Teaching HCI and Research in local HCI problems in Uganda: Current Status and Recommendations

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Abstract

The continuous ICT revolution is increasing penetration, ownership and use of computers, mobile devices and related systems in all countries around the world. In response, many countries both developed and developing are taking advantage of the ICT revolution to increase their competitiveness as well as efficiency and effectiveness of Government service delivery. In Uganda, the Government is computerizing several of its services like the Immigration, Land Registration, Integrated Financial Management, Voter Register, tax collection, business registration, tourism information, etc. For such projects to succeed, human centered design is vital. This requires HCI education and research capacity to be developed alongside other fields of ICT. However, HCI education and research in Uganda is still marginalized in ICT programmes. There are hardly any HCI courses in the ICT curricula hence the bulk of ICT teaching is still heavily focused on the technical aspects of software engineering and electronics. Research on local HCI problems is also still very limited due to limited human resource in this area. This proposal reviews the current gaps in teaching HCI and research in local HCI problems in Uganda with the case study of Makerere University which is the oldest and biggest university in the country and the best in East Africa (recent Webometrics Ranking), and recommends ways existing gaps can be addressed.

Key Words

HCI; ICT education; developing countries; Uganda; Makerere University

Introduction

The field of Human Computer Interaction (HCI) is rapidly growing with the continuous ICT revolution that is increasing penetration, ownership and use of computers, mobile devices and related systems. Guided by the National Development Plan and Vision 2040, the Government of Uganda is setting up systems like the Immigration System, Land Registration System, Integrated Financial Management System (IFMS), E-Voter Register, Personnel Management System, E-Tax management, E-Birth and Death Registration, E-business registration, National Identity Card (ID) System among others. For such and more e-government systems to succeed, there is need to tailor them to the local needs of Government, the citizens, the business community as well as the technological, social and economic environment. This is even more important given that most of these systems are not built from scratch but adapted from existing off-the shelf systems already in use in other countries/institutions such as the e-tax system which was bought off the shelf from Taata Consultancy services in India. Often times, such systems have been built based on the needs and environment of other countries. This has sometimes led to failure of some systems such as the e-voter registration system in 2001 in which Uganda lost over US$ 22 million (Olaniyan, Mapayi, and Adejumo, 2011). To increase the success rate of Information Technology projects and for such projects to facilitate economic and social development, HCI education and research capacity in Uganda needs to be developed alongside other fields of ICT.

However, to-date HCI education and practice is still based on the experiences and practices of developed countries. Additionally, very few HCI courses are covered in the computing curricula hence the bulk of ICT teaching, research and practice is still heavily focused on the technical aspects of software engineering and electronics. Furthermore, research on local HCI problems is still limited.

Nevertheless, HCI needs in developing countries are different from those of developed countries due to a number of differences key of which include: level of literacy (general and technology), level of ICT and Internet development, different cultural models and level of institutionalization of HCI. The meaning of each of these aspects and how they influence HCI needs is summarised below.

(1) Level of Literacy (general and technology): UNESCO defines literacy as the ability to identify, understand, interpret, create, communicate and compute, using printed and written materials associated with varying contexts. On the other hand, the Uganda Demographic and Health Survey (UDHS) defines literacy as the 15-24 year olds who have attended secondary school or higher or who can read a whole sentence or part of a sentence. Technological literacy is the ability to understand or familiarity with common computer/mobile interaction paradigms such as the concept of menu systems, radio buttons, navigation or data entry (White, 2010). Non-literate populations avoid complex functions and primarily use phones for synchronous voice communication (Chipchase, 2005). On the part of technology, non-literate and novice users of technology face several barriers with existing text-based mobile interfaces such as difficulties understanding hierarchical structures, soft keys, scroll bars, non-numeric inputs, and specialized terminology (Medhi et al. 2011). Therefore, they need a different interface such interactive voice response (IVR).

