Penan's Oroo' Short Message Signs (PO-SMS): Co-design of a Digital Jungle Sign Language Application

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Abstract. Oroo', a very peculiar jungle sign language of the semi-nomadic Penan in Malaysia, Borneo Island, is at the virtue of extinction with recent changes in lifestyle. The youth inhabiting the rainforest are more drawn to technology than traditional forest activities needing cognizance of Oroo'. In partnership with community members of Long Lamai, as part of a long term collaboration, we launched into revitalizing Oroo' through digitalization. Complementing previous efforts of database, tangible and game developments, we postulate that a language can only be revitalized if integrated in daily use. Thus in this paper we present the co-design of the Penan's Oroo' Short Message Signs (PO-SMS) application, which extends current technology driven communication means. Following a community-based co-design approach, a group of local youth and elders have led the unique design of their own digital indigenous communication tool. Our research contributes directly to the INTERACT 2015 theme of "Connection.Tradition.Innovation".

Keywords: Indigenous Language· Community-based Co-design· Oroo'· Local Content Creation.

1 Introduction

"Many linguists predict that at least half of the world's 6,000 or so languages will be dead or dying by the year 2050. Languages are becoming extinct at twice the rate of endangered mammals and four times the rate of endangered birds." ([1] as cited in [2])

Countless indigenous languages have emerged over epochs of which many have already disappeared and others are at the virtue of extinction. Besides spoken and written languages, a great variation of alternative local language systems such as

sign languages have evolved. The languages vary by degrees of complexity and strengths of expression. The most developed and current sign languages are without doubt the deaf signing languages which are composed of gestures symbolizing words or letters. Another well-known sign communication is composed of smoke signals, one of the oldest forms of long-distance visual communication. The Native Americans have developed complex signals with dependencies of locations from where it is sent to ensure their enemies cannot decipher the messages. While for example the Vatican's papal election procedure uses a simple binary smoke code to announce a positive or negative result. Other unique languages are whistled and whistling languages, emulating a tonal oral language, such as Silbo Gomero practiced in Spain, and other variations found in Mexico and some African countries. However, even less noticed are the rainforest sign languages, which have been used by different tribes on Borneo Island. The language is composed out of different natural elements found in the jungle and combined along so called message sticks. Numerous different messages can be formed through combinations of signs, expressing warnings, information of whereabouts, state and activities [3,4]. However less and less inhabitants of the Borneo rainforest master these languages due to changes in life conditions. Because most tribes have meanwhile settled and are no longer nomadic, the need for excessive messaging in the forest has diminished. The younger generation is no longer interested in upholding the knowledge of the language but rather drawn to technology and other modern utilities.

Languages are major carriers of culture and worldviews, which must be preserved primarily from a cultural heritage preservation perspective. *"In contrast to dominant languages with long written traditions, most indigenous languages either lost their written systems during colonization or never had one. The current struggle involves standardizing a written system, and the challenges are linguistic, political, and cultural." [2]* Thus most early attempts to digitalize indigenous languages were dominated by database and website approaches, which were based on transcribing local languages. The major aim was to document and gather information around the languages, in projects such as the Australian Indigenous Language Database[1], Indigenous Languages of the Americas library[2], and the Archive of the Indigenous Languages of Latin America[3]. Yet their organization is neither inviting for native speakers, nor captures non-written languages nor encourages the active use of the language.

"The definition of a healthy language is one that acquires new speakers. No matter how many adults use the language, if it isn't passed to the next generation, its fate is already sealed. Although a language may continue to exist for a long time as a second or ceremonial language, it is moribund as soon as children stop learning it." ([1] as cited in [2]).

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[1] (http://austlang.aiatsis.gov.au/main.php)
[2] (http://www.brown.edu/Facilities/John_Carter_Brown_Library/ildb/index.php)
[3] (http://www.lib.utexas.edu/indexes/titles.php?id=16)

We postulate that languages can be sustained only if used in every day's life. With new trends and interaction styles of technologies, new opportunities have opened up to revitalize indigenous languages. Besides large audio and video repositories, a number of mobile apps and games have been developed. Yet connecting indigenous people, via their own traditional forms of communication has not been prominent in current trends of innovation and technology design.

