigma Q4 = 57; \Sigma Q10 = 57$$

Figure 2. SUS Formula

Finally, upon completion of the training the instructor noticed that the participants were highly engaged in the material. Participants were eager to learn and showed gradual improvement daily. Participants were on time and prepared for each training session. Also, due to the participants quickly grasping the material, additional, more advanced material had to be created and administered. On the last day of class one participant expressed that the training gave her confidence to create her slides in PowerPoint and try new applications.

		Scales					
P	Odd items	Even items	SUS score (/100)	Grades			
1	18	5	57.5	F		Grading SUS Key	
2	15	15	75	C		92	Best imaginable
3	20	20	100	A		85	Excellent
4	20	6	65	D		72	Good
5	13	16	72.5	C		52	OK/Fair
6	14	8	55	F		38	Poor
7	16	7	57.5	F		25	Worst imaginable
8	18	8	65	D			
9	16	17	82.5	B		90-100	A
10	13	4	42.5	F		80-89	B
11	18	13	77.5	C		70-79	C
12	20	12	80	B		60-69	D
13	18	10	70	C		Less than 60	F
14	18	11	72.5	C			
15	20	15	87.5	B			
16	18	13	77.5	C			
		Average score	71.09375	C			

Table 2. SUS Results – After Training

CONCLUSION

According to the SUS anything above 68% is above average. The overall results before training was 66.7%. The average of the SUS at 71.1% after training, proves its usefulness for the participants. Participants need more training to become proficient users of the system. With the continued training of the trainers, they will be able to provide more effective training to the field users as well as the farmers that look to provide an analysis of their crops. Overall, the training proved to be effective for the participants and continued training is necessary. As a result of training, 62.5% of the participants ranked above average, as opposed to 43.6% prior to training. Additionally, the SUS scores measuring difficult with learnability and usability, while higher before the training, decreased after the training, which indicates that the participants achieved greater learnability and usability of the system as a result of the provided training.

This study has limitations; the information may not be sufficient to generalize. Therefore, caution should be taken when using the data outside the context conducted in this study. The data could vary considerably between different regions within Guinea to include industries such as education. Future studies should be directed towards looking at different groups within the ministry to include conducting a longitudinal survey.

ACKNOWLEDGMENTS

REFERENCES

1.   Bangor, A., Kortum, P., and Miller, J. (2009). Determining what individual SUS scores mean: Adding an adjective rating scale. Journal of usability studies, 4(3), 114-123

2. Gelvanovska, N., Rogy, M., & Rossotto, C. M. (2014). *Broadband networks in the Middle East and North Africa: Accelerating high-speed internet access*. World Bank Publications.

3. Haji, V. M., & Ahmed, N. S. (2017). A Web-Based Management Information System for Human Resources in Selected Universities of Duhok Province. *Science Journal of University of Zakho*, 5(2), 214-220.

4. Oyelaran-Oyeyinka, B., & Lal, K. (2005). Internet diffusion in sub-Saharan Africa: A cross-country analysis. *Telecommunications policy*, 29(7), 507-527.

5. Sauro, J. (2011, February 2). Measuring usability with the system usability scale (SUS). Retrieved on February 3, 2018 from https://measuringu.com/sus/

6. System Usability Scale (SUS). (n.d.). Home. Retrieved January 25, 2018, from http://www.usability.gov/how-to-andtools/methods/system-usability-scale.htm

7. Wang, N., Zhang, N., & Wang, M. (2006). Wireless sensors in agriculture and food industry—Recent development and future perspective. *Computers and electronics in agriculture*, 50(1), 1-14.

8. Zhao, J. C., Zhang, J. F., Feng, Y., & Guo, J. X. (2010, July). The study and application of the IOT technology in agriculture. In *Computer Science and Information Technology (ICCSIT), 2010 3rd IEEE International Conference on* (Vol. 2, pp. 462-465). IEEE.