(2) ICT and Internet Development: In developed countries, users are generally familiar with ICT, the Internet, and various applications of mobile technologies. This is not the case in developing countries where the biggest part of the population may know about the Internet from their more elite acquaintances, radio or TV programmes or movies but have no actual experience of it. In 2013, only 16% were using the Internet in Africa which is just half the penetration rate of Asia and the Pacific (ITU, 2013). Therefore, developing countries have a challenge of developing new products and services rather than mere improvement of processes which requires different HCI methods. Additionally, developing countries are rapidly adopting mobile technologies ahead of fixed landlines and computers. This means unique usage patterns which require distinct user-centred design methods and solutions. For example, Africa is expected to benefit more from mobile financial services (mobile money) than Europe, Asia and North America because its financial services industry is not as technically developed (Hinman and Matovu, 2010).

(3) Cultural Models: In Western societies, the youth and their attributes, ways of life and interests are valued. This has resulted into a number of systems targeted for youthful user groups such as gaming applications. On the other hand, in Africa, the elderly are more respected and the preferred groups to consult (Dralega, 2009). This affects the way people greet each other and the way knowledge is distributed in society. But as technology continues to mediate social interactions, these cultural structures are being subjected to change where wisdom and knowledge is not necessarily attributed to the older generations, but to the youth who are more techno-savvy (Wamala, 2010). Continual changes highlight the need to study how ICT can facilitate better social interactions and knowledge distribution in Uganda. Additionally, there is need to examine the influence of cultural practices on the usability of information systems in Uganda.

(4) Institutionalization of HCI: Institutionalization of HCI means developing institutional structures for the ownership and indigenous development of the HCI discipline. This is necessary both in the academia (to support effective teaching and research) and industry (so that software engineers understand and implement the principles and practices of HCI (Toyama, 2013). In addition to institutional structures, for developing countries, Smith and Dunckley (2001) recommend formation of national organizations beyond the international groups (such as CHI chapters of ACM) to promote localization of methods, supporting the growth of HCI teaching and research in universities, and dissemination of best practices within the industry.

This proposal presents a review of the current gaps in teaching HCI and research in local HCI problems in Uganda based on the case of Makerere University, the oldest and biggest university in Uganda and East Africa, and ways existing gaps can be addressed to strengthen the capacity of Makerere University and other universities in the country to effectively teach HCI and research in local HCI problems. The long-term benefit of increased capacity to teach HCI and research in local HCI problems in Uganda is an increased capacity in the Ugandan society for development and acquisition of information systems that are relevant to the needs and environment in Uganda. The next section describes current HCI education and research at Makerere University.

Current HCI Education and Research at Makerere University

Effective practice of HCI principles in software development requires effective teaching and active research in local HCI problems by the academia as well as understanding and implementation of HCI principles and practice by the industry (Toyama, 2013).

However, at the moment, Makerere University has only two staff out of over 30 at the level of PhD with qualifications and researching in HCI. But even these two are recent graduates from foreign universities: 2010 from Radboud University, Netherlands, and 2013 from University of Cape Town, South Africa, respectively. At the country level, there are no known Lecturers/Professors and or researchers in HCI at the other 5 public, and 31 private universities all of which offer computing programmes.

Due to this human resource gap, very few HCI courses are included in the computing curricula – in some cases, no HCI course is included. This is expected given that curricula are developed by staff members of

proposing departments/schools. Presently at Makerere in the School of Computing and IT, there are only two courses at undergraduate level and one course at graduate level (Table 1).

Table 1. Summary of the HCI courses in computing curricula at Makerere University

Programme	HCI Courses in the Computing curricula
Undergraduate	
Bachelor of Information Systems	Human Computer Interaction & User Interface Design
Bachelor of Information Technology	Human Computer Interaction & User Interface Design
Bachelor of Software engineering	User Interface Design
Bachelor of Computer Science	User Interface Design
Graduate	
Masters in Information Technology	Web design and Usability
Masters in Information Systems	None
Masters in Computer Science	None
Msc. Data Com & Software Engineering	None

In contrast, the ACM Information Technology curriculum for 2008 highlights five HCI courses: IT301. Human-Centered Design and Evaluation; IT302. Graphical User Interface; IT303. Multimedia Systems Development; IT304. Interactive Systems Development; IT305. Computer-Supported Cooperative Work and IT306 Human Cognitive Skills. On the other hand, the draft ACM Information Technology curriculum for 2017 provides 8 courses namely:

ITE-UXD-01 History and overview; ITE-UXD-02 Human factors in design; ITE-UXD-03 Effective interfaces; ITE-UXD-04 Application domain aspects; ITE-UXD-05 Affective user experiences; ITE-UXD-06 Human-centered evaluation; ITE-UXD-07 Assistive technologies and accessibility and TE-UXD-08 User advocacy.