In this paper we present one of our recent technology co-design ventures, namely a jungle sign language app development, which we have conceptualized with a semi-nomadic Penan community in Long Lamai, Malaysia, Borneo Island. The endeavor is part of a larger project on indigenous knowledge management and language preservation in a long term community development collaboration established between the Institute of Social Informatics and Technological Innovations (ISITI) at the Universiti Malaysia Sarawak (UNIMAS), and the Long Lamai community. In this paper we first explore current digitalization efforts of indigenous languages especially sign languages. We then provide the research and project context as well as our documentation and digitalization efforts of Oroo', the sign language of the Penan. We then describe the co-design process and outcome of the Penan's Oroo' SMS app. We conclude with a short reflection on our co-design and contribution to the field of local content creation under the theme of "Connection.Tradition.Innovation".

2 Revitalizing Indigenous (Sign) Languages

2.1 Digitalizing Indigenous Languages

Many initiatives of culture and language preservation have mushroomed over the last decade. Most have followed a traditional technical solution in form of a databases or a website, with the purpose of documentation and cultural heritage preservation rather than promoting the usage of the language. Often the development and even the use of the technology were detached from the native speakers.

"To get ahead in the modern world without losing their heritage, indigenous communities need to develop a biculturism that enables them to move between two cultures and to combine certain elements of each harmoniously. […] In a digital world, it means Internet chats in indigenous languages, indigenous web pages, multimedia CD-ROMs for learning indigenous languages, and cultural information published by indigenous groups for a global audience." [2]

Thus recently more initiatives aimed at developing technologies for or even with indigenous communities. A good demonstration of such an endeavor is the Ara Irititja Knowledge Management System (http://www.irititja.com/index.html)

which brings back materials of cultural and historical significance to Anangu speaking people in Central Australia. Similar commendable are projects such as "The Yanomami Intercultural Education Program" where indigenous communities were involved in the development of digital educational material thereby enhancing the literacy rate in indigenous languages [5]. While the examples are many relatively few indigenous "non-written" languages are digitalized.

2.2 Digitalization Efforts of Indigenous Sign Languages

Sand drawings are a medium of communication among the members of the various language groups living in the north of the Vanuatu archipelago in the South Pacific Ocean. Sand drawings uniquely express the deep understanding of the land, conveying a sense of community, identity, and interaction with nature and history [6]. In 2011, in partnership with the French Embassy, the Vanuatu Cultural Centre signed an agreement for the digitalization of the audiovisual, photographic and sound archives of the Archive Unit. Therefore, more than 3000 audiotapes, 1000 VHS and others video format and about 3000 photography are currently digitalized. However the focus of the digitalization process is mainly preservation of this wonderful cultural wealth rather than revitalization. The later could be supported with current touch-based drawing apps (such as "Sand Draw) with haptic feedback thereby simulating the drawing in the sand feeling.

An innovative use of newer technologies to rekindle smoke signals as they were used by Native Americans has been developed by Dennis Be Bel. Native Americans used smoke signals from smudge fires to exchange information over great distances and across cultures [7]. Dennis Be Bel developed smoke messaging service iPhone add-on hardware case that will release puffs of smoke to communicate securely with others [8]. At the push of a button, lamp-oil is heated and vaporized, sending a little cloud of smoke up in the air. This iPhone cover allows two people to speak to each other using agreed upon common and programmed code. So the users can assign their own code, number of puffs for a sentence such as two puffs for "how are you?" and three puffs for "I am fine", however it will be difficult to manage complex conversation with this tool. The app in its current form rather has entertainment value than a serious language authenticity.

Another example is Silbo Gomero, the whistle language of La Gomera in Spain Canary Islands, off the coast of Morocco. Although whistled languages can be found around the world, they are rare, and few are likely to survive in the long term [9]. Silbo Gomero is not endangered but a unique indigenous way of communication. There are approximate 22,000 numbers of speakers or rather whistlers [10]. Silbo Gomero uses whistles meant to mimic the sounds of four vowels and four consonants, which, when used in conjunction, are able to create a vocabulary of over 4,000 intelligible words. Silbo Gomero can be understood at a

distance of up to two miles, much further and with less effort than shouting. Some of the highly skilled whistlers are able to send messages from one end of the island to another [11]. Complementing government efforts of teaching the whistling language, Busuu is a social network for learning languages and based on a freemium business model. The website (with downloadable app) provides 80 learning units for thirteen languages including Silbo Gomero in Spanish, French, German and English.

