Domain Exploration of ICT Use in Consumer-to-Producer Feedback Loops within the Fair Trade System

Jennyfer Lawrence Taylor
Research School of Computer Science
Australian National University
Canberra, Australia
jennyfer.lawrence.taylor@anu.edu.au

Duncan Stevenson
Research School of Computer Science
Australian National University
Canberra, Australia
duncan.stevenson@anu.edu.au

Tom Gedeon
Research School of Computer Science
Australian National University
Canberra, Australia
tom.gedeon@anu.edu.au

ABSTRACT
Information and communications technology (ICT) plays an important role in facilitating information flows through fair trade supply chains. While previous research has focused on the role of ICT in providing consumers with fair trade producer information, few studies have considered the operation of feedback loops from consumers to producers, particularly in an Australian context. This qualitative study provides a novel contribution in this area through a domain exploration of the consumer-to-producer feedback loops in the fair trade system and the role of ICT in facilitating these supply chain communications. We have used ethnographic techniques through semi-structured interviews with consumer, importer, and producer links in the supply chain, analysing and refining our data using a grounded-theory approach. The discussion engages with emerging themes addressing the actual information needs of producers, attributes of existing feedback loops, and the role of ICT in fair trade handicraft supply chains. We explore the function of intermediaries in the supply chains who aggregate, filter and interpret feedback that flows from the consumers and importers through to the producer organisations and the artisans who produce the goods. Finally, we consider potential future applications of ICT to fair trade feedback loops and associated design sensitivities to ensure that feedback offered by consumers and importers satisfies producer information needs, establishing new avenues of enquiry in the field of HCI for Development (HCI4D).

Author Keywords
Fair trade, feedback loops, human-centered design, supply chains communications, conceptual models, information flows, HCI4D.

OzCHI '15, December 07 – 10, 2015, Melbourne, VIC, Australia
Copyright © 2015 ACM 978-1-4503-3673-4/15/12... $15.00
DOI: http://dx.doi.org/10.1145/2838739.2838754

ACM Classification Keywords
H5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION

This study examines the role of ICT in facilitating feedback loops in fair trade handicraft supply chains from Australian consumers and importers back to producers in developing countries.

Fair trade is "based on dialogue, transparency and respect" (FTAO, 2013), and requires supply chain participants to adhere to fair trade principles including the payment of a fair price and community premium, non-use of child or bonded labour, and environmentally sustainable production practices (Trade Aid, n.d.). Information flows, encompassing communication channels between supply chain participants such as consumers, importers and producers, are particularly important in the fair trade system for enabling "sustainable development for excluded and disadvantaged producers in developing countries by facilitating better trading conditions" (Randall, 2005:55). The informational aspect of fair trade is leveraged to re-establish "social relationships" between the producer and consumer of commodity items (Hudson & Hudson, 2003:413) in order to drive demand for ethical products. Product labelling, point-of-sale (POS) material, and online content about fair trade producers raises awareness of global trade inequalities, supporting transparent business practices and enabling consumers to make informed purchasing decisions by revealing the "social and environmental relations of production and exchange" (Hudson & Hudson, 2003:413).

While Fair trade may be enhancing consumer awareness of producers and production conditions, little attention is granted in the literature to feedback loops from the consumer to the producer (Figure 1). Fair trade aims to provide producers with "market information" (Nicholls, 2002:7) to determine global trading opportunities and target production to foreign export markets. However, present fair trade supply chain communications are instead "rooted in a politics of difference, unequal participation and one-way information flows" (Lyon, 2006:459) due to inadequate producer feedback loops. A video depicting Ivory Coast cocoa farmers handling and

tasting chocolate for the first time (VRPO Metropole, 2014) provides an indication that fair trade commodity producers may lack an understanding of the end product of their labour, the consumers of this product, and the factors driving market demand.

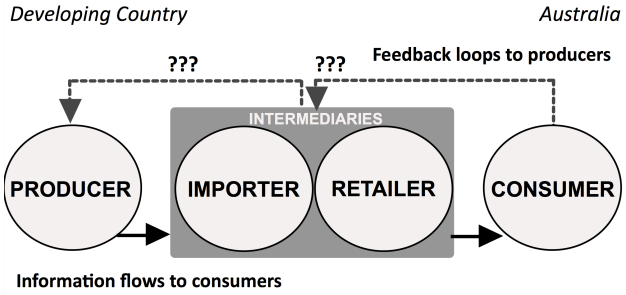

Figure 1. Fair trade supply chain information flows

Our study makes a novel contribution to the field of Human Computer Interaction for Development (HCI4D), which is centred upon design work that "empower[s] users to circumvent the barriers that may otherwise constrain their health, education or employment-related outcomes" through the use of ICTs (Shaw et al., 2014:480). ICT plays an important role in facilitating consumer-to-producer feedback loops, providing knowledge that enables and supports producer agency in supply chain activities. This study examines whether feedback offered by consumers and importers along the production chain meets the actual information needs of producers, revealing gaps and opportunities for future design interventions in this space. HCI concepts such as 'feedback loops', 'conceptual models', and 'interfaces' have provided a theoretical sensitivity for considering these issues from a design perspective.

