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Factors Influencing the Perceptions of Human-Computer Interaction Curriculum Developers in Higher Education Institutions During Curriculum Design and Delivery

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Factors Influencing the Perceptions of Human-Computer Interaction Curriculum Developers in Higher Education Institutions During Curriculum Design and Delivery

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ABSTRACT

Computer science (CS) and information systems students seeking to work as software developers upon graduating are often required to create software that has a sound user experience (UX) and meets the needs of its users. This includes addressing unique user, context, and infrastructural requirements. This study sought to identify the factors that influence the perceptions of human-computer interaction (HCI) curriculum developers in higher education institutions (HEIs) in developing economies of Africa when it comes to curriculum design and delivery. A qualitative enquiry was conducted and consisted of fourteen interviews with HCI curriculum developers and UX practitioners in four African countries. A thematic analysis of their responses revealed two factors shaping the perception of HCI curriculum developers: HCI curriculum structural challenges and organizational challenges. These findings contribute to the HCI body of knowledge by explaining how the HCI field can be made more inclusive for the global south context.

Keywords

Human-computer interaction (HCI), curriculum developers, user experience (UX), higher education institutions (HEIs), Africa, developing economies.

INTRODUCTION

In higher education computing programs, students are often taught to design, develop, and analyze software applications that are used to solve problems in business, scientific and social contexts (Lazem, 2019). The curriculum exposes students to the foundations of CS and IS and equips them with the necessary skills to pursue entry-level software developer positions. By harnessing the skillset acquired from their formal education and training, students go on to develop increasingly complex software applications that solve real-world problems. Unfortunately, these software applications often fail to
address the needs of diverse user groups (Oleson et al., 2020) and do not consider various cultural models (Lazem & Dray, 2018). In cases where multicultural aspects have not been considered, users must often adapt to the interfaces when in fact interfaces should be designed to adapt to the user’s needs (Collazos et al., 2010). This highlights how crucial it is that companies design and build technologies while keeping inclusivity and international users in mind. Studies have also shown how diverse facets of identity and contextual factors influence the acceptance of technology and the way users experience and engage with products (Himmelsbach et al., 2019). By equipping computing students with skills that enable them to build empathy and understand users from diverse backgrounds, perspectives, and computer literacies, technologies can be designed to meet local contexts more closely. Usability, accessibility, and inclusiveness are concepts that software developers need to be cognizant of when developing software applications (Oleson et al., 2020). These concepts are addressed in UX design, a field which is usually situated in the HCI discipline (Brosens, 2017).

The Association for Computing Machinery (ACM) defines HCI as “a discipline concerned with the design, evaluation and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them” (Hewett et al., 1992, p. 5). The field has evolved rapidly and is recognized by researchers and designers as an instrumental discipline that helps us to understand how technologies can support social and economic development (Erete, 2015; Namara et al., 2018; Wong-Villacres et al., 2020). However, its interdisciplinary nature has raised challenges associated with the many theories, methods, and sub-areas available to select from when designing a curriculum (Sari & Wadhwa, 2015). Additionally, Abdelnour-Noecera (2017) reports that “a lack of multicultural aspects in HCI curricula presents a challenge for promoting diversity in a field inherently aimed at satisfying needs and goals” (p.3). This is evident in the context of developing economies like South Africa where HCI has only fairly recently become well-established in curricula and is often not considered to be part of the core curriculum (Lazem, 2019; Pretorius et al., 2015). HEIs offer HCI courses but they are often deeply rooted in ‘Western’ epistemology and fail to address different cultural settings in their teachings and practices (Winschiers-Theophilus & Bidwell, 2013). Although increasing efforts have been made to address these issues, educational strategies still tend to position South-centric usability requirements at the borders of mainstream HCI (Wong-Villacres et al., 2020). There is currently a scarcity of literature that examines these problems and that explains the factors that need to be considered in designing a localized HCI curriculum for developing economies.

An increase in demand for UX professionals in the industry has in turn created an urgent need within academia to train and equip students to fill these positions (Getto & Beecher, 2016). In South Africa, there is a lack of skilled UX professionals and of formal HCI education (Pretorius et al., 2015). Pretorius et al. (2015) conducted a survey study consisting of 105 self-identified UX practitioners in South Africa. Their findings at that stage showed that the UX field was still in its infancy and was yet to be an established and recognized field of study. This is concerning as South Africa has a population with a multiplicity of backgrounds; therefore, recognizing the needs of diverse user groups needs to be considered in software design. Hence, when developing software applications, software development companies should be aware of the diversity of needs and adopt a formalized UX strategy. Furthermore, a context sensitive HCI curriculum should be designed so that students are equipped to design technologies that meet users’ contextual needs. With this background, the objective of this study is to identify and understand the factors that influence the perceptions of HCI curriculum developers in HEIs in developing economies.
HUMAN-COMPUTER INTERACTION

Background to HCI

HCI has become increasingly important in the design and development of interactive software applications. As digital technologies advance and become more complex, the theoretical foundations of HCI research and practice are challenged (Frauenberger, 2019). HCI places a primary focus on the engagement between humans (the users) and computers, and in practice it is mainly concerned with the tools and methodologies utilized in design, implementation, and in evaluation of users’ mastery of the software (Preece & Rombach, 1994). Throughout literature, HCI has been characterized by its dynamic and interdisciplinary nature as it has been derived from a collection of disciplines, with cognitive science, CS, and psychology at its center (Dix, 2010). As the technology landscape changes, HCI evolves to embrace these changes and extends into new disciplines (Grandhi, 2015). Researchers have attempted to document the evolution of HCI as it adapts to ever-changing technological advancement. According to Myers (1998, as cited in Renaud & Flowerday, 2017), the field of HCI was formally recognized in the 1960s as developers became increasingly interested in the way in which graphical objects were manipulated via user interactions. However, Carroll (1991) argues that HCI focuses on the end-user rather than the computer hardware element. Bødker (2006, as cited in Renaud & Flowerday, 2017) views the development of HCI more broadly and refers to HCI’s evolution as a succession of three waves. The first focused on the individual and their human factors (Harrison et al., 2007). The second, instead of focusing on the individual user studied people interacting with applications in work settings and focused on context (Renaud & Flowerday, 2017). The third wave sought to bring marginal issues such as culture, values and the role of the researcher to the forefront (Duarte & Baranauskas, 2016).

