HCI Practices in the Nigerian Software Industry

Abiodun Ogunyemi, David Lamas, Emmanuel Rotimi Adagunodo, Isaias Rosa

HCI Practices in the Nigerian Software Industry

Abiodun Ogunyemi[1], David Lamas[1], Emmanuel Rotimi Adagunodo[2], Isaias Barreto da Rosa[3]

[1] Institute of Informatics, Tallinn University, Narva mnt 29,10120 Tallinn, Estonia
[2] Department of Computer Science & Eng., Obafemi Awolowo University, Ile-Ife, Nigeria
[3] ECOWAS Commission, Niger House, Area 1, Abuja, Nigeria
{abnogn@tlu.ee, david.lamas@tlu.ee, eadagun@oauife.edu.ng, isaiasbr@gmail.com}

Abstract. In this paper we explore the state of HCI practices in the Nigerian software industry. Our societies have evolved quickly into an information age, and the criticality of software and humans as components of socio-technical systems becomes more worthy to address. In Nigeria, the level of HCI practices is not yet known. We understand clearly, the role of software systems and services to strengthen information societies, and we decided to run a survey of the local software organizations. The results from the survey indicate some level of HCI awareness. Therefore, we conducted some semi-structured interviews in order to deepen our understanding of HCI practices in the industry. The results show there is a knowledge limit regarding HCI practices in the industry. We present a preliminary report of the results obtained from our studies of software organizations in Nigeria.

Keywords: HCI, Human-Centred Design, Human-Centred Software Engineering, Usability, HCI Education

1 Introduction

Although the field of human-computer interaction has been in existence for more than three decades, its spread has yet to be significant. Most of the spread has been in the developed countries and developing countries continue to lag behind [17].

Nigeria has an overwhelming population of 150 million people, which also accounts for approximately 20% of Africa's population (situation in 2012) [8]. Recently, the Nigerian government introduced a cashless economic policy, which implies that economic transactions are to be conducted electronically. Furthermore, many businesses have been moved online, and e-commerce is becoming a major business trend in the country [2]. Thus, the role of software systems and services cannot be ignored in Nigeria. Approximately 33% of Nigeria residents are connected to the Internet in a country where approximately 67% of the Internet users are mobile[1]. Nigeria is in the 133rd position in the recent World ICT development index[2].

---

[1] UN e-Government survey - http://unpan3.un.org/egovkb/Portals/egovkb/Documents/un/2014-Survey/E-Gov_Complete_Survey-2014.pdf

[2] ICT development index - https://www.itu.int/en/ITU-D/Statistics/Documents/publications/mis2014/MIS2014_without_Annex_4.pdf

Although it is the biggest Economy in Africa (primarily because it is the biggest oil producer in Africa), Nigeria still remains a developing nation. It can be envisaged as well what leading role Nigeria could play in promoting HCI in Africa in terms of the country's size and economy.

The story of HCI uptakes in developed and developing countries so far, might not differ, especially, when talking about certain practices such as usability engineering, user experience and Human-Centred Design (HCD). For example, Larusdottir, Haraldsdottir, and Mikkelsen, [13], ran a survey of the Icelandic software industry to determine how practitioners perceive the importance of usability and user involvements in software projects. The authors found that most of the companies use their own method regarding user involvement methods, and more than a third of the organizations surveyed, are skeptical regarding the importance of usability. Similarly, Ji and Yun, [12], conducted a survey of 184 Korean IT professionals and 90 User Interface/Usability practitioners, regarding User-Centred Design (UCD) and usability practices in the Korean IT industry. Their results show that awareness of UCD/Usability is high, but the reality of its application in projects is not fully realized.

The Nigerian software industry is still very young and in its formative stage. There are not yet regulations for the industry and most software companies use in-house methods [6, 18]. There are many small companies and only a few of these companies focus on custom developments [14]. Most custom developments are largely based on web applications. Very few of these organisations develop off-the-shelf software in which lower-level applications such as payroll, human resources management, educational, and accounting solutions are built from scratch as semi-packages and configured for various customers over time [18]. There are very few universities that offer an elementary course in HCI. Thus, there are very scarce sources to describe the state of HCI practices in Nigeria.