This project is framed within the human-centred design approach that emphasises "a good understanding of the people and needs that the design is intended to meet" (Norman, 2002:9) before new ICT interventions can be considered. Given a lack of prior HCI research relating to fair trade supply chains, a domain exploration of producer information needs, the nature and context of feedback offered, and existing ICT use will provide designers with some of these insights in order to move forward in the design process. Our domain exploration has been achieved through a qualitative study based on interview data from three different stages of the supply chain: fair trade consumers and importers in Australia, and producer groups located overseas. Our interview themes were drawn from the following research questions:

Research Questions

- What types of feedback do producers actually want and need from consumers about their products?
- What types of feedback are currently offered along fair trade supply chains from consumers and importers to producers, and how is this feedback transformed along the chain?
- How is ICT currently used in fair trade supply chains to facilitate feedback links?
- What are the gaps or limitations in these feedback links that interaction designers in this space may need to consider?

BACKGROUND

Producer Information Needs

There is a notable body of literature in information sciences identifying the general information needs of citizens in developing countries and outlining both the social and technological barriers to information access. Dutta (2009) provides a literature survey of studies relating to urban and rural indigenous populations in countries such as Malawi, Nigeria and India, with a lack of basic literacy skills emerging as a common social barrier to accessing information needed for their "basic survival". For example, Momodu's (2002) study suggests that 40% of the information needs of Nigerian Ekpoma people are related to agriculture in areas including farming processes, purchase and use of chemicals and equipment, financial programs such as loans, environmental conditions, and "market situations". However, a lack of English language skills means that they are unable to benefit from English-only information sources (ibid.). Additionally, a study of Nigerian fisherman shows that low literacy skills create a dependency on information such as obtaining credit facilities that is "outdated, unreliable, and inaccurate through informal networks", with negative implications for their productivity and livelihoods (Dutta, 2009:48).

Technological barriers to information access are also illustrated by agricultural case studies. For example, while there are currently web platforms and mobile applications available to provide Sri Lankan farmers with access to agricultural and market information (De Silva et al., 2012), these information sources are currently underutilized by the farming community due to a lack of digital literacy skills, scarce internet connectivity, and little knowledge of the services available (ibid.). Pakistani farmers also face problems when utilizing ICT to gain market information such as "issues of accessibility, lack of infrastructure, poor wellbeing, illiteracy, [and] technology inhibitions" (Mubin et al., 2015:2). However, Mubin et al.'s study also identifies opportunities for future ICT projects given the widespread ownership of mobile phones, such as mobile applications to support informal information sharing between farming peers (Mubin et al., 2015). These studies suggest that future ICT projects in fair trade producer communities will require an understanding of the types of information producers need, their current patterns of information technology use, and the social and technological barriers to information access in order for design projects to be effective.

Fair Trade Information Flows

Producer-to-consumer information flows in fair trade systems have been studied extensively in fields such as sociology and marketing. Providing consumers with information about supply chain operations has cultivated demand for fair trade products (Nicholls, 2002:9), and is a key element for enabling "consumer choice and participation within the alternative market" (Lyon,

2006:456). Producer information is conveyed in the form of text and images on product packaging describing producer stories, the presence of fair trade labelling on the item and associated web and point-of-sale content provided by the retailer (Raynolds, 2002). However, the propagation of "unreliable" information can also diminish consumer trust in the fair trade system (Hudson & Hudson, 2003). An ethnographic study of Chilean wine producers illustrates the effect of information management issues at the production site on information quality (Light, 2010). These problems include fragmented information systems, a reliance on manual data handling processes, supply chain politics, and mismatches in the types of information producers are gathering and the types of information consumers want to know (ibid.).

The literature has paid less attention to information flows in the reverse direction from consumers to producers despite its importance for "developing producer trust in, and allegiance to, Fair Trade networks" (Renard in Raynolds, 2002:419). An ethnographic study of fair trade coffee producers in Guatemala revealed that the cooperative had "little knowledge of consumers" (Lyon, 2006:458) and felt "antagonistic" when comparing their own lives to those of "wealthy consumers in the North" (ibid). Other examples such as the Ivory Coast case study (VRPO Metropole, 2014) provide further evidence that producers often do not understand the "demands they must fulfill" from the consumer market (Renard, 1999:498). Greater analysis of information flows to producers is therefore important for identifying information needs and deficits in the fair trade system, particularly since the informational aspect of fair trade can be more valuable to producers than its other "financial and commodity arrangements" (Raynolds, 2002). These studies highlight the existence of informational inequality in fair trade supply chains and information integrity issues that could be addressed through new ICT interventions.

