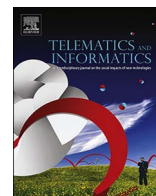




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# Design and development of a digital farmer field school. Experiences with a digital learning environment for cocoa production and certification in Sierra Leone

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## ABSTRACT

This article reports on the design and development of the Digital Farmer Field School (DFFS). The DFFS offers a tablet-based digital learning environment for farmers and extension agents for knowledge sharing and knowledge co-creation. It provides an alternative to conventional agricultural extension training and monitoring. The prototype DFFS applies Farmer Field School (FFS) learning principles and is designed and developed following user experience (UX) design principles and user interface (UI) design principles from a responsible innovation perspective, using existing FFS material and tailored films which support and enrich the content. The prototype DFFS has been tested in Sierra Leone to assess its success in providing a substitute for face-to-face voluntary sustainability standard certification training for cocoa farmers. Results show that the DFFS as an off-line, telephonically connected and regular on-line updated learning platform offers an appropriate environment in which collective and individual learning is stimulated and facilitated. The DFFS prototype was socio-culturally and technologically appropriate and fitted the operational and strategic communication skills of cocoa farmers and other value chain stakeholders. Films capturing the testing are available as additional learning media.

## 1. Introduction

The Ebola outbreak in West Africa in 2014 and 2015 and the resulting restrictions on gathering in groups of more than five people was the direct motivation to design an innovative learning environment to support cocoa certification training that had commenced in Sierra Leone. The challenge was to offer cocoa certification training without face-to-face meetings. In this context it was realised that information and communication technology-based solutions and acting upon contemporary critical reflections of the effectiveness of rural communication services (see for example Leeuwis and Aarts, 2011; Ingram et al., 2016; Paschall and Seville, 2012) could be a way forward. Digital learning environments are increasingly recognised as potential contributors to agricultural knowledge and extension systems (Asenso-Okyere and Mekonnen, 2012).

This context led to the development of a Digital Farmer Field School (DFFS), based on a user experience (UX) design in which the human-computer interaction is central. The design envisioned the use of tablets by small groups of farmers in an off-line mode with

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the aim of learning and knowledge exchange about cocoa production and certification. It was envisioned that farmers could use the tablet in an off-line mode and connect by phone or text messaging with extension agents in a back office in real time or recorded modes. The direct function of this back office would be to give support and advice to cocoa farmers and to answer specific questions. The back office would also be responsible for downloading and processing recorded information and thereby monitor the relevance of the content provided, support content creation by farmer users and connect with the wider knowledge system. The back office would also play a crucial role in facilitating periodic updating of the tablet and otherwise support the use of the DFFS by the farmer groups.

The user interface (UI) design of the tablet comprises of animations of a group of seven farmers, with Fatu, a female cocoa farmer, playing the main role. Fatu guides the learner(s) through the DFFS. A female character was chosen to ensure gender sensitivity and enhance inclusion of both female and male farmers in certification and the learning environment. The other characters were designed to be representative of the Muslim/Christian distribution within the Sierra Leonean population.

Few studies have been done on the use of tablets in agricultural extension in rural areas in the Global South. The few studies that have been done (Eitzinger, 2015; Muilerman et al., 2013; Romani et al., 2015) demonstrate that information and communication technology (ICT) can not only gather information more effectively but is dynamic and responsive and can lead to the creation of a shared, audio-visual knowledge, used for different purposes including learning, consulting on farming practices, promoting farm inputs and extending farmer's social networks. ICT can be understood as a force (Castells, 2010) with an “ambivalent face, empowering and hindering at the same time” (Lanzara, 2009, p. 38).

The article first addresses the theoretical points of departure and the underlying guiding principles for the design and development of the digital interface. Based on these principles the article discusses how the specific user experience (UX) and user interface (UI) design for the prototype DFFS on cocoa production and certification was developed. A section presenting empirical results and the analysis of testing the prototype in Sierra Leone follows this.

Although the DFFS was approached as a professional activity, requested by Julia Consultancy and FairMatch Support as the organisations responsible for the certification training, to alleviate the pressing situation experienced in Sierra Leone, this article aims to document the experiences obtained for a wider relevance of similar digital interfaces for farmers with low literacy levels and extension systems with digital ambitions for enhancing knowledge exchange and learning. The conclusions are thus situated in this broader context, with guidelines for further development in Sierra Leone and wider proposed in the closing section.

## 2. UX design of a digital interface for cocoa production in Sierra Leone

This section addresses the underlying theoretical principles of the UX design. The DFFS design was based on knowledge of rural communication services and cocoa certification (training) in Sierra Leone, gathered from farmers and stakeholders (trainers, extension agents and certification organisations) in the cocoa value chain. Secondly, being a first initiative of its kind to open up to digital learning for people with low literacy levels in Sierra Leone, the UX design required the learning principles of knowledge sharing and knowledge co-creation to be articulated. The main principles applied in the development of the prototype DFFS are in line with the learning principles of Farmer Field Schools (FFS). Thirdly, an explicit perspective on content strategy and accessibility is explained. Accessibility issues in the Sierra Leonean context were studied as the basis for the design of the UX and the content. Finally, the design and development follows the principles of responsible innovation (RI) (Stilgoe, 2013).

### 2.1. Rural communication services and cocoa certification in Sierra Leone

Cocoa is, along with rubber, coffee and palm oil, one of the major export commodities from Sierra Leone (State House, the R. of S.L., 2014). In 2014 around 13,000 smallholder cocoa farmers, working in farmer groups and cooperatives, aimed to achieve UTZ, Fairtrade and Rainforest Alliance certification. The logic behind certification is that demand and the higher ‘premium’ price paid for certified cocoa has a direct positive impact on farmers’ income and livelihoods (Blackman and Rivera, 2010). Julia Consultancy, based in Kenema, Eastern Sierra Leone, in partnership with the non-profit organisation FairMatch Support—a developer of sustainable supply chains—had organised the certification process with training and audits with the farmer groups. Julia Consultancy employed ‘trainers’ and ‘field monitors’ to conduct seminars, training and demonstrations in the field. However, due to Ebola the certification training given by Julia Consultancy in Kailahun, Kono and Kenema districts in 2015 was interrupted and the certification process could not be restarted on time for the 2016 harvest to become certified.

The challenges faced in the organisation and delivery of these agricultural extension services and certification activities originate from diverse causes. The geographic working area for Julia Consultancy staff covers large distances between the office and rural communities; agricultural extension services by the government do not support these initiatives; cocoa farmers have limited resources to procure services from private sector providers; and communication media are limited and often not considering the local languages. When rural communication services are available, a top down orientation of transmitting messages often limits their relevance further. This is then aggravated by not taking into consideration socio-cultural aspects such as literacy aspects of text and visual communication, the gender of users and other contextual specifics.

### 2.2. Learning principles for a DFFS

The design of the prototype DFFS was inspired by FFS learning principles in the context of cocoa certification, given that FFS is the main agricultural extension model used in Sierra Leone and generally appreciated for its merits as extension approach tool (Davis, 2008). In the FFS approach, groups are recognised as the key element (Anandajayasekaram et al., 2007; Braun and Duveskog, 2008;

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