3 Project Context

Digitalizing Oroo' is a collaborative project of ISITI and Long Lamai, a local Penan community in Malaysia, on Borneo Island. Penans are one of the indigenous communities living in Sarawak, Brunei and Kalimantan [12]. The Sarawak Penan population in 2010 was estimated to be 16,281 people of whom about 77% have settled permanently. The remaining 20% are semi-nomadic while 3% are still nomadic [13]. Long Lamai is one of the most progressive Penan communities in the upper reaches of Sarawak's Baram river basin. It is very remote, requiring one and a half hours' flight from Miri, and then an hours' longboat journey upriver. There are 105 households and a population of app. 500. There is no 24-hour electricity supply and limited telecommunication service. Some families have generator sets to generate power, but few families can afford this. The Penan in Long Lamai were nomads, but have settled down in the area for over 50 years. Today the communities in Long Lamai is mainly involved in subsistence farming, and thus face issues of urban migration of their youths, reduced opportunities to economic activities to improve livelihoods and loss of their indigenous knowledge. In this light the ISITI has engaged in a number of projects with the Long Lamai community, such as the e-Lamai Telecentre which was inaugurated in 2009, supporting initiatives such as the development of an indigenous botanical knowledge repository, an online Penan language dictionary and an e-health system. A number of other joint cross-disciplinary research and outreach activities are undertaken in the field of rural-based tourism, health and infrastructure in order to nurture a sustainable socio-economy.

In 2013, the ISITI and Polytechnic of Namibia with the collaboration of Long Lamai community initiated a project for digitalizing and preserving of Oroo'. Oroo' is a living cultural heritage of the Penan which from a historical, political, social and scientific perspective is of extreme value to society. The Oroo' project's main goal is to preserve the traditional knowledge and revive the sign language of the community, given that the older generation is slowly dying out, and knowledge is no longer being transferred to the younger generation. The younger generation although living in the remote village does not travel the forest any longer. Thus they are not interested in learning and retaining Oroo', as being the old way of communication. Over the last year we have assessed the number of

signs known across the different age groups of the community. The elders know on average about 30 signs, while people between 30 to 41 years 10 signs, between 20 and 30 years 6 signs and the under the age of 20 years know about only 3 Oroo' signs [14]. Thus the digitalization efforts focus on documenting Oroo' signs and messages, creating a database (photos, video description, and drawings) and a rule system with the knowledgeable elders, while developing cultural Oroo' educational games for Penan children and ICT tools for contemporary use of Oroo' signs as communication medium for the youth.

3.1 Oroo' Documentation

Rainforest Sign Languages in the Literature. The rainforest sign languages of Borneo Island as documented and published by only a small number of anthropologists differ between the tribes yet have a common pattern. The jungle sign languages consist of a stick of varying length. Clefts cut into it hold a number of folded leaves, twigs and branches, which carry different meanings constituting the message [3,4]. Messages such as event announcements, warnings, instructions and information can be communicated to other nomadic families of the same tribe (able to read the message). In case of the Murut's sign, the message contains the identity of the writer and placed in public spaces as public message [15]. These signs generally refer to ceremonial or hunting practices and describe the details of activities such as the direction of hunting, type, gender and size of hunted animal, weapon used for hunting, age, gender and personal or family affiliation of the writer. Few signs are for taboo in force, dangerous traps, marriage or death ceremonies, types of food given and the number of people attended the ceremony. Burrough reported that the Dusun (Kadazan) community uses signs and message sticks only to communicate with the spirit of their wet-paddi [3]. The Penan are recognized as the prodigies of jungle travel and sign reading [16]. The Penan often traveled in groups, where the leading group left messages for the following once. Arnold [16] illustrates a few messages, demonstrating the richness of expression, e.g. messages such as: *The first group waited a long time for the second concerning an urgent matter. Thus the second group is now requested to travel through the night to catch up.*

In general, the literature references to the rainforest sign language hardly exceeded one paragraph and a number of examples of messages illustrated by drawings.