Fair Trade ICT Projects

There have been a small number of previous ICT projects relating to fair trade supply chains, however these still emphasize information flows from producer to consumer rather than the inverse. For example, the *Fair Tracing* project proposes the introduction of a coffee tracing system using RFID technology to provide the consumer with a more in-depth understanding of the producer and the value chain (Kundu & Chopra, 2009:219). The *I-Choose* project instead focuses on developing an "interoperable data architecture" to integrate information through sustainable food supply chains, while also identifying barriers to its introduction such as information manipulation by "powerful, but irresponsible, actors in the supply-chain" pursuing their own commercial interests (Sayogo et al., 2012:151). This highlights the importance of identifying consumer and importer motivations for providing and transmitting feedback to fair trade producers to better anticipate how these ICT interventions might be used (and abused) in practice.

Industry has also identified a need for ICT to better support fair trade producers. The labelling organisation Fairtrade Australia and New Zealand (FANZ) invested in a two-year project enabling coffee farmers in Papua New Guinea to "better perform tasks such as price negotiation, logistics and planning, as well as identifying market opportunities and accessing information" (FANZ, 2014). An important insight gained from analyzing user requirements for the new system was the need to accommodate "verbal communication among farmers", supporting personal information networks in the system design (ibid.). Moreover, FANZ asserts that new ICT systems must build upon the existing information technologies used by producers (ibid.), consistent with the human-centered design view that HCI projects should support existing "human needs, capabilities and behaviours" of users (Norman, 2002:8).

METHODOLOGY

Qualitative Study Design

We conducted a qualitative study to examine the process of consumers and importers providing feedback to fair trade handicraft producers, analysing and refining our data using a grounded-theory approach (Corbin & Strauss, 2008). We took an "inductive approach" (Creswell, 2013) to formulating these design considerations based on themes emerging from the data analysis, rather than testing a predetermined hypothesis. We conducted semi-structured interviews, which are used in HCI to explore "the context in which users interact with technologies" (Rogers, 2004:98). The "emergent design" characteristic of qualitative research afforded us the flexibility to modify the interview questions as data gathering progressed (Creswell, 2013:47), such as pursuing unanticipated lines of questioning based on participant responses. Focusing our data collection around specific research questions allowed us to gather useful insights without the need for ethnographic fieldwork to be undertaken over extensive time periods (Randall et al., 2007).

Conceptual Frameworks

HCI concepts such as 'feedback loops', 'conceptual models', and 'interfaces' provided a theoretical sensitivity for analysing the data from an interaction design perspective. We used an information retrieval understanding of feedback as "a closed loop of causal influences" (Spink & Saracevic, 1998:251), where positive and negative feedback act as a "thermostat" for supply chain activities by driving changes to production practices which in turn affect the fair trade products offered to market. The idea of conceptual models (Norman, 2002) provides a vehicle to examine the array of differing perspectives and understandings of feedback loops between consumers, importers, and producers. In the context of supply chain communications, we consider the importer as the interface that acts as a conduit between producers and consumers. Through this study, we sought to gain a better understanding of the "data translations" (Light, 2010:34) that occur within these feedback loops due to the involvement of third party intermediaries.

Data Collection Approach

We engaged with "multiple forms of data" (Creswell, 2013:45) by supplementing our interviews with a small review of importer websites and social media accounts to gain an initial understanding of ICT-enabled mechanisms for gathering consumer feedback. This informed our questions and themes for semi-structured interviews with fair trade consumers and importers based in Australia and with overseas producer groups in 'developing' countries. Engaging with these three participant groups allowed us to compare and contrast perspectives of feedback from three vital links in the supply chain and gauge how this information is modified and transformed through supply chain communication. Interviews were conducted face-to-face or by telephone over a four-week period, taking approximately 30 minutes each with consumers, and 60 minutes each with importers. The two interviews with producers were conducted three months later.

Participant Information

A small, non-random sample of participants was recruited from three groups.

Group 1 consisted of *Australian-based fair trade consumers*, who were selected on the basis of having previously purchased fair trade handicrafts. They were identified through the first author's personal networks as a fair trade advocate. Sample bias was limited by the focus of the study on observing feedback behaviours, rather than advocating for or against the merits of fair trade as a movement. These consumers were motivated to purchase fair trade items due to product characteristics such as being "long lasting" and "unique"; a belief that producers should not be exploited on the basis of geographical location; the perception that consumers can personally "make a difference" by purchasing fair trade products; and support for fair trade conditions. Commodities such as tea, coffee, chocolate, spreads, and cereals were regularly purchased by most participants either from supermarkets or speciality shops, while fair trade handicraft items were usually purchased as gifts for others approximately 1-2 times per month.