This paper describes and discusses the results from a recent field study regarding the state of HCI practices in Nigeria. To the best of our knowledge, a study such as this has not been conducted in Nigeria so far.

In the next section, we present our method. Next, we present the results, and finally, we discuss the results and describe future work that needs to be done.

2 Method

An online survey was deployed using the LimeSurvey open source tool. Respondents were targeted from indigenous software companies in Nigeria. The focus of the survey was on how Nigerian software practitioners conduct usability, user experience and human-centred design practices. The questionnaire was designed in such a way that some questions would only pop up, if an earlier answered question is related to the next one. Furthermore, there were questions, which allow respondents to choose multiple options and there were some, which allow single option.

Prior to the commencement of this study, the Institute of Software Practitioners of Nigeria (ISPON) was partnered with and a list comprising 50 indigenous software companies was obtained. A database search on relevant websites was made and

through this search, a total of 95 companies were invited through e-mail to join the study. Sixty-seven companies participated in the survey, which gave us a response rate of 70%. However, only 22 responses were useful for our analysis. Forty-five responses were rejected because they did not answer at least 75% of the questionnaire [10].

In order to strengthen and exemplify the results of the survey, we conducted ten semi-structured interviews in three indigenous software companies. The three companies were randomly selected. One of the goals of the interviews was to deepen our understanding of the keys issues regarding HCI practices in Nigeria. This study was conducted between October 2014 and December 2014.

3 Results

3.1 Demographics

A majority of the respondents came from the software development sector (10) and information technology services (9). Other sectors include telecommunication (1), non-governmental organisation (1) and e-commerce (1).

Regarding organisation size, 12 participants were from very small companies (10-20 staff), 5 were from small companies (50-90 staff), 3 were from medium companies (100-199 staff), and one participant each was from a large company (200-499 staff) and a very large company (more than 500 staff) respectively. This suggests that the Nigerian software industry is primarily composed of small companies. A previous study also suggested a similar trend [18]. Twenty companies are located in the South-West of Nigeria and one organisation each comes from the North and one from the South. Fifteen companies are located in Lagos. Lagos is the Economic Capital of Nigeria where the most prominent Nigerian Companies are located.

Regarding their educational qualifications, 15 respondents (68%) possess a BSc degree, three respondents each (14%), have diplomas and other certificates and one respondent (4%), has a High School certificate. Figure 1 (left-hand side) is the overview of the respondents' background regarding their first degree. The results show that 45% of the respondents possess a Bachelor's degree in Computer Science.
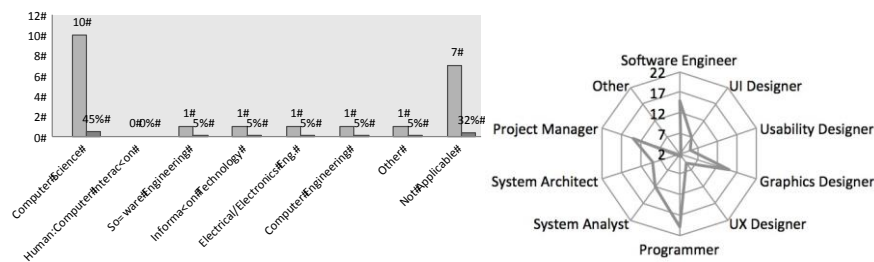

Fig.1. Respondents' first degree backgrounds and composition of software teams

With respect to the composition of software teams, the results indicate that there are very few HCI experts in the teams, and that the major aspect of HCI found in practice is graphic design. The results are also in Figure 1 (right-hand side). Regarding HCI awareness, 17 organisations (77%) are aware and five organisations (23%) are not aware.