Sign Collection. Considering the extremely scares and incomprehensive Oroo' documentation in the literature, we have launched into our own collection of signs, messages and rules. We have over the last two years collected about 50 different signs during a number of jungle walks around Long Lamai. Community members demonstrated the different Oroo' signs and messages (Fig. 1). We have video

recorded the process of making the signs and taken photos of each one. We have documented the name and description of each sign and combinations thereof. At each visit an elder constructed Oroo' signs and messages as they came to his mind in the real environment. The authenticity was verified by a second accompanying elder. Considering the density of the jungle, the clarity and details of the signs and messages are at times blurred on the digital photos, as other twigs, branches and leaves are all around. Thus, a local artists group was engaged to draw each Oroo' sign. The drawings helped to understand the detailed complexities of the Oroo' signs (Fig. 2, 3). The drawings are used alongside the photographs for further discussions, documentations and categorizations. All the drawings, photos and descriptions were reconfirmed by the community elders in community meetings.

Fig. 1. Elders creating Oroo' messages

Fig. 2. Drawn Oroo' sign for "hunted wild boar"

Sign Combinations. In the absence of a documented grammar we have recently engaged in a systematic exercise to explicate the tacit rules of combining the signs forming a valid message, as well as categorizing the signs. While at this point our analysis is still incomplete, we have uncovered a number of subtle variations and meanings in the message composition. Firstly the 'Batang Oroo' (or 'message stick') which shows the direction where the sign maker (writer) is going and also has different positions where signs can be attached and thereby combined to a full message (see Fig. 3).

Fig. 3. I'm alone, very very hungry and I have only water to survive. We are friends. I am going to the river

Fig. 4. Elders grouping Oroo' sign cards

We were shown only three signs that are placed on the ground next to 'Batang

Oroo' set obliquely in the ground; namely 'Pelun' the accumulation of leaves with the meaning of "wait here for me/us" and 'Tebai', a v-stick pointing at a direction saying "follow me this way" and 'Selikang', two straight sticks crossed at the midpoint and on message stick saying "don't go in this direction". All three being direct instructions to the reader of the message. Then a number of clefts along the stick with one cleft at knee level, mostly used to indicate number of people, state (hungry, thirsty). Other clefts app. ¾ into the message stick and a cleft at the end of the stick are used for activities, durations and destinations. The full description of the rule system is beyond the scope of this paper.

Sign Grouping. In order to understand the underlying categorization of the signs we have engaged a group of 5 elders in the jungle in a card sorting activity. [17] and [18] have demonstrated that card sorting in a cross-cultural design context can reveal cultural adequate mental models of categorization necessary for local adaptions of design. Following a generative approach all signs (either drawn or photographed, depending on the quality) were printed on individual cards and displayed all at the same time to the elders (Fig.4). They were requested to group what "belongs together" according to their perception. The elders immediately understood the exercise and launched into piling up related concepts. A few discussions with a few re-groupings led to a preliminary set of 16 named categories. Asked to reduce the number of categories, the elders put together some of the piles and re-allocated a name to the new categories. A total of 9 categories were formed, namely Instructions, Warnings, Information, Directions, Durations, Animals (animals, hunting), Number of people, River place activity (river, fishing), Hungry. The categories have not yet been verified at a community meeting.

New Sign Creation. Another interesting aspect was in the exploration of existing signs and "missing" signs. While there are signs for death announcement, differentiated by sex and age there are no signs for birth announcements nor for the distinction of sex for life persons. However, within the discussion the elders with great ease expanded the current existing set of signs by "birth of baby boy/girl" and woman and man. Following the logic of other signs, consensus on the signs was immediate. Thus the woman was symbolized by the sign of river as she is the one fishing, while the man was symbolized by a blow pipe as he is the one hunting, following the same association of the representation of dead woman being an 'Atip lutan' (fire tong, as women are the ones who make fire) and dead man being an 'Atip na'o' (utensil used by man for eating starchy sago flour).

3.2 Previous Digitalization efforts

Besides having created a database of current signs and messages composed of the Penan term, English translation, photo, drawing and video recording of

construction and explanations, we have evaluated so far two different approaches to enhancing the learning of signs with technology.

Tangibles. Capacitive sensing tangibles linked with 2D representations on tablets, were explored as a novel concept for teaching Oroo' signs. The tangibles were constructed out of a baseplate with touch points topped with the Oroo' sign made out of clay and natural products. Their sole function programmed was to initialize the signs on a tablet for further manipulation of the 2-dimensional digital representations of complex messages. The tangible-tablet tool was evaluated as a collaborative learning tool in the village where 6 family groups, consisting of respectively an Oroo' conversant parent and a child engaged with the tool [19].