Group 2 comprised *Australian-based fair trade handicraft importer organisations* who were identified on the basis of being Australian-based fair trade importers with a website and social media presence. We particularly targeted importers who actively use ICT to gather and disseminate consumer feedback. These importer participants are founders or owners of small businesses selling fair trade handicraft items such as jewellery, scarves, purses, clothing, and hair accessories directly to consumers through an online store or via wholesale intermediaries. Their commercial relationships with producers varied, including purchasing directly from independent producer organisations, collaborating with a producer "sister organisation" sharing a common management structure with the importer, and sourcing from fair trade wholesalers based in other 'developing' countries. The importers considered their role as providing (a) economic opportunities to producers and (b) access to a wider variety of fair trade products to Australian consumers.

Group 3 is made up of *overseas fair trade handicraft producers.* Producer participants were managers of fair trade handicraft organisations based in South East Asia and Latin America that sell products locally, while also exporting overseas through Australian importers and wholesalers. We interviewed two types of producer group: (a) a small, independent overseas organisation with a shared management structure in Australia that undertakes production in-house, and (b) a larger umbrella overseas organisation coordinating orders and export for a network of distributed producer workshops. Participants from this category were recruited through the professional networks of importer organisations involved with the study. Most producers and importers interviewed articulated the importance of transparency and respect in fair trade relationships, and we have thus attributed two producers by name in our results as per their request.

Five consumer participants, three importer participants, and two producer groups were interviewed. Data was manually coded and analysed through thematic clustering, consistent with a grounded theory approach.

RESULTS AND DISCUSSION

Producer Information Needs

Producers highlighted three key types of feedback required in order to address their information needs: design information, consumer experience feedback, and sales data.

Design Information

Our findings demonstrate that the product design process is a core element of producer communications with importers and is a key point in the production cycle where consumer feedback is needed. One producer expressed the ability to generate "unique" handicraft designs as a business driver, stating that "we are trying to design more things so our project will go on". This producer group reviews existing designs two times per year to update colours, sizes etc. based on advice received from importers. The communication link between producers and importers regarding product design is particularly important to ensure the commercial success of new products, with Vania Rivero and Eduardo Zeballos articulating that "we rely on our customers to do the market research, to do everything to make new products that will sell in that particular market". Their conceptual model of the design process attributes importers with the responsibility of understanding and communicating "what end customers want" to the producer group so that they can assume their proper role in "the part of the producer". Vania and Eduardo also expressed the negative implications of receiving poor design information that is not consistent with consumer preferences in the target market. Their umbrella organisation's typical design process involves discussing design patterns with the importer and directing artisans to create product samples in order to calculate the price and determine the production steps for that item. However, producing the sample has "connotations" for the artisans that the product will then be ordered. Interviewees expressed the sentiment that it is "frustrating" and expensive to make a sample that is ultimately rejected by the importer.

This data is consistent with the views expressed by importer participants, who stated that their producer partners demand "hardcore business intelligence" about the colours and styles preferred by particular markets. They noted that this feedback supports producers to modify their designs to sell more units rather than being attached or limited to producing in traditional styles. This design information is communicated by importers to producers through the use of rich media such as photographs, drawings, sketches and written exchanges with producer partners. For example, one importer reviews images of jewellery designs generated by the producer and provides feedback in the form of photographs and drawings found online, showing adjustments that could be made to improve the design quality. These recommendations are intended to influence production activities by allowing producers to enhance the desirability of their products for Western consumers, for example by reducing "mix-and-matching" of bright colours which is considered more 'fashionable' by Southeast Asian consumers than by Australians.

Consumer Experience Feedback

Feedback about consumers' experiences with a product provides information that shapes an importer's design conversations with the producer, particularly when a product is being reordered by the importer for the first time. Both producers interviewed typically have little contact with the end customers and leverage their relationships with importers to gather this information. The feedback they most need centres upon the design and the price, with one producer stating that they would most like to ask consumers questions such as "Is the design 'suitable'? Is it 'unique'? Do you 'like it'? Do you 'love it'?" This producer group also receives in-country visits from consumers as part of a development tourism program. However, the types of feedback consumers provide in person such as "I buy this for my Mum" were not considered by the producer to be particularly useful. Although one might expect that talking to consumers firsthand about the products and seeing them wearing jewellery and clothing items would serve as important feedback for artisans, this was only really deemed useful to the extent that they like seeing that their products are actually used. While consumer participants provide some consumer experience feedback to retailers and importers, this information primarily serves as a means of securing their (the consumers') own product satisfaction. This was particularly the case if there were negative financial implications such as the order not arriving or the product not functioning as expected. However, this feedback was mostly targeted at the transaction process with retailers rather than addressing design qualities, supporting the argument that product attributes of fair trade items such as "price, quality, convenience, and brand familiarity" are still more important to the consumer than their intrinsic ethical value (De Pelsmacker et al., 2005:2).