Of the 15 respondents, who possess a BSc degree, only 9 indicate they took a course in HCI, and when asked to describe these HCI courses, some of the responses are: *"MYT364 - Fundamentals of interaction design"*
"Covered just the basics of HCI"
"Visibility and Affordance"
"It involves the study, planning, design and uses of the interaction between people (users) and computers"

The roles of the respondents in their organisations are Usability Designer (2), Programmer (7), Software Engineer (5), UX Designer (1), Project Manager (3), CEO (2), Technical Resource Engineer (1) and Chief Software Architect (1).

The responses regarding the HCI courses suggest that this category of practitioners received elementary HCI knowledge. However, it is imperative that these graduates are well-equipped with hands-on skills in order to succeed in the industry [15].

Regarding the years of experience of the respondents, the results obtained suggest that most of the respondents might be relatively young in their main roles. Eleven respondents (50%), have less than five years of experience. Seven respondents (32%), have 5-10 years of experience, one respondent (9%) each had 10-15 years of experience and more than 15 years of experience respectively. In comparison with the respondents' educational backgrounds, it is possible that the bulk of the practitioners with less than five years of experience are those with some level of HCI education.

We wanted to know what software development methodologies are used in respondents' organisation. Figure 2 reveals that most of the organisations used the Rapid Application Development (RAD) methodology. Figure 2 also reveals that none of the software organisations used such methods as Rational Unified Process, Unified Process, V-Model and Spiral.
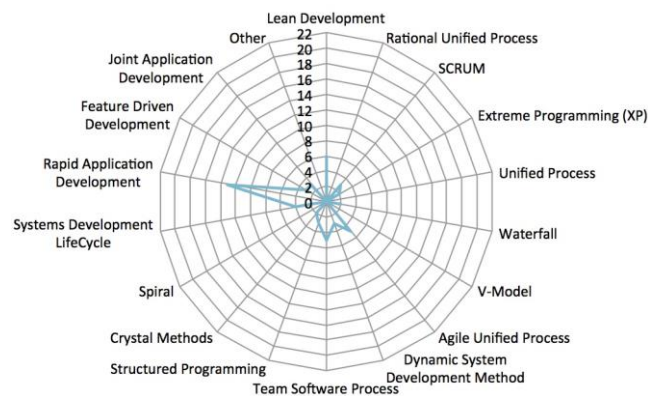

Fig.2. Software development methodologies used in respondents' organizations (multiple options allowed)

3.2 User Experience, Usability, and Human-Centred Design Practice

We asked if the organisations address user experience (UX). Seventeen organisations (77%) were positive and five organisations (23%) indicate they do not address UX.
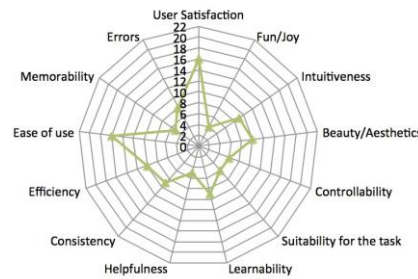

Fig.3. How UX is perceived in the respondents' organizations (multiple options allowed)

The results in Figure 3 suggest that the organizations might not fully understand the distinction between user experience and usability issues. The results show that pragmatic aspects of user experience are prioritized by the organisations ahead of hedonic aspects such as fun/joy and helpfulness. These findings are also similar to the findings by [19].

When asked about the frequency of conducting usability testing in projects, 12 organisations (55%) indicate they always conduct usability testing and 10 organizations (45%), indicate they sometimes do. Figure 4 (left-hand side) show some reasons why usability testing is not always conducted in the ten organisations.