Factors Affecting HCI Curriculum Development

The topic of HCI needs to be institutionalized in academic curricula to ensure that proficient HCI practitioners are available to assist in building digital products that cater to the needs of diverse user groups. According to Nworie (2015), institutionalization is “a process through which innovations or novel practices are made to be normal or prevailing practices within the organization” (p. 22). To achieve institutionalization, an innovation or practice needs to be maintained over an extended period until it forms part of the ‘fabric of the organization’ or becomes routine (Surry & Ely, 2002, as cited in Nworie, 2015). While the institutionalization of HCI in higher education has been successful in Western countries, there has been a struggle to establish it in developing nations (Boscarioli et al., 2013, Sari & Wadhwa, 2015). HCI knowledge production in the Global South is limited and consequently, students who wish to become researchers in the discipline must emigrate to HCI programs in the West (Zong et al., 2018 as cited in Wong-Villacres, 2020). When developing an HCI curriculum, several challenges arise making it difficult for curriculum developers to provide a good quality program to their students. These are presented next.

Multidisciplinary Nature of HCI

The multidisciplinary nature of HCI has hindered attaining a shared understanding of the scope of this field amongst researchers and educators (Churchill et al., 2013; Lazem & Dray, 2018; Sari & Wadhwa, 2015). People from these communities have asked for a unified theoretical perspective and a common curriculum. The failure to establish such a common structure in courses and training has been confusing for students when selecting HCI courses (Churchill et al., 2013). Additionally, no consensus has been reached regarding the value of an HCI focused degree amongst educators, practitioners, students, and...
recruiters. Churchill et al. (2013) provides two reasons why this is a major concern. First, a standardized curriculum aids students in selecting programs and helps industry professionals in knowing what to expect from graduates. Secondly, the value of HCI would be promoted more effectively if there was a unified perspective (Churchill et al., 2013). Another consideration is that curriculum developers need to stay abreast of trends in the HCI domain and to reflect this in the curriculum - this is more easily achieved when there is a degree of consensus (Churchill et al., 2013).

**Lack of Resources**

Mogoanee and Kabanda (2019) report that curriculum developers do not have enough resources or time to engage in curriculum development activities. This is partly because of the high levels of bureaucracy within accreditation processes as well as the plethora of other academic tasks which curriculum developers are engaged in. Within several Latin American communities, it has been a challenge to incorporate HCI in the CS curricula and develop professional UX communities and this has been attributed primarily to a lack of equipment, laboratories, and scarcity of UX practitioners and teachers (Collazos et al., 2010). However, in Brazil, HCI is a recommended course that is included in computing curricula of IS, CS, and computer engineering (Boscarioli et al., 2013). Unfortunately, due to the unavailability of a standardized teaching syllabus to reference for HCI, course professors have struggled to determine the essential parts that need to be taught and to establish better ways of teaching the content (Boscarioli et al., 2013). The proceedings of the Brazilian Symposium on Human Factors in Computing Systems proclaim that “our goal should be to prepare students to take into consideration the broad diversity of users we have in Brazil and to understand the social responsibility we have as producers of technology giving all citizens equal opportunity and access to information and services” (de Souza et al., 2008, as cited in Boscarioli et al., 2013, p. 5). This highlights an additional need to localize the HCI curriculum so that it can attend to cultural and organizational differences.

**Institutionalization of HCI Curriculum**

The HCI curricula of undergraduate and postgraduate degree programs vary in terms of priority and positioning due to the diverse socio-cultural, technology and economic perspectives of the Asian-Pacific society (Sari & Wadhwa, 2015). In some of these universities HCI is considered an integral part of the curriculum, while at others it does not exist or is only a complementary subject. For example, in developing economies like Indonesia, Malaysia and Srilanka, HCI has a less well-established position compared to nations like Singapore and Australia where top-ranked universities include the discipline in their curricula (Sari & Wadhwa, 2015). This demonstrates that the institutionalization of HCI is yet to be established in education in the Asia-Pacific countries.

**Cross Cultural Nature of HCI**

The way HCI education is designed and operationalized is influenced by the multicultural nature of a region as there are significant differences in the way that people from western and eastern cultures respond to technology (Zulaekha & Brereton, 2014). If a wide range of diversities and cultural backgrounds are acknowledged, students will be taught accordingly and they will be able to understand who they are designing a product for (Zulaekha & Brereton, 2014). Cross-cultural HCI is a means through which researchers “investigate how culture relates to user interface design, research, and practice” (Ho et al., 2009, p. 5). This is essential when adapting and integrating cultural aspects into the interface design of commercial software applications for users from different cultural backgrounds. The focus is placed on the differences in culture, particularly in the way that technologies are designed to be natural to one or more cultures. Efforts have been made to understand the way people, technology and
design practices are transferred from one region to another (Shklovski et al., 2014). However, very few educational strategies support a field for research and practice explore ways in which technology might be more inclusive and work in developing economies (Wong-Villacres et al., 2020).

A growing body of work, human-computer interaction for development (HCI4D), looks at how to appropriately design interactive products, systems and applications so that they address distinctive user requirements in developing economies as well as the infrastructural requirements where these technologies are deployed (Ho et al., 2009). According to Dell and Kumar (2016), HCI4D research “aims to maximize the usability of interfaces for interacting with technologies designed specifically for under-served, under-resourced, and under-represented populations around the world” (p. 1). Van Biljon and Renaud (2019) argue that this discipline lies at the convergence of HCI and information and communication technology for development (ICT4D). ICT4D is defined as “the application of any entity that processes or communicates digital data in order to deliver some part of the international development agenda in a developing country” (Heeks, 2018, p.11). Recent evidence suggests that, from a Southern African perspective on HCI4D research, methodologies should not appropriate Western-focused HCI tools and practices unmindfully without considering whether it is suitable in an African context (van Biljon & Renaud, 2019).