Consumers also had several additional motivations for providing feedback about fair trade handicraft products, but this is neither intended for producers nor directly addresses the producers' information needs. Some participants, who described themselves as fair trade "advocates", leveraged feedback loops as a mechanism for pursuing advocacy objectives such as applying pressure to retailers and importers to stock more fair trade products. For example, one consumer arranged a meeting with a supermarket manager to provide the feedback that their fair trade product range was inadequate for satisfying consumer demand, while another used social media to express their support for a business that was more actively engaging in ethical business activities. Others were motivated by a desire to advance the fair trade movement. One consumer described their role as a "social conscience" for others by providing feedback about fair trade items they had purchased on their social media account to raise awareness of ethical consumerism and guide other users in their purchasing decisions. Consumers also provided positive feedback on importer social media accounts as a means of indirectly supporting fair trade producers by driving an increase in sales. Only one consumer explicitly saw their role as assisting producers to "tailor their markets" by providing feedback in response to questions such as "what would you buy?" and "how can we expand our markets?".

Sales Data

Participants described the functioning of parallel feedback loops to producers, with consumer conceptual models emphasising economic feedback through transactional data, and importer conceptual models focusing on qualitative feedback about the product design. Most consumer participants stated that they primarily convey positive or negative feedback about a fair trade product through their spending decisions, making repeat purchases and donations if the consumer experience was positive or taking business elsewhere if it was negative. Consumers indicated that transactional feedback has been, or could be accompanied by verbal product feedback at the retail point-of-sale (POS), though these additional exchanges may not be captured with transactional data. A consumer conceptual model of feedback loops thus supports the notion that ethical consumers demonstrate attitudes about a product or company through their purchasing decisions (De Pelsmacker et al., 2005). The significance of sales data as a feedback mechanism was corroborated by a producer's perspective that when a product is reordered, they "know that consumers like it", consistent with Vania Rivero and Eduardo Zeballos' view that "if it sells, that's the feedback we need to know". They identified sales information as the "real feedback", indicating that the product is "sustainable", and the product and price are "correct".

Attributes of Existing Feedback Loops

Aggregative Role of Importers and Producers

While the presence of intermediaries between consumers and producers in fair trade feedback loops appears to be in tension with fair trade's focus on the "simplification of commodity chains" (Forson & Counihan, 2013:348), the interview data suggests that intermediaries are both a necessary and desirable interface for transmitting feedback to producers. Our study revealed that importers aggregate consumer feedback to transmit to producer organisations, while producer organisations further dis-

aggregate feedback to transmit to workshops as demonstrated in Figure 2. The producers indicated the importance of knowing the "story" of the importer to ensure that their organisational values align, and support transparent and respectful communications between the two supply chain links.

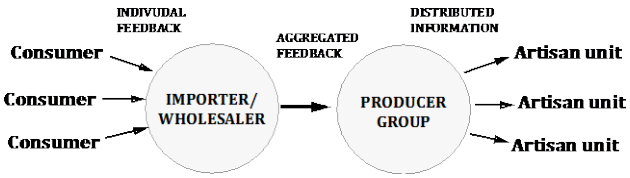

Figure 2. Aggregative role of producers and importers

Participants from the consumer and importer categories identified some disadvantages to consumer feedback passing through intermediaries such as importers prior to reaching producers. Some consumers expressed a preference for providing feedback directly to producers to avoid having their views manipulated or misrepresented by intermediaries. In particular, consumers were concerned about the retailer "tak[ing] credit" for their positive product experience and using feedback to advance their own commercial interests, or having negative feedback framed as a criticism of the producer rather than being offered as constructive advice. While importers demonstrated sensitivity to this issue by phrasing feedback in helpful ways such as 'let's make a change together' rather than 'you fix this', there are still perceptions amongst consumers that intermediaries may compromise the integrity of feedback. Consumers also expressed concerns that intermediaries would filter the information contained in feedback loops, and not necessarily pass on all feedback to producers. One consumer suggested the importer's organisational culture in terms of being "open" to feedback is a key factor affecting the flow of feedback to producers. Importers identified similar issues in terms of intermediaries between themselves and producers such as overseas wholesalers, describing fair trade as a complicated business model where communication with the producer is "essential" but "hard to maintain" due to the complex array of middlemen involved.

