Co-Design of Visualisations of Fisher Catch Data with Small-scale Fishers in South Africa

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Abstract

The small-scale fisheries sector constitutes a major component to the livelihoods of many people worldwide, employing approximately 90% of the world's capture fishers. Previous ICT4D related research in the fisheries sector focused primarily on market factors, which analysed how mobile phones aided fishers to exchange information amongst themselves, lower market price dispersions and allowed fishers to obtain the best time to sell their catch at markets, however little fisher-driven work aimed at generating other information based tools has been done in this sector.

The Abalobi Project aims to address the information and resource management needs of small-scale fishers in South Africa, through means of a suite of mobile applications designed with continuous input and feedback from fishers. Our current participatory research with two communities in South Africa, aims to design and develop a mobile application for the visualisation of catch metrics collected using tools from the Open Data Kit suite. The aim of the visualisations is to provide fishers with actionable information which they can use to best plan their future fishing activities. These include but are not limited to improved financial management of daily operations, mitigation measures to address declining resource trends, identifying and fishing for more profitable species during more favourable periods as well as budgeting for periods where the fishing yield is

not as favourable. We strive to understand which facets of the data collected can help fishers make these decisions relating to their fishing activities in addition to understand how fishers interpret and best interact with the data.

Author Keywords

ICTD; HCI; Co-design; Small-scale fisheries; Visualisation; Open Source

ACM Classification Keywords

H.5.m [Information interfaces and presentation (e.g., HCI)]: Miscellaneous; H.5.2 [User Interfaces]: Interaction styles

Introduction

Fisheries are a vital food source for the world, providing the primary source of protein and sustenance for 17 percent of the world's population [3]. Fishing additionally supports approximately 12 percent of the world's population of which small-scale fishers constitute approximately 90 percent of the world's capture fishers [3].

With the increasing affordability and access of mobile phones, research has shown that fishers are naturally inclined to using phones as a tool for consuming and distributing information used to make decisions [9, 4, 2]. Previous research on use of ICTs in fisheries in developing regions has shown that the use of mobile phones by fishers can help them manage and co-ordinate their resources, including helping to lower price dispersion among markets within a region [4, 2], allow stakeholders to coordinate market prices, logistics and maintain trade relations [4, 9], communicate good fishing locations [6, 8], allowing fishers to remain in contact with families while at sea as well as a communication device during emergencies while at sea [9, 2, 6]. These are some examples of how fishers are using information available to make informed decisions in order to sustain their livelihoods, increase their income and economic growth, however the information exchanged is primarily based on market related factors such as price and market demand, which may not be the only contributor to growth. The mFisheries project [5] explores the possibility of providing small-scale fishers in Trinidad and Tobago with a set of mobile application tools which supply fishers with various types of information and actions. The suite consists of multiple modules which provide users access to information guides and tools for safety at sea which include basic GPS and map tools, a compass, and an S.O.S service which allows fishers to request local rescue services when necessary.

Providing fishers with access to information based on other factors at various stages of the fishing pipeline could further improve their growth.

In this paper, we outline our project, Abalobi, a set mobile applications to support the information needs of small scale fishers. The Abalobi project proposes a different approach within a South African context, one based on data collection of fish catch metrics by local fishers and the visualisation of collected data, to complete the feedback loop providing fishers with actionable information they can easily aggregate to drive collection action in management processes and value chains.

Abalobi

Abalobi aims to transform the small-scale fisheries governance in South Africa, by providing fishers with a set of open source mobile software tools in addition to serving as a tool to bolster the implementation of the Small-Scale Fisheries Policy (SSFP) of 2012 in South Africa [1].

The Small-Scale Fisheries Policy (SSFP) of 2012 aims to provide redress and recognition to the rights of small-scale

fisher communities in South Africa previously discriminated against and marginalised [7]. The policy emphasises the shared responsibility of management of small-scale fishing communities and its resources on the community members as a form of empowering members, fostering ownership and self-development of communities.

The tools that Abalobi provides, aim to aid fishers to improve catch data collection and management, with the goal of co-producing knowledge, addressing unsustainable use, as well as creating a platform for fisher community members to partake in the management of resources, and provide a virtual market place where locally caught fish can be traded by various parties. The project consists of modules which collectively address the overall goal of promoting community engagement by creating information and resource networks that fishing communities can use to foster local development and facilitate market opportunities.