HCI employs cultural models and frameworks to explain the cultural bias that exists within a design. One widely used framework is the iceberg model of culture which was conceived by Hall (1976). It is used in cross-cultural research as it helps researchers to study culture in terms of surface culture and deep culture. An alternative model is the pyramid model, developed by Geert Hofstede (1992), who defines culture as the ‘collective programming of the mind’ (p. 362). He identified five cultural dimensions, these are: power-distance, collectivism vs. individualism, femininity vs. masculinity, uncertainty avoidance, and long vs. short-term orientation (Oshlyanksy, 2007). Hofstede’s cultural dimensions have been adapted to propose a set of HCI design guidelines (Marcus & Gould, 2000; Oshlyanksy, 2007). This adapted set of dimensions provides a guideline for designers to inform their practices and create more culturally appropriate designs (Oshlyanksy, 2007). Winschiers-Theophilus and Bidwell (2013) have drawn attention to the fact that HCI models are deeply rooted in a Western epistemology. They posit that “assumptions re-produced by dominant HCI paradigms, paths [sic] the way for establishing new methods and, indeed, new theories on human-computer interaction in general” (p. 2). An Afrocentric paradigm has been put forward as a way to contest existing research frameworks, thereby reframing and composing HCI design and evaluations so that they are effective in African contexts. Instead of allowing the HCI agenda to study indigenous people, they argue that it should be driven by indigenous people with the hopes of eventually institutionalizing local HCI. They also argue that making room for Afrocentricity in research and academia will enable indigenous HCI in Africa. Asante (1990) defines Afrocentricity as a philosophical and theoretical paradigm shift that puts Africa’s intellectual perspective at the forefront. Winschiers-Theophilus and Bidwell refer to the concept of ‘Ubuntu’ which encompasses the idea that “a person is a person through other people” (p. 8). ‘Ubuntu’ means ‘humanity’, ‘humaneness’ or ‘humaness’ and is described by the characteristics of generosity, love, maturity, hospitality, understanding, and humility (Mkabela & Luthuli, 1997). These values are reflected when researchers show sensitivity to the epistemologies that exist in Southern Africa by appreciating the world views and cultures of rural societies. In this way, an interconnected and collective paradigm can be formed to preclude the frequent leaving out and misunderstanding of cultures prevalent in Western discourse.
Understanding UX and its Applications

UX is a relatively modern field that falls within the HCI domain and is grounded in user centered design practices. There are a myriad of definitions for UX because of its usage in multiple disciplines such as psychology, ergonomics, CS, graphic and product design, anthropology and engineering (Rusu et al., 2015). However, there has been a struggle amongst scholars to arrive at a common definition. Nevertheless, researchers have generally agreed that UX is shaped by a combination of pragmatic qualities attributed to the task-oriented nature of an experience (e.g. functionality, usability), as well as hedonic qualities attributed to the appeal of the product (e.g. pleasure, enjoyment, stimulation; Hassenzahl & Tractinsky, 2006). They also agree that UX is intended to improve human welfare (Hassenzahl & Tractinsky, 2006) by focusing on the user’s needs (Billqvist Ung & Nevecereal, 2020).

In several commercial organizations there has been an increased interest in the adoption of UX and a design-oriented culture (Gray et al., 2015). Engineering-dominated companies such as IBM, Intel and Microsoft have prioritized the need for design strategies and UX-focused practices. A UX designer is ‘concerned with the entire process of acquiring and integrating a product, including aspects of branding, design, usability and function’ (Interaction Design Foundation, 2016,1). To achieve this, UX methods, tools and guidelines help to assist UX practitioners in developing solutions that have increased usability and offer a seamless user experience. Boersma’s T-model of UX (2005, as cited in Pretorius et al., 2015) contributes to various areas of practice related to this field, and articulates the necessary skill sets that are needed by UX designers. These include information design, visual design, interaction design, information architecture, usability design, copywriting, marketing, communication and software development. However, this list does not include numerous other professional practices from which UX draws as it excludes usability testing and user research (Getto & Beecher, 2016). Preece et al. (2002) divides the UX design approach into three phases: research, design, and evaluation. Most UX practices are grounded in the philosophical foundation of User Centered Design (Garrett, 2010), which places the user’s requirements at the center of design processes (Getto & Beecher, 2016).

While integrating a design culture across an organization as a whole has been well received in some organizations, there are often instances where the internal culture has been found to be hostile towards UX. This resistance has been reported to be prevalent in South Africa, where organizations exhibit an ad-hoc approach to UX as opposed to a sustained and managed practice (Pretorius et al., 2015). This creates a significant barrier to development because a focus on UX has the potential to contribute to business value (Ross, 2014). By designing for experiences that are pleasurable and fulfil the user’s needs, companies can establish a good reputation and keep users loyal to their product or brand. Hence, good UX can lead to higher sales and increased customer satisfaction (Ross, 2014). Irizar-Arrieta and Casado-Mansilla (2017) reported that employing UX practices when designing digital products can have a positive impact as it encourages sustainable behaviors in the workplace. This is based on the idea of pro-environmental behaviors “that consciously seeks to minimize the negative impact of one’s actions on the natural and built” (Kollmuss & Agyeman, 2002, p. 240). These actions include recycling, reducing resource and energy consumption, and reducing waste production.

Whilst organizational benefits are valuable, it is important that design practitioners also focus on the social design aspect of software development which is key in the fulfilment of individual needs and the society as a whole as opposed to commercial objectives (Fuad-Luke, 2009). For example, designers can actively engage in the product development process and inscribe persuasive intention into products so that it encourages positive behavior change by users (Coskun & Erbuğ, 2014). For instance, the Green Energy Meter displays levels of consumed energy thereby motivating reduced energy consumption by the user and consequently helping to improve the wellbeing of the environment (Wever et al., 2008).
addition, practitioners can adopt positive computing approaches which provide support to people’s well-being and mental health (Desmet & Pohlmeye, 2013; Hassenzahl et al., 2013; Riva et al., 2012).