Despite these concerns, intermediaries in fair trade feedback loops are necessary in a number of circumstances to enable information flows from both consumers and importers to producers. Barriers to information technology access can require face-to-face contact in order to close feedback loops to producers. One importer described the challenges of working with palm-leaf handicraft producers in a rural Southeast Asian village, where communications had to be conducted through an in-country agent as the producers could not be accessed in any other way. Language and literacy barriers also prevent importers from speaking directly with producers on the factory floor and they must instead rely on office managers or export agents to translate their feedback to the producers. Producer organisations may also lack the staff resources needed to monitor and respond to consumer experience feedback provided online. Importers play a necessary role in reducing this burden by identifying and aggregating the most useful information to report to producers, such as compiling a book of photographs of Australian consumers wearing clothing items made by a particular producer group. Moreover, the presence of an intermediary may be desirable in supporting vulnerable producers who are trying to "free themselves" from situations of disadvantage such as human trafficking, where a random telephone call from an overseas consumer may be a traumatic or unsettling experience, according to an importer. Intermediaries have a greater understanding of the producers' specific circumstances and cultural context and can consequently present feedback to producers in accessible, useful and sensitive ways. Intermediaries therefore play a useful and necessary role as interfaces for feedback transmission between consumers and producers, with the examples above evoking the metaphors such as a "bridge" or "conduit" used by importers to describe their role in facilitating the flow of goods and information through the supply chain.

Feedback Loop Engagement Strategies

The nature of feedback as 'positive' or 'negative' informed conceptual models of feedback loop operations, with differing attitudes between participants as to how and when each type of feedback should be provided to producers. Some consumers stated that they would communicate positive feedback through public forums such as importer Facebook pages, driving demand for fair trade products through positive testimonials. However, other consumers did not see the need to provide feedback if the product "works as expected". Importers were also less likely to give positive feedback to producers because this was "implicit in reordering", with the absence of feedback signalling to producers that "everything is fine" and that there are no problems or issues that need to be addressed. In contrast, consumers and importers both felt that providing negative feedback was valuable, with one importer expressing a sense of "obligation" to provide producers with market intelligence about why their product is not selling (for example, if the fabric is uncomfortable). Unlike positive feedback, consumers were more inclined to provide negative feedback through "private" mechanisms such as email so that they would not discourage companies from pursuing ethical business practices, or damage the reputation of the fair trade movement. The visibility of feedback loops is therefore influenced by varying conceptual models of positive and negative feedback held by supply chain participants.

Feedback As Dialogue

Rather than being conceptualised as a one-way communication, consumers and importers instead perceived feedback as *dialogue* between supply chain participants. Consumers expressed a desire for producers to acknowledge and respond to feedback they received, even if the suggestions provided would not be acted upon. This suggests that consumer conceptual models include the need for closure following discrete feedback dialogues with producers. Feedback loops from consumers to importers were also dialogic by importers responding to questions and concerns posted on their social media accounts. While some comments could be

construed as negative feedback, for example concerns voiced about the importer's profit margins, one specific importer chooses not to remove this feedback from their Facebook page in order to encourage information transparency. Although consumer and importer conceptual models suggested a conversational quality to feedback exchanges, this was less evident in the online content analysis where social networking was primarily used by importers as a broadcast medium rather than a space for dialogue.

Role of ICT in Feedback Loops

Gathering Consumer Feedback

A preliminary analysis of the websites and social media accounts of ten Australian importer organisations revealed a lack of explicit feedback mechanisms for consumers to provide feedback to producers. Most importer websites listed their contact details including an email address and phone number, or provided a contact form. However, these feedback mechanisms were intended for consumers to communicate issues with their order, or for retailers to express their interest in stocking the importer's products, rather than gathering consumer experience information to pass onto producers. Importers also collect feedback from consumers through online tools such as email satisfaction surveys, website contact forms, product rating systems, and social networking sites such as Facebook. Most importer organisations examined did not publish feedback online, though one website shared comments expressing consumer satisfaction with product attributes such quality and style.

The use of social media accounts by importers and wholesalers was less interactive for the purpose of gathering consumer feedback than expected. There were only some instances of consumers posting positive product feedback to the importer's Facebook page in image or text form, and it seems that consumers were more likely to use social media to share feedback with other consumers and recommend new products they had found. It is not evident whether producers monitor these sites or importers pass on this feedback. The producers themselves have organisational websites for local and international markets, however there is a resource and skills burden associated with updating them. One producer relies on the help of Australian volunteers to maintain both the internal and external facing websites, and was unsure themselves of content of these sites or whether they were used for gathering consumer feedback.

Facilitating Supply Chain Conversations

ICT was identified as a key driver of information flows from consumers and importers to producers. One importer asserted that tools such as email, VoIP and social media are essential to their operations by enabling communications with geographically disparate producer groups, and that "without the internet, the business wouldn't really survive". The ability to email photographs and sketches was considered particularly important given the visual nature of product design work. Both producers interviewed communicate with their importer partners in written form primarily through email and verbally by phone and Skype. For example, Vania Rivero and Eduardo Zeballos use Skype calls to speak to new prospective customers in export locations who wish to sell their products at market stalls. VoIP calls serve as a vehicle to provide guidance to importers in terms of what products to sell, and where. These calls are supplemented with email messages containing further written information and attachments. Both groups also use alternatives to fixed phone lines and mobile calls in the form of mobile phone applications such as Viber and WhatsApp, permitting low cost written and VoIP communications through WiFi and cellular data networks.

