

# Technology at the Museum: The Missing Voice

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## ABSTRACT

Museums offer opportunities to observe and interact with exhibits, alongside learning about different cultures. Technologies have been developed in order to augment the visitor's experience during their museum visit, and how to make those technologies accessible is also an active and complementary field of research. In this work however, we find that there is a gap when discussing accessible technology for the African museum. We conducted a formative assessment, which incorporates previous work, and augmented it by sampling user reviews on Google Maps of 102 African museums, in order to probe the question of relevance and scalability in the applicability of previous approaches to the African museum. From this, we highlight opportunities to be found in the intersection of the two domains: for cultures to better tell their own stories, to reach an expanded audience, and to offer opportunities for research, together with potential tensions and barriers.

## CCS CONCEPTS

• **Applied computing** → *Computers in other domains*; • **Human-centered computing** → *Human computer interaction (HCI)*;

## KEYWORDS

Museum technology, cultural tensions, accessible technology

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## 1 INTRODUCTION

A local museum provides the represented community an opportunity to present its culture and tell its own story to visitors in its own way. Visitors to the museum may originate from within the community intending to appreciate their own culture, or from outside the community wishing to experience the resident culture. This confluence of people from different cultures and origins, speaking different languages, possessing different literacy levels and arriving with myriad “tastes, interest and expectations”[2] make for a rich ground for HCI researchers to learn from and/or to design technologies that “help to make new connections for museum visitors”[2].

Developing technology to augment a visit and that would scale across visitors' experience while at the museum is a subject of our ongoing research. We consider the appropriateness of technology in a given space and audience, and then how best to augment a visit without negatively impacting the visitor's attention. We subsequently consider how the museums benefits. From a wider angle, we also continuously evaluate how to best leverage technology that offer the most utility given limited available resources (limited charging, poor internet access etc.) [11].

Our original intention, in appreciation of the research opportunities present in the realm of museum technology, was to consider previous work addressing some of these challenges. We were especially keen on identifying those that highlight opportunities in the design and/or reuse of technology at an African museum (including cultural or heritage sites). This would enable us to best avoid pitfalls, and consider lessons learned together with recommendations given

by these existing works, towards our user study at a regional museum.

While also reflecting on design considerations and recommendations [1] that focus on specific African communities including those that account for limited resources and/or literacy, it was surprising to find little intersection between these two fields. There is an opportunity at the museum to design for different audiences, to address challenges inherent in designing accessible technology, that best leverages learning practices and that balances utility and aesthetics to best augment the African museum experience.

This work then serves as an initial survey highlighting design opportunities based on visitors' sentiments about their museum visits taken from reviews on Google Maps. We also leverage observations from our ongoing work in designing for different age-groups at a regional science museum pollinator garden [10], and our broader work on Tech on the Trail [11, 12] to highlight opportunities in, and barriers to undertaking research and designing technology for an African museum.

## 2 BACKGROUND

Museums by nature are places for learning, and comprehensive work exist [7, 9] that surveys museum visitors for their interests and expectations. From these observations, they derive learning opportunities that lead to recommendations on design approaches.

Other work in the domain consider specific applications of technology to augment object learning [4]. They can either be utilized as a stand-alone add-on, or as an augment to the museum visit [17]. An archetypal technology accompaniment at a museum tends to be in the form of a smart phone application, and an early survey [6] considered these applications availed by different museums around the globe. Notably, there are no examples of applications provided by/for an African museum. All other continents are represented.

Although we consider mobile applications as a starting point, we note the known risks in relying on this technology, such as visitor's unwillingness to download, the risk of distracting attention from exhibits, and the assumption that visitors own smart phones. There are other, unique challenges that we found, that are specific to the African museum (and the attendant cultures) that we discuss later in the paper.

### The African Dimension

The missing essential "voice" giving an African perspective is of great consequence. We know this perspective to be varied, but largely misunderstood. There is a richness of metaphors and opportunities for advancing Afro-centric pedagogies that would guide the HCI experience. Examples include the proposed *Thiong'o's model of Language and Culture* [14] as

an approach that designers can use in cross-cultural design to address assumptions and repercussions.

In this vein, we also observe different cultural perspectives offering unique frames-of-reference for design. The use of African idioms as a means of determining the criteria for a participatory design [20] is one example. Another is the use of African-inspired metaphors as a framework to inform the technological design of a story-telling application for a tangible display[4].

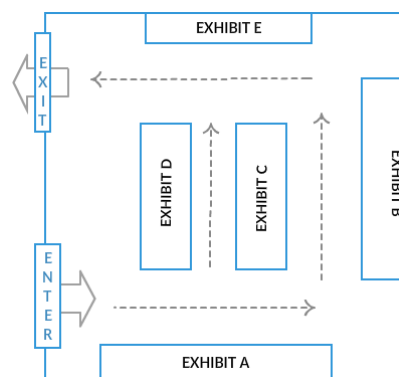
Lived experience further provides a crucial service beyond idioms and metaphors: the nature of human-computer interaction demands an interaction with the population to be designed for/learned from. This way we are able to gather new (cultural) insights and design opportunities by observing how technology is used and re-used. There is no shortage of work[3, 5, 8, 18] that apply this principle, and offer unique, valuable perspectives and also challenge ingrained assumptions.