The major reason indicated by the ten organisations was time constraints. This is consistent by the findings of [3]. However, software organisations that neglect usability aspects due to time or cost constraints, often spend more time and money on training and fixing bugs [14, 16].
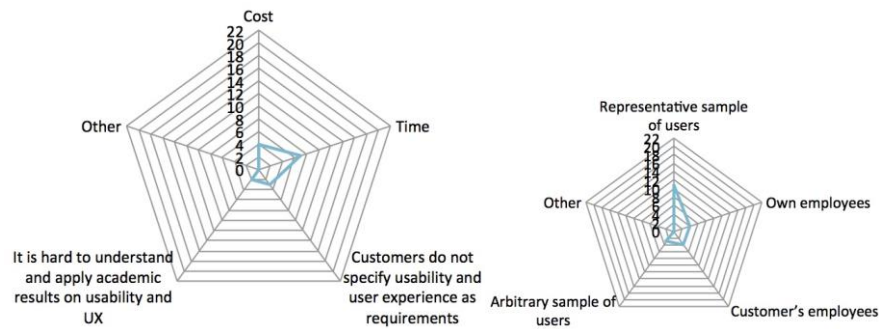

Fig. 4. Reasons for not conducting usability tests and the types of users selected for usability tests when they were conducted

Respondents also provide information regarding the kind of users selected for usability testing in their organizations. This is shown in Figure 4 on the right. As it can be seen, eleven organisations (50%) indicate they use a representative sample of users for usability testing. Four organisations (18%), used their own employees, four organisations (18%), used their customer's employees and three organisations (14%), used an arbitrary sample of actual users.

Similarly, some challenges as presented in Table 1 suggest reasons for the choice of RAD in most of the organizations. Rapid Application Development is particularly used where organisations are constrained by a short time frame for software projects, cost, and need for quality [1]. However, organizations suffer when they substitute HCI aspects for time and cost [7]. A respondent reports: "*It's time consuming.*"

Table 1. Challenges indicated for conducting usability, user experience and HCD Practices

Challenges	Respondents	Percentage (%)
Lack of standard tools for integration	2	9%
Lack of knowledge of best practices	5	23%
Short time to deploy software projects	7	32%
Cost of hiring HCI experts	7	32%
Ineffective Government policies	1	4%

We requested the organisations to select the principles for HCD, being applied by them, according to the ISO 9241-210 framework [11]. The results obtained and presented in Figure 5 show that the only aspect that is more prioritized is the understanding of users, tasks and environments. Other important dimensions such as user involvement and involvement of multidisciplinary-skilled experts are less prioritized. Our results in this regard, are similar to the study by [13].
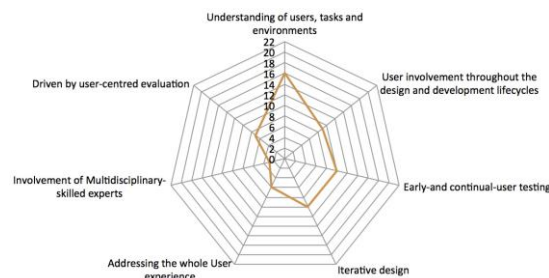

Fig. 5. HCD principles used in respondents' organizations (multiple options allowed)

3.3 Interviews

We conducted ten semi-structured interviews with software practitioners in three companies. Two of the companies are small-sized and are involved with custom development. The other company is medium-sized and is involved with off-the-shelf development. We wanted to know about interviewees' educational background. None of the interviewees, including those saddled with user interface design, have strong

HCI backgrounds. At their best, these interviewees have developed their knowledge of HCI from reading HCI books and web descriptions of HCI practices such as usability. One of the interviewees, a Chief Technical Officer (CTO) in one of the small-sized companies, responded: *"In trying to protect ourselves, we found ourselves implementing HCI."* The insight we can draw here is that of an educational limit.