Although the tool seemed engaging and the children learned most of the 10 signs tested for, a number of critical points show the unwieldiness of the tool. Firstly tangibles constructed were only functional for a few days, due to weather conditions. Using fresh leaves is impractical as they die after a few days, which modifies the authenticity of the sign; such as the 'wild boar' can only be symbolized by a fresh leaf. The creation of permanent artificial signs would resolve this, yet in general the question regarding the purpose or use and quality of these handmade tangibles using capacitive sensing remains. The technology chosen does not allow for any further interaction with the signs then the retrieval of the digital sign, which substantially undermines the characteristic of the language. There is no evidence that beyond the novelty effect the tangibles would actually enhance learning. Through discussions with community elders, we realized the complexities of interaction between Oroo' signs, tangible tools and the corresponding two dimensional images.

Games. We have developed an Oroo' adventure PC game with three stages for kids. On the first level the Oroo' signs are explained in the form of stories followed by an interactive component of finding hidden signs scattered in the background picture of the rainforest. Then, the users have to distinguish between pairs of presented Oroo' messages. And finally the kids are presented with an Oroo' sign representing an animal and are requested to shoot the corresponding animal with a blow pipe. The game is then followed by a quiz to test the users' Oroo' sign knowledge. A first evaluation, with 17 kids in Long Lamai, suggests that the general interest in local content games is awakened yet the learning curve has been rather shallow. A number of improvements are required to enhance the performance and its applicability beyond kids [14].

4 PO-SMS

We postulate that a language is only truly sustained if in use. Thus we have conceptualized the digitalization of the Oroo' language, as an extension to current

means of communications such as sms or whatsapp. The elders have expressed their concern about the lack of knowledge and lack of interest by the youth in learning the language yet being drawn towards technology-driven communications. Thus the idea of an Oroo' sms app arouse within the discussions in the village. In a pre-study with a selected group of youth a number of new Oroo' signs were created for assumed messages to be conveyed to each other via cell phones, such as "How are you?", "I am well/not feeling well", "Where are you?", "I am at home/school/church", "I am taking dinner", "I am going for fishing", "I am cooking". The pre-study showed promising results and interest by the youth, thus the development was endorsed.

4.1 Community-based co-design approach

To ensure a higher authenticity and user acceptance the development of the new app follows a community-based co-design approach [20]. The methodology is based on principles of participatory design with adapted methods to the community context. We would like to emphasize that the first author has been regularly returning to the community for the last years thereby establishing a strong trust relationship. He has worked on a number of projects with this community among others the establishment of cultural protocols and the preservation of indigenous knowledge both providing contributions to local interaction design methods [21, 22].

4.2 Co-design workshop

In late 2014 a two-day workshop was held with eight youth in Long Lamai, three female and five male participants in the age group between 14 and 24, as well as one male participant of age 32. The workshop consisted of different phases. In the first phase personas were created, representing Long Lamai community members. Then paper SMS were created as sent between the personas to capture typical and realistic sms texts. The sms'es were categorized and a reasonable number were selected for which Oroo' signs were created (if necessary) following the logic of the existing signs. Then signs were categorized to define a user interface organization and the layout of the interface was determined jointly with a final paper prototype as outcome.

Personas. A relatively popular user-centered design method is the use of personas, which are describing a fictitious future user of a system to be developed. Benefits are seen as *"ranging from increasing the focus on users and their needs, to being an effective communication tool, to having direct design influence, such*

as leading to better design decisions and defining the product's feature"[23]. Mostly personas are created by the designers as an amalgamation of collected data about users thereby creating a typical user. We have adapted the method to participatory design principles, where the user participants, the Long Lamai youth, generated their own personas. The group of youth was split in a group of girls and a group of boys each creating a male and a female youth persona. Then as a full group they jointly described an older male and female persona. Thus a total of 6 personas were generated (Fig.5). The primary aim of the personas was for the youth to sufficiently identify with the one or the other persona for the next phase of the workshop and to be able to compose sms texts freely without them being attributed to any participant.