Fishers are one of several stakeholders involved in the project, which also include government institutions and workers. They are actively involved throughout the design process of each module of the project. We, the authors, are currently collaborating with fishers from two fishing communities in the Western Cape region of South Africa to design and implement initial implementations of the modules.

An issue raised by fishers was the latency involved in the dissemination of information from data collected using current paper based methods by community monitors and fishers, to the respective governmental stakeholders. Community monitors are stakeholders that pertain to a third party contracted by the government to collect data of fishing effort and fish caught as it arrives at local harbours. Fishers do not partake effectively in what happens with the data after collection, and how it contributes to stock assessment and renewed input and output controls (i.e. quota, size limits, etc). This lack of awareness, feedback and participation prohibits fisheries compliance and legitimacy of the fisheries system.

Through discussions, fishers have provided input on how to transition from the current paper based data collection methods to a digital implementation using the ODK Collect from the Open Data Kit suite of tools. Community monitors collect a set of predefined data points set by the government, however the transition provided fishers with the opportunity to collect data on other previously unexplored metrics that they believed where important to them. Metrics initially included weather and sea conditions, however other metrics were added as discussions progressed, including logging trips that yield no catch, costs associated with each trip, as well as any income generated from trading any excess catch. For the past 19 months, fishers have been collecting data with the designed forms, using either their own phones or phones provided to a select number of fishers, however results of that phase are not within our current scope. Data alone however has minimal value to fishers in it raw form. The second module in the Abalobi suite is concerned with visualising data collected and is the current focus of our research.

Initial Investigation

Two versions of the visualisation application have been developed to date, the first (v1) of which, was the included application that came with our chosen database. In response to concerns raised by fishers, a second application (v2) was developed which addressed issues related to v1's slow performance and the small size of graphs presented. The absence of input from fishers during the selection and design processes, led to the creation of a visualisation application that not all fishers understood and consequently unable to address their needs.

Our initial investigation uncovered 3 categories of fisher concerns: Data visualisation complexity, offline usability, and visualisation content. Some visualisations within the applications were too complex, such as the stacked bar charts used within v2, and as a result not all fishers were able to extract any or all information they provided. Fishers suggested the use of simpler graphs such as pie charts because they understand each slice of data as being part of a whole, however still maintaining more complex visualisations for other fishers who could interpret them. Due to unreliable connectivity, fishers were not always able to use the visualisation applications as these specifically required a constant internet connection to operate. Fishers wanted to still be able to access information, even if outdated, when an internet connection was poor or unavailable. Fishers showed an interest in understanding their historical data, specifically how a number of metrics change over time, which both v1 and v2 did not entirely address. Access to these metrics would allow fishers to plan future trips for when they were most favourable and budget finances during periods with infrequent or poor opportunities.

Given these concerns, we, the researchers and participants, established the need for a new version of the application which better addresses the needs and concerns highlighted by the fishers. To achieve this, fishers involvement should not be limited to preliminary discussions about the application, but include involvement in the design process allowing their input to steer the design decisions and direction of the application. Fishers are interested in understanding their historical data, and consequently we identified 4 metrics available from data collected for the new application's first iteration, with the possibility of using other available metrics in future iterations. The metrics consist of a) the change in the distribution of species caught over time allowing fishers to identify which species they target or are available during which periods of the year; b) how income generated compares to expenses incurred from fishing activities allowing fishers to quickly view by how much they are operating at a loss or profit; c) the distribution of the various kinds of costs incurred within a time period providing fishers with information of which types of costs are highest, and d) the distribution of income generated by a given species giving fishers an overview of which species generate the most or most stable revenue. With the visualisation of these metrics fishers believe that they would be better equipped to make informed decisions based on historical information. It will allow them to reduce costs by avoiding trips during periods that have been shown to have low catch yield as well as allow them to direct their fishing efforts to the most profitable species during a particular period or season. Fishers also believe that the access to information will not only encourage discussion among members during community meetings, but will also facilitate discussions between small-scale fishers and governmental institutions relating to policy making, by using data collected as evidence and input into the discussion.

Conclusion

Abalobi is an open source and trans-disciplinary project which serves as platform for fishers to discuss their concerns and propose possible solutions. These discussions are not only on an individual level but also at a community and a national level. Our research focuses on addressing the fisher information needs by closing the feedback loop generated from their collected data, facilitating the transfer of this information through use of visualisations designed with input from fishers, consequently enabling them to make informed decisions relating to their fishing activities.

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