**RESEARCH METHODOLOGY**

The main objective of the study was to identify and understand the factors that influence the perceptions of HCI curriculum developers in HEIs in developing economies. This study followed an interpretivist paradigm to allow the researchers to collect information about the curriculum developers’ experiences. The interpretivist paradigm accesses the subjective meanings of research participants with the intention of gaining further understanding of individual experiences and perceptions in a social context (Goldkuhl 2012; Alharahsheh & Pius, 2020). The researchers were aware that individual curriculum developers faced different social realities as they came from different cultural backgrounds; this would result in different meanings being formed at different times and under different circumstances (Saunders et al., 2009). It is the subjective experiences of curriculum developers that, to a large extent, inform the shaping and development of HCI curricula.

The target population for the study was employees at HEIs that teach technology-related subjects, as well as Information Communication Technology (ICT) organizations within the industry. Curriculum developers and Head of Departments were included as respondents as they define and make critical decisions regarding HCI curricula in South African HEIs. They provided information by virtue of their knowledge and experience and were well-informed regarding the phenomenon of interest. All curriculum developers who were approached review, plan, develop, implement and maintain curricula (Pinar, 2004). Participants from the industry, such as UX practitioners, were included in the study as they could provide insights based on their own experiences, regarding what should be included in curricula. This helped the researchers to understand what factors would assist students to become proficient and to learn how to accommodate a developing economy’s contextual needs. Only a small number of UX practitioners were included in the sample as this is not the primary focus of the research.

This study employed the purposive sampling method. Initially, participants were identified from HEI websites and were contacted via email. These potential participants underwent a pre-screening exercise to find out whether they had ever participated in the HCI curriculum development process at their institution. Respondents who had the required experience were invited for an interview. Those who had been contacted were also asked to refer the researchers to other participants that possessed experience that was of research interest. Therefore, a snowballing technique was implemented. A sample of 15 respondents from African HEIs was aimed for as well as 5 industry practitioners. Whilst the sample may appear small, it is important to note that there are not many HEIs in Africa that have dedicated HCI curricula and courses. The initial method for contacting respondents was via email and most were through referrals. Although this snowball sampling has advantages, the researcher was aware of the possibility of selection bias. This is because acquiring additional participants is dependent on respondents who make subjective choices when making referrals (Atkinson & Flint, 2001).

Data was collected using semi-structured interviews and focus group discussions as these are considered natural ways of interacting with people and “create an environment of openness and trust within which the interviewee is able to express herself or himself authentically” (Terre Blanche & Durrheim, 1999; p. 297). These two techniques allowed detailed accounts to be collected of current curriculum development and design in the HCI discipline in HEIs. As a result of the Coronavirus disease (COVID-19) outbreak and the need for social distancing, interviews were conducted virtually using communications technologies such as Zoom and Google Meet. The platform which the participant was most familiar and comfortable with was the one used in most cases. The research instrument used to elicit data was based
on the research questions and emergent themes from literature on factors affecting HCI curriculum development. The instrument was divided into Sections A-F. Section A focused on the demographic details of the respondents (the HCI curricula developers and UX practitioners). Section B elicited information about how cross-cultural HCI influences their perceptions during design. Section C elicited information regarding Afrocentric indigenous HCI paradigms and how these can inform curriculum design. Section D contained questions regarding HCI curricula and curricula guidelines that are implemented in the HEI where the respondent worked. Section E focused on perceptions of usability maturity at the organization at which the respondent worked. Finally, Section F aimed to elicit organizational challenges that may arise when developing HCI curricula. Prior to commencing the data collection process, ethical clearance was sought and granted from the researcher’s institution’s research ethics committee. Respondents were briefed and reminded during the interview and when signing the consent form that their participation in the study was completely voluntary. All identifiable information was anonymized. Approval was obtained from the organizations to conduct interviews with members of their staff using a consent letter. Permission was obtained from the respondents to record the interview sessions that were hosted securely online.

Data was collected from ten HCI curricula developers employed by HEIs in South Africa, Namibia and Egypt; and four people from industry who were working as UX practitioners. Each interview session was transcribed using a third-party software, Otter.ai. All transcripts were captured using Microsoft Word and stored in secure cloud storage. Thereafter, the researchers employed the stages of thematic analysis to identify themes in the data. The first stage required the researchers to immerse themselves in the interview transcripts to become familiar with and grounded in the discussions that took place in the interview sessions. Familiarization involves the reading and re-reading the collected data, allowing “the researcher to not only discern latent meaning but also the implicit patterns, assumptions and omissions of text” (Fürsich, 2009, p. 4). The transcribed data was cross-checked with the audio recordings to ensure that it was transcribed verbatim. During the process of reading transcripts, the researcher noted preliminary ideas for codes. The second phase of analysis required initial coding using the dataset to identify features of the data that are obviously relevant to answering the research questions. Specific characteristics were focused on; important sections of the transcribed file were highlighted and then labelled appropriately. This was done by manually highlighting and writing down codes on a Word document (see Figure 1). Thereafter, these codes were applied in Nvivo - a software program used in qualitative research.
The third stage involved collating relevant codes into themes linked to the research questions. According to Aronson (1994), a theme “captures and unifies the nature or basis of the experience into a meaningful whole” (p. 362). An inductive, bottom-up approach was employed for coding the interviews and hence the themes identified were strongly linked to the data. Codes that did not fit into any of the main themes were temporarily housed in a ‘miscellaneous’ theme in NVivo. Braun and Clarke (2006) argue that data should not be abandoned at this stage as their relevance may be realized in later stages. Once themes had been identified and created, the researchers embarked on the fourth stage which required the themes to be rigorously reviewed as a refinement process. All coded data extracts were checked to ensure that themes were informed by a logical pattern in the data. When a theme did not have enough data to support it, it was either deleted or reviewed and categorized into a new theme. Finally, the themes were appropriately named and defined by considering how the theme fitted into the overall research study. The codes were examined to see that the scope and content of each theme were described concisely. As a final attempt to review the themes which had been developed and to ensure their validity, the researcher revisited the names of all themes and sub-themes.