The next section presents recommendations for strengthening teaching HCI and research in local HCI problems at Makerere University.

Recommendations for Strengthening Teaching HCI and Research in Local HCI problems at Makerere University

To address the current gaps in teaching HCI and research in local HCI problems at Makerere University and in Uganda, the following strategies are proposed:

Introduction of an HCI specialty in the current Masters and PhD in Information Systems programmes: The School of Computing and Informatics technology already has Masters in Information Systems and a PhD program in Information Systems approved by the Makerere University Senate and accredited by the National Council for Higher Education. To increase on the number of nationals trained in HCI and researching in HCI, an HCI specialty needs to be introduced in these programs at the next review which is after every three years. The HCI specialty in the Masters and PhD in IS will ensure a market driven continuous training of HCI experts in the country.

Strengthen knowledge and experience sharing between the academia and industry in the area of HCI: Through collaboration between the ICT4D research group at Makerere University and the ICT Association of Uganda (ICTAU), ICT professionals in Uganda can be facilitated to learn basic concepts and principles of user-centred design, participatory design, and HCI in general. Given the current human resource constraints at Makerere University, capacity building in HCI practice for ICT practitioners can be achieved through a partnership with departments and research groups in universities with more experience in HCI teaching and research such as Karlstad University in Sweden which has a running partnership with Makerere University. Other potential universities include University of Cape Town in South Africa and Namibia University of Science and Technology. Through such partnerships, local ICT professionals can also benefit from HCI case studies of other countries but learn them with the target to localize them to meet Ugandan urban and rural needs.

The increased knowledge and experience sharing between the academia and industry will facilitate awareness building and sensitization of the industry about relevant HCI principles and techniques worth practicing in their software development processes and at the same time provide input into the curricula on the requirements of the labor market.

Support other Universities in the country and region in building capacity to teach HCI and Research in local HCI problems: Being the oldest and biggest University in the country and East Africa, Makerere University in collaboration with partners from universities in the North and South, can also support other public and private universities in the country and region running computing programmes with capacity building to teach and research in context sensitive HCI.

Use a Multi-disciplinary team: The capacity building team should be multidisciplinary with members from information systems and computer science – the primary disciplines contributing to HCI and others

from other contributing disciplines namely; - psychology and social sciences. The motivation for the multi-disciplinary combination is the fact that most failures of Information Systems projects in developing countries including Uganda have been largely attributed to social, economic and cultural factors rather than technical factors.

Formation of a Local ACM CHI chapter: As recommended by Smith and Dunckley (2001), there is need to form national organizations to promote localization of methods, supporting the growth of HCI teaching and research in universities, and dissemination of best practices within the industry. This option has already been considered but at the moment the number of HCI faculty is still small. Due to this constraint, the HCI4D group is part of the development Informatics (DI) research group at Makerere University. The team is also considering applying for a local ACM CHI chapter.

Challenges to Efforts to Strengthen Teaching HCI and Research in Local HCI problems at Makerere University/Uganda

The key challenge currently facing efforts to strengthen capacity to teach HCI localised to the local context and research in local HCI problems at Makerere University has so far been finding funding for enthusiastic research students and researchers. Most ICT research and capacity building funding calls for Africa/Uganda are focused on the technical aspects of software engineering and electronics. For example, in February 2012, Makerere University in collaboration with Karlstad University (Sweden) carried out an investigation with key ICT stakeholders on their interest and whether they would use a usability testing facility if it was set up at Makerere University to which all the participating companies - local, government and international organizations - answered yes. In addition, 86% of the participants said their organizations would be willing to pay for the services. But the funds to set up such a facility have not yet been found.