Regarding user experience and human-centred design practices, we can say that the practitioners' organizations are not implementing these HCI practices, as we would expect. There are a couple of issues to justify our assumption. For example, none of the companies have a UX expert and no interaction design labs exist. The Project Manager (PM) in the medium-sized company attests: *"one area that we know we need to still work on is even our own development standards; we have not accepted that we are there, (in terms of) our benchmarks..."* The PM also indicated their challenge in doing UX work: *"we don't have a lab to say 'change the colour and see what people react to?' we don't do scientific experiments to decide what is the best colour scheme for this and that."*

Regarding usability practices, again, we see some limitations in all of the three companies. As explained by the CTO of the medium-sized company, although the company uses focus groups for product conception and evaluation, there is bias in the user selection. The CTO hints: *"we get people within the company at different levels of IT to come and do like a focus group and run through this piece of software and throw up their challenges."* We do not agree that that using our own employees would provide objective assessments for obvious reasons. In one of the small companies, a programmer, when asked about when to involve end-users in usability testing, responded: *"when the software is about to be implemented."* The PM in the medium-sized company corroborates by indicating that: *"end-users are coming later into things that have been developed in many cases."*

We wanted to know more about the importance of end-user involvement in software projects. The PM in the medium-sized company gave a hint: *"Where I see the involvement of the users would be because in a project for example, we are dealing with a specified level of users, maybe the senior users, the technical users, within the company to accept your product."* We therefore, asked the company's perception of the end-user. The response is: *"Those are the people (the senior users and technical users) I call end-users per se."*

Finally, we found out through the interviews, that none of the three companies was familiar with the ISO 9241-210 framework for human-centred design. Thus, the companies only used their own methods. However, we found promise for the adoption of HCI practices in these companies. All the companies are aware of HCI, strive to build intuitive and visually appealing products, albeit the companies lack the expertise to engage in more productive HCI practices.

4   Discussions

The overarching insight drawn from our study is that there is a major gap between what HCI practice is elsewhere and how it is currently practiced in the Nigerian software companies investigated. It appears that HCI education and practice in

Nigeria so far, are at the same level. Although HCI awareness is there and there is basic knowledge of HCI being applied in the industry, several issues exist which limit the uptake of HCI practices in Nigeria.

End users' involvement is lacking in the way software development is carried out in all the companies investigated. As Nigeria has embraced a cashless economy, people involvement in software projects is critical. A major problem regarding end user involvement in Nigeria could be that of the perception of who the end user actually is. So far, we have not seen it documented in the literature that the end-users should be technical people and senior employees. The primary purpose for users involvement seems to be endorsement of a product. This would not be ideal for an information society.

Government policies are reported to be plodding and ineffectual. For example, the current software policy is yet to be enforced and many of the government actions are spontaneous. However, as can be seen in the introduction, the software industry in Nigeria is still in its formative stage and it is clear that standards and regulations are lacking as well.

The level of HCI knowledge in Nigeria currently, is limited. Thus, the industry is not able to give enough to meet the demands from the market. There could be a need to review the HCI education curriculum to ensure that it matches global standards. Unlike in the developed countries where HCI practices have advanced, the story is quite different in developing regions such as Africa (see e.g. [9]). In a recent study conducted in Colombia by Collazos and Merchan, [4], the need was stressed for local universities to "develop real-world projects as experimental studies that consider industry needs, bringing together participants from both academia and industry" [p.8]. Similarly, Winschiers, [20], in a study in Namibia emphasized that "methods have to be evaluated within the design process and adopted to the context" [p.75].

However, in comparison to other developing countries such as India and China where HCI practice is growing rapidly [17], the same cannot be said of Nigeria. At best, HCI is just at the awareness level in Nigerian software companies. However, the Nigerian market environment seems to be driving these software companies towards fully taking up HCI practices. A CTO of one of the small companies, when asked how they came to be aware of HCI, responded: *"maybe the market taught us."*

This study has a major limitation. Although we strove to get many participants for the survey, our sample is not representative. This is still a major challenge to most quantitative studies [5].

In future work, we plan to investigate HCI education in Nigerian universities.

References

1. Agarwal, R., Prasad, J., Tanniru, M., Lynch, J.: Risks of Rapid Application Development. Commun. ACM. 177–188 (2000).

2.   Akintola, K.G., Akinyede, R.O., Agbonifo, C.O.: Appraising Nigeria Readiness for E-Commerce Towards Achieving Vision 20:20. Int. J. Res. Rev. Appl. Sci. 9, 2, 330–340 (2011).