**RESEARCH FINDINGS**

**Descriptive Findings**

The participants of the study comprised of ten HCI curriculum developers from both CS and IS departments as well as four UX practitioners in the industry as shown in Table 1. Five HCI curriculum developers were from South African HEIs (two from the same institution and three each from different institutions), four came from the same HEI in Namibia and one from Egypt. It was found that all participants working in HEIs fulfilled both the roles of curriculum developer and lecturer at their
university. Of the participants, 36% had earned a PhD, most of which were not in the HCI discipline, and 29% participants were currently studying towards a PhD in a technology-related discipline. Interestingly, two participants working as UX practitioners stated they were involved in developing UX related courses; however, these courses are not similar to those typically found in undergraduate and postgraduate study at HEIs. Caveats to the study include but are not limited to the varying continents where the participants’ qualifications were obtained. Five of the participants reported that that they had obtained their degrees from HEIs situated in countries outside the African continent (the United States, United Kingdom and China). There was no indication that curriculum developers were directly influenced by this. However, some did demonstrate the ability to be reflexive about their own academic positioning when designing curricula.

Table 1

Demographic Details of Participants

<table>
<thead>
<tr>
<th>Type of Establishment and Country</th>
<th>Department</th>
<th>Participant</th>
<th>Professional Position</th>
<th>Highest Qualification</th>
<th>Institution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Education</td>
<td>CS</td>
<td>P1</td>
<td>Curriculum Developer &amp; Associate Professor</td>
<td>PhD</td>
<td>A</td>
</tr>
<tr>
<td>South Africa</td>
<td>IS</td>
<td>P14</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>PhD</td>
<td>B</td>
</tr>
<tr>
<td>IS</td>
<td>P4</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>PhD</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Multimedia</td>
<td>P6</td>
<td>Senior Lecturer</td>
<td>PhD Student</td>
<td>D</td>
<td></td>
</tr>
<tr>
<td>IS</td>
<td>P13</td>
<td>Curriculum Developer &amp; Associate Professor</td>
<td>Masters</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Namibia</td>
<td>Informatics</td>
<td>P2</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>PhD Student</td>
<td>E</td>
</tr>
<tr>
<td>IT</td>
<td>P3</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>PhD Student</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Informatics</td>
<td>P5</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>PhD Student</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>CS</td>
<td>P12</td>
<td>Lecturer &amp; Curriculum Developer</td>
<td>Masters</td>
<td>E</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>CS</td>
<td>P11</td>
<td>Lecturer &amp; Researcher</td>
<td>PhD</td>
<td>F</td>
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<tr>
<td>Industry</td>
<td>Organization A</td>
<td>P7</td>
<td>UX Designer &amp; Company Director</td>
<td>Diploma</td>
<td></td>
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<tr>
<td>South Africa</td>
<td>Organization B</td>
<td>P8</td>
<td>Product Designer</td>
<td>Masters</td>
<td></td>
</tr>
<tr>
<td>Organization C</td>
<td>P9</td>
<td>Head of Product Design</td>
<td>Masters Student</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization D</td>
<td>P10</td>
<td>Product Designer</td>
<td>Diploma</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: CS = computer science; IS = information systems; IT = information technology; UX = user experience.
Empirical Findings

Challenges with Curriculum Development

There was a general perception amongst curriculum developers that there are gaps in HCI curricula that need to be addressed. If attended to, students would be better prepared to work in the industry and be sensitive to the developing economy context when developing software applications. The first of these gaps was that the HCI courses often teach students how to design a user interface but do not consider design constraints, i.e., “only designing for people who have unlimited, uncapped internet access and have the latest and greatest phones” (P1). However, developing economies are home to users who face high data charges and bandwidth constraints. In an attempt to address this, P1 exposes students to statistics regarding distribution of Android devices in both the local and global context, thereby highlighting the need to pay special attention to whom they are designing for and what their contexts are. This topic of inclusivity was extended by P4 who explained that the curriculum needs “to make room for multicultural inputs”. From an outsider’s point of view, one UX practitioner expressed that students should learn to adapt and change the theories that they learn in the classroom to fit the South African context. This was elaborated on by P12 who stated that curricula should “allow our students to be critical and to analyze different situations”. By looking at papers or cases studies from the African continent, and teaching students to be critical regarding issues embedded in designs, students would develop a deep understanding of why it is important to design for an African context. This way they also learn to adapt and change their abilities to fit a variety of contexts and situations, thus developing competencies in a turbulent field.

A second challenge was a lack of sources to reference from and the ease of use of educational resources and instructional materials. When asked what informs the HCI curriculum development at their institutions, two participants mentioned the work of Gary Marsden, a passionate advocate for HCI for Development, as a primary informant for their teachings (P1 & P14). Gary was an internationally renowned HCI researcher who passed away in 2013. Gary was Irish but taught in South African for twenty years and therefore P1 said that his work was relevant and enriched the curriculum. Most participants were familiar with the ACM curriculum, but not many admit to using it as a guideline when developing their curricula. The reasons for this were unclear; however, P1 revealed that it has been difficult to figure out its place in their syllabus.

A third challenge is that the HCI curricula lacks a practical component to supplement the theoretical teachings. Participants see value in allowing students to engage with communities or users to collect requirements before designing systems. This hands-on approach is also seen as a missing element by UX practitioners. P7 said that the best way for students to flex their practical muscles is to “find a client that’s willing to do free or pay a group of students to solve a real problem for the client”. Part of being a good designer in the industry is knowing how to conduct user interviews and run usability tests, skills that are acquired by practicing them (P13, P10, P9). Given these challenges, several respondents (P1, P2, P3, P4, P9, P11) identified the industry as a potential avenue for assisting and influencing HCI curriculum design. P1 indicated that the industry is in search of students with a specific skillset: “I’ve talked to people in the industry in South Africa. They’re like the one thing that we really want professional IT graduates to have in terms of skill is empathy”. It is for this reason; the participant teaches their students how to understand the customer needs. Furthermore, participants generally design their curriculum so that the exit outcome of the program aligns with what the industry needs. Current trends in the job market are identified by curriculum developers to find out what should be included in
their teachings to make their students more employable. HCI concepts are often undervalued while topics such as cybersecurity and Artificial Intelligence (AI) are prioritized in CS curricula (P1).