### The Data Gap

We searched museums and cultural or heritage sites across the entire African continent <sup>1</sup>. We began with each country's official museum oversight authority to determine (1) online presence (website and/or social media) and if present: (2) an augmentative technology (an app or a custom in-house technology). From these, we then selected those museums with at least 100 reviews on Google Maps, in order to extract user sentiments and to inform our discussion.

Our narrowed selection yielded 102 museums representing 26 countries. Some museums had individual online presence, while some were managed as a group from a central (national) entity. Most of the websites we found were static and outdated, and as of the submission of this work, we could

<sup>1</sup>Supplemental data: <https://github.com/kotut/AfricanMuseums>



**Figure 1: Simplified museum layout: Visitor's overall paths and where "holding" (pauses) occur is useful in planning museum layout by strategically leveraging popular exhibits**

not identify an *official* mobile application for the selected museums on either Google and Apple stores.

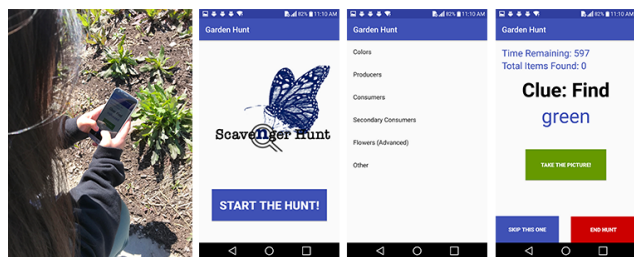
### Lessons from the Garden

Our ongoing work with a regional science museum's garden exhibit is atypical of most museums where application of labels, charts and most other technology do not significantly improve the visitor's experience (*relevance*). Providing a mobile app will do so only if it is designed not to distract the user from the exhibit and if it is able to *scale* to accommodate different groups.

In our pursuit for an approach that would be *relevant* to the garden exhibit experience and would effortlessly *scale* to different visitors according to need, we found a balance in focusing on incidental learning as an objective, and designed an Android app – *the Gardenator* (Figure 2) to implement this: users play a scavenger hunt game with clues composed of species to be found at the garden. This allow for involved interaction without distracting the user from the exhibit, transforming them from passive observers to active participants leading to a more positive (and fun) experience.

From the museum standpoint, our approach offers the opportunity to remain *relevant* following the bloom-and-wither species' cycle. For instance, on a long-term view, pictures from interactions with the garden allow an easy approach to chart the species time-lines, and less visibly, but equally important, what species that “hold” a given visitor's most attention (see Figure 1). Opportunity exists to direct the visitors' tour paths to best take advantage of thriving species at different seasons.

We consider all these facets: the nature of museums, the importance of storytelling, the dearth of research and in-the-wild examples of augmentative museum technology, woven together with our experience in designing such technologies. We then use them as a lens in this formative assessment as a foray towards identifying and discussing opportunities, tensions and barriers towards the use of technology in museums. We also discuss how they may impact the visitors



**Figure 2:** The *Gardenator* app offers clues based on species at the garden, participants take pictures of their guess and a visual recognition engine classifies and grades the image.

expectations and experience, and how they can fulfill the museum objectives.

### 3 BARRIERS AND TENSIONS

There is a reasonable concern that technology may serve as a vehicle for amplifying social inequality [19], by favoring the literate, the urban and the tech-savvy. Apart from these concerns, we categorize other barriers from the museum survey and users' reviews, together with leveraging our observation in pursuit of designing and testing the *Gardenator* and discuss them below:

**Cost-benefit ratio:** Profit is a powerful motivator, and we can attribute the scarcity of 3rd party application to this. Except for a handful of applications by popular museums worldwide, and those provided by third parties in partnership with major museums<sup>2 3</sup>, most applications on the Android and Apple app stores had their number of downloads only in the teens. We can hypothesize why this is so, by noting factors such as the non-deliberative design [16] – creating a replica of the website for example, so the application does not provide value beyond what can be already be accessed. We do note, as did [16], that there are costs involved in maintaining applications and devices (if they are provided by the museum). This can serve as another barrier to adoption. But we can only appreciate how much this is so, by actual attempts on the ground.

We do not believe the audience level to play a large role in the lack of applications. As a frame of reference, we found the 2017 official provisional yearly visitor count to the Nairobi National Museum (NMK) to exceed 250,000 (museums ranking second in popularity to parks and game reserves) [15].

**Bureaucracy:** Given that the majority of museums we surveyed are state-run, they come with attendant bureaucracy and navigating the whys of established rules and presenting opportunities might prove a challenge. A recurrent example of such a bureaucracy involves the atypical application of an outright ban on picture taking, regardless of whether the concern was for the detrimental effect of flash photography: “if you do take photographs your device would be collected and never be returned” (National Museum - Lagos) or if photography is considered an add-on service that provides the museum with another avenue to collect revenue: “there is an optional photography ticket for 50 LE to have a permission to take photos of the antiquities kept there” (Cairo Museum).

