# Community Based Co-Design Of Effective Visual Hints In A 3D Virtual Environment With Namibian Rural Elders

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## Abstract
3D virtual environments are commonly used for video games and other simulations in various industries. Due to their ability to present models of objects with clarity and high fidelity, they have now found their use in education and in some cases Indigenous Knowledge preservation. This paper describes my reflections on the experience of co-designing one such 3D virtual environment together with elders from the Herero ethnic group in rural Namibia using the Unity3D game engine. The paper aims to show how developing products for disenfranchised communities based on oneâĂŹs technical expertise may not produce accurate results as compared with developing for a community with the actual community members.

## Author Keywords
Namibia; Indigenous Knowledge; 3D; Game engines; Community based co-design; Participatory design.

## ACM Classification Keywords
H.5.2 [User Interfaces]: prototyping, evaluation / methodology.

## Introduction
The backdrop of the project was the ongoing Indigenous Knowledge Systems (IKS) project being undertaken by a research cluster from the Faculty of Computing and Infor-

**Figure 1:** Scenario 1, meeting to discuss water shortages

**Figure 2:** Scenario 2, cattle branding activity

**Figure 3:** Scenario 3, Child naming ceremony

matics (FCI) at the Namibia University of Science and Technology (NUST) since 2008. The project is aimed at creating digital tools to aid in the preservation of Indigenous Knowledge (IK). The research cluster mainly uses a Participatory Design (PD) approach called Community based co-design (CBCD) [1] that helps ensure that the final product is not based only on the technical expertise and assumptions of the of the developers but rather relies heavily on what the end users(community) need to be present in it [3]. In this regard, the community must be part of the whole design and development process, not just as observers but as co-designers of the product.

As a result, all the tools that the researchers have developed have a heavy footprint of the communities which they were designed in. The focus of this paper is on my experiences designing a 3D virtual environment platform with a group of village elders in Erindiroukambe, Eastern Namibia.

## Homestead Creator

In 2014, one of the researchers co-designed a platform known as the Homestead creator [5] with village elders, who are also knowledge holders from the rural Herero community. The aim of this tool was to allow the knowledge holders to recreate their homesteads in an accurate manner and provide them with the chance to embed media to better describe various scenarios or culturally relevant activities that take place around a Herero homestead [2]. The system was evaluated with the community members and the some of the design shortfalls documented.

## Homestead Scenario Depiction Tool

The design shortfalls [4] provided the basis for which the second prototype, called the Homestead Scenario Depiction Tool (HSSD), was designed and developed [2]. The aim of the HSSD was to engage the IK holders and have them participate in the design of visual hints that could guide a user navigating a virtual homestead and point out the location of embedded media [6].

*User research*

The researcher formulated questions which he felt would narrow down the scope of the hints to be created. The questions were:

- Are there any specific real world objects that can be used as indicators of a culturally relevant event in Herero culture? The aim of this question was to determine if a single object can be added to a location in the virtual environment to give a user a clue as to the type of IK embedded on the location.
- How does an observer determine the nature of an event occurring at a homestead when he/she is viewing it from a distance where he/she cannot ask those in attendance? The aim was to find any other extra markers that can be used to differentiate between events characterized by the assembly of large crowds of people.

*Findings*

The questions outlined above were formulated based on the assumption that single objects can be used as markers for events and shrines and therefore, the researcher wanted to obtain a list of these, model them using 3D modeling software and embedded them on specific virtual locations where media depicting an event associated with the model existed.

Two elders from the community were selected to participate in the co-design process. The researcher used the services of a translator to communicate with the elders. During the sessions with the elders, the researcher discovered that the

assumptions made during the formulation of the questions were inaccurate and would therefore not provide the researcher with a better understanding of how to model hints for events accurately. This was mainly due to the observation that, participants had shown a propensity to associate a collection of relevant symbols, behaviors including facial expressions and sitting arrangements as opposed to associating a single object as an event marker. While some of the symbols and artifacts could be modelled, it was impossible to model and render facial expressions due to the processing power of the test devices the researcher had in his possession. As a result, the researcher had to determine the best way to create hints that were relatable to the participants and any other users from the ethnic group.

The conversation thereby shifted to how each event should be depicted in the virtual environment and how an observer can determine its nature based on a combination of markers. From this conversation it became apparent that, to an observer not familiar with the cultural practices and norms of the group, most events may look identical from a distance and this makes it difficult to accurately recreate them using 3D modelling tool and game engines. The researcher realized that there was need to capture the more minute details about any activity and try to recreate them as hints as compared to taking single objects and using these as event markers. The data gathered from this session was used to develop a prototype which was tested in the same community using the same community based co-design approach to elicit the accuracy of the scenarios depicted in it.

## Current work

While tests on the HSSD produced favorable results, more design gaps were discovered and plans are now underway to fill some of these up. Of main importance is to determine how best to strike a balance and accurately depict an activity using the necessary 3d models and rendering this without putting a strain on the resources of the device in use. This would require that the models be less detailed but maintain their fidelity.

## Reflections

The results from the tests were encouraging and showed the researcher that using Community based co-design is beneficial when working on products to be used by people unfamiliar with the technology in use. The testing phase was also a revelation as it showed the researcher how CBCD is an ever-continuing process that does not end once the product has been released. It is the researcher's belief that CBCD can also be used by organisations to co-design systems with a target demographic with no Information Technology professional background and still produce products that are better embraced by the target users. The method is particularly appropriate in a cross-cultural setting where the context is not familiar to the developer.

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