**Cross-cultural HCI and Afrocentric Indigenous HCI Paradigm**

Although most participants were familiar with the concept of cross-cultural HCI, many stated that it is not mentioned explicitly in their HCI curricula and instead, curriculum developers incorporate other elements that tap into the concept more broadly. In this way students are taught to be sensitive to cultural differences when developing software applications. Participants perceive culture to be a salient topic that needs to be taught to students since “different systems that are designed need to be natural and fit into the different cultures we have” (P2). The norms and values of certain cultures need to be understood by the developers of a system so that they do not discriminate against one culture or promote another. In most cases, participants suggested that the concept is incorporated to a small extent in their curricula (P1, P2, P3, P4, P14). However, typically ‘cross-cultural HCI’ is not how curriculum developers choose to frame it and instead introduce concepts such as value sensitive design, Maslow’s theory, and dominant frames in Southern African HCI (P1). P14 indicated that the topic of cross cultural HCI is not addressed but rather “it comes up in standard HCI textbooks as ‘design for all’ where there are typically some bits about culture”. In some instances, courses related to culture are offered by other departments, thereby providing students with an opportunity to immerse themselves in such topics and supplementing what is currently taught in the CS department (P3, P4). P3 is of the view that, without exposing their students to concepts such as culture, the student may begin to lose track of where they come from, their norms and their values. This belief was shared by the respondents who were curriculum developers who also advocated for co-design, participatory design, and community-based research.

Another factor that influenced the curriculum developers was the user and their context. UX practitioners and HCI curriculum developers shared similar sentiments regarding context-driven design; they agreed that students need to be taught to take the context of the user into account as an essential part of the process of achieving cross-cultural HCI. For example, P8 explained that “in South Africa, mobile data is expensive, and this has implications on the way software is designed”. For students to understand varying contexts, the participants believed that they need to “become sensitive to the fact that people may experience software in different ways based on unique cultures” (P4). HCI curriculum developers reported that they give students opportunities to practice this in projects where the students encounter users in their own contexts. P11 explained that the lecturers set up projects that make sense in cultural settings familiar to the students and hence provide students with examples they relate to.

A third factor mentioned was design thinking - understood by respondents as a problem-solving process that equips students with higher-order thinking skills linked to creativity. Many mentioned design thinking as an approach to design software that can accommodate a developing economy’s contextual needs as it takes the perspectives and experiences of local users into account (P1, P5, P6, P7, P8, P10, P12, P13, P14). The inequalities and socioeconomic factors that are prevalent in developing countries can best be understood through building empathy. This is the first step in the Design Thinking process and allows designers to uncover and understand the emotions of users in response to a certain situation. According to P1, it is this quality that employers particularly wish to see in graduating students. By understanding the context of users and placing them at the center of design approaches, the student can elicit important insights about the user’s context, especially in developing economies. This type of insight helps students to avoid making unfounded assumptions about the people they are designing for. As a part of the curriculum, students are asked to exercise the design thinking process in a project. P5
said that many people “always think that HCI is about interfaces but it’s really not. Most times it’s a lot to do with psychology, lot to do with self-awareness, a lot to do with contextual and environmental awareness”. Although Design Thinking was positively described by the respondents, there were a few negative aspects that participants highlighted. P1 believed that Design Thinking tends to be colonial. This view was supported by P12 who believes that “the way we would empathize with our community might not be the same as how Westerners do it”.

Finally, there was a perception that good communication plays an integral role when designing software and therefore influences curriculum development. Participants indicated that the language spoken was important when conducting user research; the researcher should be able to speak the language of the user when conducting the research because “sometimes you need to be able to speak the language to understand or to get what you want in each context” (P2). It is believed that only when user and designer can understand one another well that valuable insights can be elicited. P3 alluded to the idea that students, especially international students completing a program at their institution, should complete a course on the local language and culture to make it possible for them to connect with those cultures and communities (P3 & P14). While curriculum developers expressed their interest in language and its importance in the curricula, no participants indicated whether language is taught in the HCI curricula at their institution. They all, however, indicated that the language or languages of use should be considered in the actual design of interfaces for software applications. These insights imply that curriculum developers’ perception of their curriculum development is shaped by the local culture, language, and the context in which the intended artefact would be used. Although the research participants expressed interest in incorporating these in their curricula, some believed that it was difficult to implement at an undergraduate level as there is little time in the syllabus for this kind of engagement. Additionally, an attempt to incorporate this may lead to a program becoming superficially grounded in the local culture. Unfortunately, implementation that is not grounded in local realities could potentially leave such communities dissatisfied (Harrington et al., 2019).

Most participants revealed that they were familiar with the concept of an Afrocentric Indigenous HCI paradigm; however, they did not discuss this as being explicitly brought into their HCI curricula. Several challenges were noted related to introducing such a paradigm into the curriculum. The first was the lack of time to address such a complex aspect of the curriculum as P1 elaborates:

You want your students to understand the state of the art in terms of Western design. And that’s because they are not going to design only for Egypt, most of them would work for a company that does outsourcing. So, they need to understand the general things about HCI. Then they need also to understand that things will differ across cultures. So, to talk about that next level, of Afrocentric, or understanding indigenous culture, requires significant level of immersion. This might be challenging and not something that every institute would like to try, or every student would like to kind of invest their time in.