For producer organisations communicating with dispersed producer workshops, ICT is also particularly important for arranging face-to-face meetings. According to Vania Rivero and Eduardo Zeballos, each workshop in their organisation has a group leader who speaks with producer organisation management using a "basic" mobile phone. While calls in their country are charged per second, the artisans often require managers of the producer group to call back when they do not have phone credit. Mobile phone calls and text messages are primarily used to communicate to the artisans that they have an order, and arrange a time to meet at the office in the city to provide the artisans with design photographs and materials. Presently, text messages comprise broadcast communications from the producer group to the artisan workshops as many of the workshop leaders do not know how to respond to an SMS message. A couple of workshop leaders also have smartphones with applications such as WhatsApp, which they use to take photographs to send to customers.

Barriers to ICT Use in Feedback Loops to Producers

The importer participants identified social and technological barriers to producer access to feedback that are similar to those discussed in the literature. Language barriers limit importer communications directly with producers as previously mentioned, and can give rise to misunderstandings and confusion in commercial interactions. A lack of producer responsiveness to emails also poses issues for importers, such as lengthy response times that elongate the temporal aspect of feedback loops. Some ICT tools are used to compensate for deficiencies in others, such as telephone calls replacing emails if producers cannot easily access email or are slow to reply. Some importers must resort to asynchronous communication methods such as email rather than verbal communication to overcome barriers such as time zone differences. Technical infrastructure can also be rudimentary in locations where producers live and work. Both producers explained that fast internet connections in their countries are very expensive, and affected by rain and varying electricity levels. While the artisans on the factory floor from both producer groups are "experts" in their handicraft, they primarily do not speak English and have limited skills and experience with using ICTs.

Future Applications of ICT to Supply Chain Communications

The interview data highlighted several gaps and opportunities to enhance feedback flows, with participants themselves offering some suggestions for design interventions:

Consumer Link

Consumers suggested that ICT could be used to support more immediate feedback processes, particularly through the introduction of new mobile phone applications. Some consumers suggested developing an "app" that would allow consumers to rate or comment on a fair trade product soon after its purchase. This would enhance the volume of design and consumer experience feedback provided to importers for aggregation. Another consumer suggested attaching feedback mechanisms to product barcodes using RFID technology, which would extend the functionality of previous work such as the Fair Tracing project (Kundu and Chopra, 2009) by converting one-way information flows to two-way feedback loops.

Importer Link

Importers aspired to implement ICT tools that are currently available but they previously lacked resources to investigate, such as email surveys to formalise feedback collection from consumers or interactive social media campaigns for consumers to share their product experiences. Design interventions could assist in simplifying and automating web content and social media updates to reduce resources required to engage with these platforms in a sustained manner. New technologies such as spectrophotometry could assist with ensuring that new samples are suitable by remotely communicating accurate and visualisable information about fabric colours and textures (Yamashita et al. 2015).

Producer Link

Some importers and producers mentioned the idea of providing ICT skills training to producers, but were unsure if producers would understand the value of feedback systems such as an online survey tool even if they possessed the technical skills to use it. Interfaces enabling the provision of real time sales data through the supply chain to producer groups would provide a more rapid indication of whether new products are commercially viable. Vania Rivero and Eduardo Zeballos also suggested that greater smartphone usage by group leaders and artisans would enable mobile banking and information sharing about design and orders, reducing the need for artisans to travel into urban areas to physically meet with management from the umbrella organisation to exchange resources.

Given the complexity of feedback loops in fair trade handicraft supply chains, designers in this domain must account for factors such as the actual information needs of producers, complex information pathways and the aggregation effect of producers and importers, and the opportunities and barriers to ICT use that exist in producer countries. As the FANZ project suggests, implementing ICT inventions that leverage existing technologies and business processes rather than disrupting supply chain operations may enhance their uptake by feedback loop participants (FANZ, 2014). Designers should also consider whether new ICT initiatives resolve or further exacerbate the issue of fragmentation in existing feedback systems.

CONCLUSIONS AND FUTURE WORK

This study demonstrates the complex nature of consumer-to-producer feedback loops in fair trade systems with supply chain participants maintaining a variety of conceptual models about feedback loops. The provision of feedback as design requirements, consumer experience information, and sales data is affected by the manner in which this feedback is gathered and aggregated, the attitudes towards these differing forms of feedback, and the notion of feedback as a "dialogue" between participants. The presence of supply chain intermediaries such as importers also raises concerns about the way in which feedback is aggregated, filtered and translated before reaching producers. However, intermediaries are also indispensible for sustaining the effective functioning of fair trade feedback loops, ensuring that producers receive meaningful information to design products that will be commercially viable in their target export markets.