Fig. 5. Personas created by the Youth

SMS Composing. In the sms composing phase of the workshop, the personas now familiar to every participant were placed in the middle. Every participant had a pile of A6 cards next to them and was asked to compose as many sms texts as possible with the following rules: Only one sms per card indicating clearly which persona wrote to which other persona. The card could then either be dropped in a box (for no one to see), or handed over to another participant with the request to reply or put out in the open for any participant to read and reply. This phase of the workshop was without doubt the liveliest activity, where all participants engaged

in writing sms, reading others, laughing out loud and replying promptly (Fig. 6a). Within less than 15 minutes 89 sms texts were created, with one third in Malay and the rest in English. A first grouping of identical or similar sms texts showed the highest occurrences of the following messages: "What are you doing?" (7), meeting up (7), "what do you mean? (4), where about question (4). Considering the large number of sms texts created the group agreed on 13 sms texts to create Oroo' signs for during the workshop (see an excerpt in table 1).

Fig. 6 a & b Left: SMS composing, Right: Oroo' sign creation

Creation of Oroo' signs. Firstly the group went through a slide show of the documented Oroo' signs, to ensure that every participant recalls the existing signs. Then a couple of participants went to the nearby woods and collected a set of items, such as twigs, branches, and leaves. Jointly the signs were created one by one with trials, suggestions and lively discussions until consensus was achieved (Fig.6b). The final sign was photographed and drawn by the participants.

Table 1 presents an excerpt of signs created and reused.

Table 1. Sample signs: Newly created and existing ones

Number	SMS text	Sign	Comment
1	How are you?		Composed out of existing sign "not fine" combined with a new sign for "fine"
2	I am not fine		Existing sign for "sick" whereby the scratched area shows the seriousness of the illness.
3	Are you hungry?		Inspired by the existing "hungry" sign with the leave unfold halfway and inserted at the end of the stick rather than any cleft.

4	I am hungry		Existing sign of a folded leave signifying hunger.
5	I am not hungry		Existing sign of “hungry” combined with existing sign of “not”
6	Where are you going?		A stick with many branches indicating different directions
7	I am waiting for you at home		Composed out of existing waiting sign and existing “home” sign
8	I am sleeping		Newly created out of a new sign for “bed” (wooden bars) and an existing sign of “person”
9	Kuching		Cat symbol as the town Kuching is known for its association with cats

10	Pick Nick		New sign for “fire place” combined with existing sign of “boar”

Oroo’ Signs Categorization. Firstly the existing and newly created Oroo’ signs were drawn on one card each by the participants. Then the participants were asked to group the cards as they “belong together”, similarly to the elders’ card sorting (see section sign grouping). The youth struggled to come up with an appropriate categorization but after a long time finally agreed to the following:

- Activities: waiting, fishing, meeting, pick nick, going
- State: are you hungry? hungry, not hungry, are you fine?, fine, not fine
- Objects: house, plane
- Living beings: person, monkey, boar, friends

The categorization was tested on four community members that were not part of the grouping exercise. Each of them was shown the four categories and requested to point out in which category a specific Oroo’ sign prompted would be. All community members identified the correct categories without hesitation. This ‘quick and dirty’ testing hints at a usable classification.

App Screen Layout Design. The layout is aiming for a middle sized touch screen smart phone considering that more than half of the participants own such a smartphone. The layout was co-sketched with the youth participants screen by screen exploring the sequence and interactions. The pictures below show the screen sequence and layout created.

Screen 1: The “blow pipe with its container of darts” was chosen as the app splash screen icon, thereby representing that darts which are blown/send to a recipient and at the same time being peculiar to the Penans.

Screen 2: The “batang Oroo” was chosen to represent the “compose message button”. Once pressed screen 3 appears. The crossed sticks are to quit the process and the twig with roots is an existing Oroo’ sign for “Person” which leads to the address book. “New Message” indicates the unread message and “Message 2”, “Message 3” and “Message 4” indicate read messages.

Screen 3: The empty “batang Oroo” will be populated with the chosen signs. The four categories (Living being, Objects, Status and Activity) are buttons once pressed display the signs in that category. Alternatively the A button allows for additional text. The “right dart” can be used as send button. .

Screen 4: “From” represents sender of the message. Once the message arrived and read the “right dart” button is pressed to forward message and “left dart” to reply message.