The second challenge was the lack of material to support Afrocentric indigenous curriculum development because the associated discourse is in its infancy (P5). This was explained further by P4, who stated that “there is a practical problem there and it is that when you start reading and looking for material, there is actually very little that has been systemized in terms of the African value system”. These sentiments are in contrast with P1, who believes that there is a significant amount of theory regarding work with indigenous people and knowledge creation which is used to inform how their work is approached. However, what the authors of these theories particularly find to be a problem is related to identifying which groups of people are indigenous; it is often the case that the intended users are ‘transplanted’ and not originally from the place where they will use the software. Although the value of
an Afrocentric Indigenous HCI paradigm is recognized, the terminology is not used as such, but the idea, according to participants, is embraced through practices such as community engagement and co-design. For example, most saw co-design and community-based research as a way for students to practice cultural and social immersion and in doing so would have touched on the Afrocentric Indigenous HCI paradigm. P3 discusses this from a Namibian perspective, where certain applications are co-designed with the local OvaHimba tribes. They go on to explain that an Afrocentric indigenous HCI paradigm should be incorporated in the curriculum through short courses where students can self-enroll and acquire credits upon completion. This kind of community-based research is generally seen to be incorporated in the curriculum at a post-graduate level. According to P12, one way to approach co-design practices is by exploring user-centered approaches, where students can practice co-design techniques that allow local indigenous people to have a say and be included in the design process. P11 was in support of community-based case studies on a small scale where students would be invited to communities and be involved in community engagement and participatory design. A challenge identified by P4 with this kind of participatory practical work in their environment is that students cannot be sent out as they are at a distance education university. Therefore, P4 includes relevant case studies as an alternative. According to P3, including African case studies, where students must apply theoretical concepts in an African context, is important because “this allows them to nurture and practice higher-order thinking skills”. P12 raised a concern that students often Google design principles and simply follow these Westernized principles as a guideline. Instead, they believe students should be given assignments to critique and question design principles and even compare them in action in different contexts instead of accepting them at face value. Rather than privileging Western philosophies and epistemologies, participants looked to supplement their curricula with an Afrocentric underpinning and go beyond the idea of decolonizing the curricula and “decolonize our minds and start to be reflective (P5)”. A third challenge surrounding an Afrocentric indigenous HCI paradigm is the negative perception that it presents of “us (Western epistemologies) versus them (Afrocentric epistemologies)”. P6 disliked the terminology as it is perceived as a Western way of identifying ‘other’ groups of people. It is considered ineffective when HCI principles are specific to a single indigenous group of people and therefore believe “that the principles are the same wherever you go in the world as certain principles hold true”. As an alternative, P6 chooses to teach students democratic design principles that help them understand the local-global context and to appreciate different cultures and how to become aware of them. The student body itself often consists of individuals who are, according to P6, “representative of the country” and are part of these indigenous communities, therefore implying that this is why they avoid using such terms. This is despite significant research by African researchers demonstrating how this paradigm shift can avoid privileging Western epistemologies. As a part of this paradigm, designers are encouraged to fully immerse themselves into the community; however P6 argues against the idea of immersion because “you would have to, at minimum, spend at least 15 years and even then you would not fully understand”.

**Organizational Challenges**

From this study it was apparent that HCI curriculum developers experience organization-specific challenges when trying to design the curriculum at their institution.

The first challenge was the lack of buy-in from stakeholders in the organization. Five participants alluded to the fact that there is little support from their institution or buy-in from their students for them to develop an HCI curricula, therefore making it a difficult task to execute. P5 attributed this to the
concept of value; “people think it’s a waste of time and all you do is just sit and talk”. Two UX practitioners spoke on this issue and revealed that from their experiences, there is a misperception of HCI and UX that is contributing to this issue. “Students don’t understand why they have to do it or why they need to choose to do it” (P8) as it is often perceived as a frivolous thing (P10). CS students tend to believe that HCI falls under humanities, and they are not inclined to study or work in this field. To solve this issue at an institutional level, P10 sees the role that industry bodies can play in facilitating a dialogue between them and the heads of departments at HEIs. This would help heads of departments to understand the current needs of the industry and how their students can be equipped to pursue a UX-related job.

The second challenge relates to the scarcity of HCI experts given its multidisciplinary nature. P11 was of the opinion that:

in many institutions, there are [only] a few HCI lecturers that are equipped to teach the course and so it is often the case that institutions will allocate CS professors to teach it instead, and this is always the challenge because the multifaceted nature of HCI cannot be captured by CS alone.

The third challenge is that at many HEIs, HCI is only included in a few courses in a four-year degree program due to the very crowded syllabus. Participants emphasized that curriculum development is an exhausting exercise especially when you’re working on a program with a lot of courses (P3). Participants also mentioned program relevance and trying to stay abreast of HCI trends. Curriculum developers want to create a perfect program that can instill the necessary skills but they have to develop a program that can run for several years before it is phased out or updated. One way of going about this, as suggested by P4, is to make incremental changes as it is often the case that permission is not required to implement small changes. For example, only the case studies in student assignments will change from year to year.

These organizational challenges have made it difficult to institutionalize a HCI curriculum in most HEIs. P11 reflected on an experience where they were unable to include HCI into the curricula at their institution due to the lack of support from the relevant departments. As a way to describe their usability maturity level, P4 explained that they introduce their students to usability concepts at an entry-level i.e., in undergraduate teachings and then reinforce this in their Honors year. However, this makes up only a small portion of the syllabus. Only one participant considered that their institution was taking usability seriously and included a cycle where curriculum developers thought carefully about integrating usability concepts into their curricula and then found ways to develop their maturity further. A UX practitioner from the industry expressed their concern regarding the lack of usability theories included in the syllabi of the larger institutions. As a result, when UX practitioners interview students as potential employees, P8 had the impression that that usability was not formalized in syllabi anywhere. P11 attributed the low levels of maturity to the demand for specific fields. P11 was of the view that “if HCI for some reason tomorrow gets the same hype as artificial intelligence, you’ll probably see a different attitude from the institution”.

DISCUSSION OF THE FINDINGS

This study sought to identify the factors that shape perceptions of HCI curriculum developers in HEIs in developing economies and to investigate them more thoroughly. Two main themes, HCI Curriculum Challenges and Organizational Challenges, emerged from the study (see Figure 2). HCI Curriculum Challenges explain difficulties associated with compiling and introducing the curriculum. Three factors were perceived to affect HCI curriculum design and development. The first was program relevance, the
need to stay abreast of HCI trends and the multidisciplinary nature of the discipline. The findings show that the curriculum was perceived to be complex due to the multidisciplinary and interdisciplinary nature of the field of HCI, in which several domains of knowledge compete for attention. Kallergi et al. (2018) notes that this complexity is further compounded by the needs of non-HCI fields of study that nevertheless have a valid interest in HCI education. Current curricula were perceived to lack sufficient emphasis on design constraints and to provide minimum multicultural inputs which consequently failed to make “students become critical in their analysis of different situations and contexts” (P12).