3.   Ardito C., Buono P., Caivano D., Costabile MF., Lanzilotti R: Investigating and Promoting UX Practice in Industry: An Experimental Study. Int. Journal Human Computer Studies. 72, 6, 542–551 (2014).

4.   Collazos, C.A., Merchan, L.: Human-Computer Interaction in Colombia: Bridging the Gap between Education and Industry. IT Emerg. Mark. 38, 6, 900–915 (2013).

5.   Cycyota, C.S., Harrison, D.A.: What (Not) to Expect When Surveying Executives: A Meta-Analysis of Top Manager Response Rates and Techniques Over Time. Organ. Res. Methods. 9, 2, 133–160 (2006).

6.   Egbokhare, F.A.: Causes of Software/Information Technology Project Failures in Nigerian Software Development Organizations. African J. Comput. ICT. 7, 2, 107–110 (2014).

7.   Gulliksen, J., Göransson, B., Bovie, I.: Key Principles for User-Centred Systems Design. Behav. Inf. Technol. 22, 6, 397–409 (2003).

8.   Hotez, P.J., Asojo, O., Adesina, M.: Nigeria: "Ground Zero" for the High Prevalence Neglected Tropical Diseases. PLoS Negl. Trop. Dis. 6, 7, (2012).

9.   Hussain, Z., Slany, W., Holzinger, A.: Current State of Agile User-Centered Design: A Survey. In: Holzinger, A., Miesenberger, K. (Eds.), HCI and Usability for e-Inclusion, vol. LNCS 5889, pp. 416-427. Springer, Berlin Heidelberg. (2009).

10.   Hussey, J., Hussey, R.: Business Research: A Practical Guide for Undergraduate and Postgraduate Students. Macmillan., London (1997).

11.   ISO: Ergonomics of Human-System Interaction - Part 210: Human-Centred Design for Interactive Systems. ISO 9241-210:2010. pp. 1–32 ISO (2010).

12.   Ji, Y.G., Yun, M.H.: Enhancing the Minority Discipline in the IT Industry: A Survey of Usability and User-Centered Design Practice. Int. J. Human- Comput. Interact. 20, 2, 117–134 (2006).

13.   Larusdottir, M.K., Haraldsdottir, O., Mikkelsen, B.: User Involvement in Icelandic Software Industry. Proceedings of the INTERACT 2009. pp. 1–2 ACM, Uppsala (2009).

14.   Lizano, F., Sandoval, M.M., Bruun, A., Stage, J.: Usability Evaluation in a Digitally Emerging Country: A Survey Study. Proceedings of the INTERACT 2013. pp. 298–305 Springer, Cape Town (2013).

15.   Phillips, C., Kemp, E.: The Integration of HCI and Software Engineering. Proceedings of the ICSE 1998: (Education and Practice) pp. 399–401 IEEE Comput. Soc (1998).

16.   Shneiderman, B., Plaisant, C.: Designing the User Interface: Strategies for Effective Human-Computer Interaction. Pearson Education Inc. (2005).

17.   Smith, A., Joshi, A., Liu, Z., Banon, L., Gulliksen, J. Li, C.: Institutionalizing HCI in Asia. Proceedings of the INTERACT 2007. pp. 85–99 Springer, Rio de Janeiro (2007).

18.   Soriyan, H.A., Heeks, R.: A Profile of Nigeria's Software Industry. , Precinct Centre, Manchester (2004).

19.   Wechsung, I. Naumann, R., Schleicher, R.: Views on Usability and User Experience: From Theory and Practice. Proceedings of the NordiCHI 2008 Conference. pp. 1–4 ACM, Lund (2008)

20.   Winschiers, H.: The Challenges of Participatory Design in an Intercultural Context : Designing for Usability in Namibia. Proceedings of the Participatory Design Conference, Vol II. pp. 73–76 , Trento, Italy (2006).