**Employment:** Apps for self-guided tours also pose a threat to employment in communities that rely on this service to generate income. We also note that not all museum conditions need an assistive app during the visit and people do

<sup>2</sup><https://play.google.com/store/apps/details?id=com.google.android.apps.cultural>

<sup>3</sup><https://play.google.com/store/apps/details?id=com.mobgen.smartify>

not interact with technology the same way every time [13]. But perhaps an opportunity exists in providing it as a means of reflection post-tour. These considerations provide a challenge rather than a barrier to successfully navigate the tensions when considering the advantages and disadvantages of guided tours, including addressing the knowledge gap, together with provenance concerns that we discuss below.

#### 4 OPPORTUNITIES

Considering lessons learned in designing technology for the garden exhibit, coupled with the scarcity of examples of technology use either directly from museums or from literature that leverage accessible technology, together with insights from online reviews, we categorize opportunities present in this domain that would benefit the museum and visitors both. The general positive tone of reviews for the different exhibits and the opportunity to learn different cultures offer encouraging signs in providing a supportive/appreciative audience.

*Collaboration:* There is an inherent value in designers partnering with museum curators in participatory design, together with collaborating with the local community to enrich exhibits for example by providing oral accompaniment, that also serve to foster the sense of ownership of the museum.

*Data and Insights:* From our African museums survey, we find that there is a need for insights about visitors' habits, experiences and varied learned behaviors and how this informs their interactions with the exhibits. We can subsequently compare these insights with other work in the domain to derive common factors, behaviors, and insights to designing accessible technology in general or those specifically targeted for the museum.

*Generational Impact:* Museums offer unique opportunities for accessing and interacting with different school-groups with varied age, literacy levels and learning styles – these factors influencing how they interact with technology. How to design for them and observing their use of technology would offer valuable insights that is currently lacking.

*Museum Experience:* Labeling artifacts when well done, provide information and context about their nature, and provide a starting point to augment that knowledge *in-situ*. When done poorly, it negatively impacts the whole museum experience. Most of the user concerns surrounded this: “*The displays were not explained in detail in English*”(Museum of Islamic Art - Cairo).

There is also an opportunity to enhance the experience for children by adding the fun aspect the museum experience: “*Children will become bored very quickly and want to leave because of the amount of historical items that generally get a short lecture in front of each piece*” (National Museum of

*Ethiopia*) “*I would perhaps not visit with small kids as there's a lot of text and it's heavy*”; “*a self guided audio tour would have been awesome*” (Apartheid Museum, Johannesburg).

*Provenance:* The limited online presence of museums has the effect of letting other entities tell the story for them. This extends to the use of tour-guides. The ideal provision of tour guides would be those working for the museum, or those resulting from a partnership of the museum with the local community. This provides a means of provenance – telling a (hi)story that is consistent. Else it is difficult to prove truths in the presence of non-sanctioned guides: “*But it must be said that the guides make up a lot of crazy stuff ... Go a few times, and you will not hear the same story*” (Fort Jesus, Kenya). Technology can step in this breach and be used to provide context to exhibits and a measure of provenance to the stories.

*Planning and Reflection:* Not all museums have guided tours available. Applications that augment experiences can be used to pre-plan the museum visit. The same is also true post-visit: if the experience is thought-provoking, there is an opportunity to design for reflection “*...just make a note of everything you want to Google when you get home*” (Cairo Museum) – especially useful when the museum has overwhelming number of exhibits or the organization is unclear.

*Secondary Museum:* There were two major consistent concerns that were raised across the board from the synthesized online reviews: (1) grounds maintenance, which is beyond the scope of this paper, and (2) limited artifacts (either due space constraints or from the lack of updates). Design opportunities lie in this divide, by providing an opportunity for a museum to showcase them by providing richer, possibly more interactive context.

We consider as proof, the inexorable move towards adopting technology for the museum in providing a “secondary museum” made up of digitized collections currently being planned by the National Museums of Kenya<sup>4</sup> and as a sign of changing times – a herald for opportunities to be involved in providing design guidelines that will take advantage of this movement and be on the forefront of future research.

#### 5 CONCLUSION

In the absence of research work that consider the divide between designing accessible technologies and designing technologies for the African museum, we conducted a formative assessment that included a sampling of user sentiments about 102 African museums from Google Maps reviews. While also considering complementary previous works, we highlight the importance that the African perspective brings to the

<sup>4</sup>[http://www.museums.or.ke/wp-content/uploads/2016/11/NMK-press-release\\_3.28.17.pdf](http://www.museums.or.ke/wp-content/uploads/2016/11/NMK-press-release_3.28.17.pdf)

discussion. We also leverage our experience in designing for an atypical museum exhibit to highlight the need for *relevance* in designing for the context, and the need to *scale* across groups. We argue that these two considerations are important as starting points towards designing for the museum. We conclude by discussing barriers and opportunities to be found in this domain. We offer as recommendation technologies that would breach this divide in presenting formal study of visitors to an African museum and how technology designed and used therein is *relevant* and *scalable* given the context.

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