The second factor was the limited availability of educational and instructional reference materials, especially material suitable for the context of a developing economy. To respond to these challenges, some participants improvised by introducing localized challenges to students so that they could respond to, or at least become aware of this type of challenge affecting their design. The responses received were similar to those by Lazem and Dray (2018) who proposed a localized living curriculum where the applicability and relevance of Westerns methods to African contexts would be investigated. Another component that both HCI curriculum developers and UX practitioners felt was missing in most of the existing curricula was a practical component where students are provided with an opportunity to practice design. The findings in this study are in accordance with those reported by Churchill et al. (2013) who reported that participants felt that students need hands-on approaches to reinforce what is taught in theory. Furthermore, the perception that commonly taught theory is divorced from, or not relevant to practice in Africa, results in graduates not being sufficiently sensitized to the developmental challenges of their local communities (Muya, 2007, as cited in Kaya & Seleti, 2013).

The third factor was related to the integration of cross-cultural HCI and Afrocentric indigenous content. HCI curriculum developers perceived the concept of culture to be important in HCI curricula as it assists students to create software that is culturally appropriate in the context of use. However, in most cases, there is no attention paid to cross-cultural HCI and hence it is not formalized in curricula. Instead, students are taught to be aware of who they are designing for and the culture in which their design will be used. Many participants acknowledged the need for culture-centered design practices, specifically because of the multitude of cultures that exist in the country that they reside in. This in turn influences curricula design. Cultural attributes, such as language, were seen as important in facilitating design research with target users as this helps to elicit user requirements effectively. Participants felt that collaborating with local researchers is the best way to get around these language barriers. Winschiers-Theophilus and Bidwell (2013) are in support of this idea as they believe that “the researcher must have some familiarity with history, language, philosophy, and myths of the people under study” (p. 8).

However, the extent to which it is possible to include this in a HCI curriculum is a matter of concern. Another topic was how user interfaces are translated in cross-cultural design from one language to that of the target user. However, there was no strong indication that students are made aware of the issues that direct translations impose. According to Plocher et al. (2012), a literal translation may result in obscure meanings that do not accurately represent the original meaning. Participants referred to the inclusion of User Centered Design practices in their teaching as a way to address the cultural particularities of users in developing economies. Developing an understanding of the intricacies and nuances of the user’s context was believed to contribute to a cross-cultural digital experience. The HCI curriculum developers acknowledged the need to integrate indigenous knowledge and a local HCI curriculum into higher education studies. However, they found that tensions arise when attempting to educate students in a way that will allow them to compete in the global market and at the same time, work effectively in the local job market. This has also been noted by Winschiers-Theophilus and Bidwell (2013), who advocate a HCI research agenda that foregrounds indigenous voices. Cross-cultural design and decolonial computing have been identified as ways to respect and promote indigenous ways of
knowing (Lazem et al., 2022). The findings from published research agree that respecting, adapting and being sensitive towards the local cultures is a constructive way to build rapport between designers and the local communities that they work within (Winschiers-Theophilus et al., 2015).

**Figure 2**

Empirical Framework of Factors Shaping HCI Curriculum Developers in Developing Economies

In this study the HCI curriculum developers who were advocates of co-design, participatory design, and community-based research agreed with this sentiment. Although the participants expressed interest in incorporating this in their curricula, some believed that it was difficult to implement at an undergraduate level as there is little time in the syllabus for this kind of engagement. Harrington et al. (2019) argue that participatory designs that are not grounded in contextual reality could leave underserved communities dissatisfied. Unworkable solutions result from design processes that do not consider the constraints that exist in communities. When discussing participatory design issues regarding power and privilege were also raised.
The second theme raised organizational challenges, specifically the availability of organizational resources and support for HCI design and delivery. It was repeatedly claimed that the research participants received only limited support for HCI due in part to a lack of awareness of HCI by various institutional stakeholders. Similar findings are reported by Galal-Edeen et al. (2019) that “the lack of awareness and knowledge of the field is a significant issue, as very few managers appreciated its importance” (p. 57). This lack of awareness of HCI and in some cases a perception that “it is an arts field, hence considered less desirable” (Thakkar et al., 2018, p. 2) explains the limited resources allocated to the reskilling of current staff members and recruitment of new HCI experts. It also explains the limited time allocated for practitioners to develop their skills and become institutional champions, as well as limited access to training spaces.

CONCLUSION

An increase in demand for HCI practitioners, and specifically UX professionals in the industry has created an urgent need for academic institutions to provide suitably qualified candidates. However, higher education HCI lecturers are faced with a myriad of challenges in fulfilling this mandate primarily related to the design and delivery of a suitable HCI curriculum in a developing economy context. Further, there have been calls for more inclusive approaches to design, moving away from “Western methods, practices, standards, and classifications in the manner in which new technology-related knowledge is created and globalized” (Lazem et al 2022, p. 1). We add to this body of research by describing how organizational structures, such as the limited and in some cases complete lack of organizational resources and support for HCI, affect the contribution of organizations in achieving this. In addition, it is suggested that the HCI curriculum itself together with the HCI practitioners’ understanding of the value of curriculum design influences how HCI curriculum can be contextualized for the global south context. The HCI curriculum is challenged by the interdisciplinary nature of the HCI field, the increasing interest by non-HCI practitioners in HCI education, and the need to remain relevant and stay abreast of HCI trends. The curriculum itself was perceived by the research participants to be constrained by a lack of access to contextual educational resources and instructional materials, and insufficient time to address design considerations including those related to cross culture and local indigenous knowledge offerings. The over-crowded academic syllabi of students make it difficult to include the HCI topics that are currently missing in the curriculum.

Given the multidisciplinary nature of HCI, the study recommends institutional support to address constraints regarding resource acquisition and management HCI training and awareness programs so as to assist in highlighting the potential of HCI to decolonize technological innovations by tapping into local indigenous knowledge offerings.

Whilst the findings of the study provide a nuanced understanding of factors influencing the perceptions of HCI curriculum developers in HEIs, there are several limitations that need to be considered. Firstly, the sample size of this study is small; this can be improved upon in future studies to gain deeper insights on the topic of HCI curricula development in HEIs. The small sample size was partly because of the scarcity of participants involved in teaching HCI courses on the African continent. A second limitation is that many participants were involved in HCI curriculum development at their institutions despite not being experienced HCI practitioners or researchers. Their perceptions would have been influenced by their varied academic backgrounds. Despite these limitations, the present study has enhanced the understanding of curricula development and hopes to stimulate further investigation of HCI in HEIs in developing economies.
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