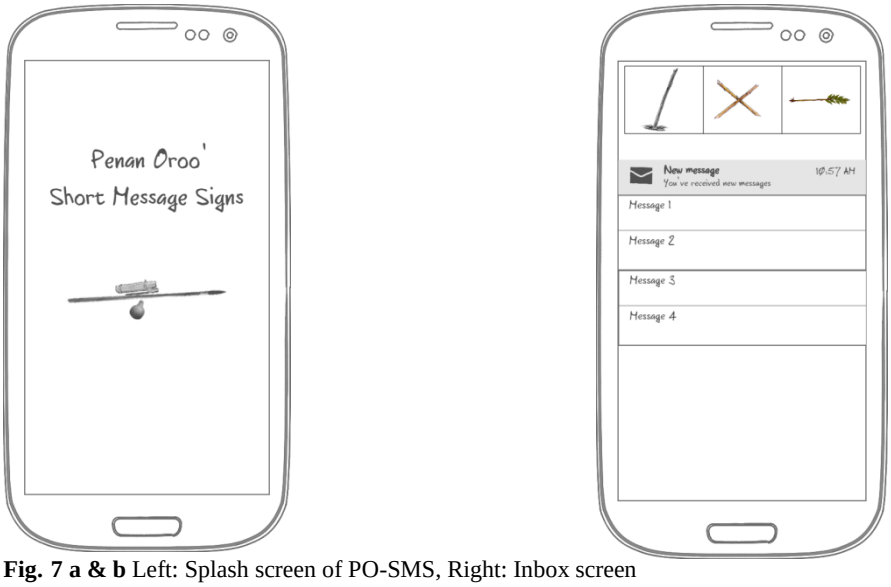

Fig. 7 a & b Left: Splash screen of PO-SMS, Right: Inbox screen

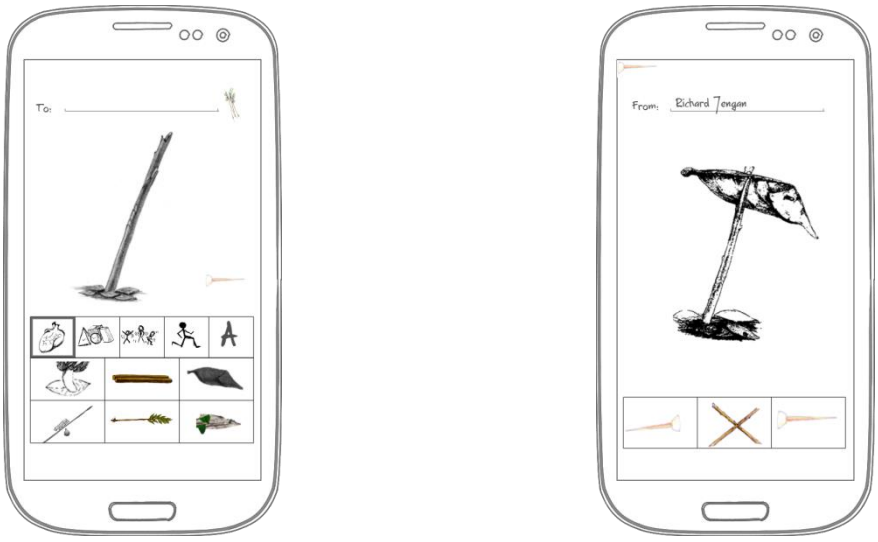

Fig. 8 a & b Left: Compose message screen, Right: Read messages screen

5 Conclusion and Future Work

This paper presents the community-based co-design process of an innovative communication tool, as designed in collaboration with an indigenous community aiming at reviving a traditional sign language.

The process itself has shown to be very rewarding for community members and technologist, engaging the youth and the elders in a creative development. A separation of elders and youth was done intentional for the youth to feel free and not be dominated by the elders in their originality. The persona method showed to be extremely fruitful in the youth unleashing the sms texting freely. Taking the youth through all the phases of design up to the screen layout ensured that they understood all the steps and are empowered to do design modifications at any level. For instance we are aware that the designed new signs still have to go through a number of community validations, as well as the 'artificial' categorization of the signs. Most problematic has shown to be the categorization of the signs, which is needed for a fast retrieval in the process of compiling a message. The different categorization approach between the elders and the youth requires us to further investigate a suitable mechanism during the app use. It is planned that at the next visit the prototype implementation will be evaluated in the community, revealing a number of usability and design modification requirements.

Overall we trust that the community initiated development of this tool will contribute to the revitalization of a forgotten jungle sign language. We are aware that the current set of messages of Oroo' and SMS texts contains an extremely small common subset. Thus it is necessitating the creation of numerous new signs in order to cover current expressions. Nevertheless the designed communication tool will be re-connecting indigenous elders and youth via their own tradition in an innovative way.

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