Conclusion

The uptake of ICTs in Uganda is continuously increasing. However, HCI education, research and practice is still heavily focused on the technical aspects of software engineering and electronics. This proposal has described the current gaps in teaching HCI and research in local HCI problems at Makerere University in Uganda, and provided recommendations on ways existing gaps can be addressed to strengthen the capacity of Makerere University to effectively teach HCI and research in local HCI problems.

References

Bødker, K., Kensing, F., and Simonsen, J. (2004). Participatory IT design: Designing for business and workplace realities. MIT Press: Cambridge, Mass.

Burke, M., 2010. Key factors that should be taken into consideration in planning for implementation of IT. cgdev.org/files/1424175_file_Aker_Mobile_wp211_FINAL.pdf

Chipchase, J. 2005. Understanding non-literacy as a barrier to mobile phone communication. Retrieved on 16th May 2012 from: 789 hjyuv7v78hjyuv878yuhvjjjjjjjj877v-ssx

Churchill, E., Bowser, A. &Preece, J. (2013). Teaching & Learning HCI downloaded on 10th Fe. 2014 from; http://interactions.acm.org/archive/view/march-april-2013/teaching-and-learning-human-computer-interaction

Dralega, C.A. (2009). ICTs, youths, and the politics of participation in rural Uganda.In Mudhai, O.F., Tettey W.J. & Banda, F. (Eds.) African media and the digital public sphere. New York: Palgrave Macmillan

Farmer, L. & Boot, M. (2014) Barriers and Solutions in using M4D: Connecting Directly to Citizens for Scalable Impact. Proceedings of 4th International Conference on M4D Mobile Communication for Development, M4D 2014, April 7-9 2014 in Dakar, Senegal. Karlstad University Studies 2014:26, pp. 208-212.

Hinman, R. and Matovu, J. 2010). Opportunities and Challenges for Mobile-based Financial Services in Rural Uganda. CHI 2010, April 10–15, 2010, Atlanta, Georgia, USA

Information Technology Curricula 2017: Curriculum Guidelines for 11 Undergraduate Degree Programs in Information Technology: http://www.itm.iit.edu/faculty/IT2017v061.pdf

Lopez-P. R. (2011) Assessing electoral fraud in new democracies: A basic framework: IPSA-ECPR Joint Conference : what happened in North- South University of Sao Paulo, Brazil Breuer, F (2006) e-voting:

Medhi et al (2011). Designing Mobile Interfaces for Novice and Low-Literacy Users. Designing mobile interfaces for novice and low-literacy users.ACM Trans. Comput.-Hum. Interact. 18, 1, Article 2 (April 2011)

Mugwanya, R. (2013). Software Support for Podcasting Mobile Lecture Content for Education in Sub-Saharan African Universities (Doctoral dissertation, Univ Cape Town).

Toyama,K (2013). Reflections on HCI for Development: http://interactions.acm.org/archive/view/november-december-2013/reflections-on-hci-for-development

Uganda Demographic Health Survey (UDHS) (2011): http://www.ubos.org/onlinefiles/uploads/ubos/UDHS/UDHS2011.pdf

Uganda National Development Plan 2010/2011-2014/2015:http://npa.ug/

UNDP (2012). Uganda Human development Reports. Accessed from www.undp.org on 20th July 2014

UNESCO (2007). UNESCO Institute of Statistics Data Centre, regional literacy rates:http://stats.uis.unesco.org/unesco/TableViewer/tableView.aspx?ReportId=y201

Walsham, G. Robey, D. Sahay, S. (2007). Foreword: Special issue on information systems in developing countries. MIS Quarterly Vol. 31 No. 2, pp. 317-326/June 2007

Wamala, C. (2010). Does IT Count? Complexities between access to and use of information technologies among Uganda's farmers.Doctoral Thesis, Luleå University of Technology Printing Press.

White, G. (2010). Designing Mobile Services for non-literate communities.Proceedings of 2nd Int. Conference on M4D-Mobile Communication Technology for Development, 2010, Kampala, Uganda.