Existing technologies including email, SMS, telephone, Skype, websites, social media, and mobile phone applications are presently used to communicate feedback through fair trade supply chains. These systems are fragmented, with significant social and technological barriers hampering producers' use of ICT for receiving, interpreting and acting upon feedback. There are consequently a number of opportunities and challenges for design practitioners in HCI4D to introduce new ICT interventions that support the effective operation of these fair trade feedback loops. Designers must consider issues such as motivations for giving feedback, conceptual models of feedback system operations, the involvement of supply chain intermediaries in feedback loops, and the social and technological context of fair trade producers in identifying new ICT pathways in this area.

Our domain exploration establishes new avenues of inquiry for researchers in the field of HCI4D, and addresses gaps in a multidisciplinary body of literature. These gaps include feedback in fair trade systems, fair trade-related ICT initiatives, the importer role in Fair Trade handicraft supply chains, and understandings of fair trade from an Australian, non-commodity perspective. Limitations of this study include a reliance on participants' perceptions of their own behaviour by engaging in interviews rather than further ethnographic methods such as participant observation. Further comparison with fair trade commodity supply chains and non-fair trade handicraft supply chains may also yield interesting insights. These shortcomings should be addressed in future studies.

ACKNOWLEDGMENTS

Thank you to the participants for generously volunteering their time to partake in this study, and the reviewers for their helpful feedback.

REFERENCES

Corbin, J. and Strauss, A. Basics of Qualitative Research. 3rd Edition. Sage Publications (2008).

Creswell, J. Qualitative inquiry and research design: choosing among five approaches. Sage Publications (2013).

De Pelsmacker, P., Driesen, L. and Rayp, G. Do Consumers Care about Ethics? Willingness to Pay for Fair-Trade Coffee. The Journal of Consumer Affairs 39, 2 (2005), 363-385.

De Silva, L., Goonetillake, J. and Wikramanayake, G. Towards using ICT to Enhance Flow of Information to aid Farmer Sustainability in Sri Lanka. In Proc. ACIS 2012, ACIS (2012), 1-10.

Dutta, R. Information needs and information-seeking behavior in developing countries: A review of the research. The International Information & Library Review 41, 1 (2009), 44-51.

FANZ. Successful first year of Fairtrade ANZ's ICT project in Papua New Guinea. Fairtrade Australia and New Zealand (2014). Available from: https://fairtrade.com.au/news/successful-first-year-fairtrade-anz%E2%80%99s-ict-project-papua-new-guinea. Accessed May 10 2015.

Forson, P. and Counihan, C. Taking Food Public: Redefining Foodways in a Changing World. Routledge (2013).

FTAO. What is Fair Trade? About Fair Trade. Fair Trade Advocacy Organisation (2013). Available from: http://www.fairtrade-advocacy.org/about-fair-trade/what-is-fair-trade/113-about-fair-trade. Accessed 1 June 2015.

Hudson, I. and Hudson, M. Removing the Veil? Commodity Fetishism, Fair Trade, and the Environment. Organization and Environment 16, 4 (2003), 413-430.

Kundu, A., and Chopra, A. The Fair Tracing project: mapping a traceable value chain for Indian coffee. Contemporary South Asia 17, 2 (2009), 213-223.

Light, A. Bridging Global Divides with Tracking and Tracing Technology. Pervasive Computing, IEEE 9, 2 (2010), 28-36.

Lyon, S. Evaluating fair trade consumption: politics, defetishization and producer participation. International Journal of Consumer Studies 30, 5 (2006), 452-464.

Momodu, M. Information needs and information seeking behaviour of rural dwellers in Nigeria: a case study of Ekpoma in Esan West local government area of Edo state, Nigeria. Library Review 51, 8 (2002), 406-410.

Mubin, O., Tubb, J., Novoa, M., Naseem, M. and Razaq, S. Understanding the Needs of Pakistani Farmers and the Prospects of an ICT Intervention. In Proc. Human Factors in Computing Systems 2015. ACM Press (2015). 1109-1114.

Nicholls, A. Strategic options in fair trade retailing. International Journal of Retail & Distribution Management 30, 1 (2002), 6-17.

Norman, D. The Design of Everyday Things. New York: Basic Books Inc (2002).

Randall, D. An Exploration of Opportunities for the Growth of the Fair Trade Market: Three Cases of Craft Organisations. Journal of Business Ethics 56, 1 (2005), 55-67.

Randall, D., Harper, R., and Rouncefield, M. Fieldwork for Design - Theory and Practice. London: Springer-Verlag (2007).

Raynolds, L.T. Consumer/Producer Links in Fair Trade Coffee Networks. Sociologia Ruralis 42**,** 2 (2002), 404-424.

Renard, M-C. The Interstices of Globalization: The Example of Fair Coffee. Sociologia Ruralis 39, 4 (1999), 484-500.

Rogers, Y. New theoretical approaches for human-computer interaction. Annual Review of Information Science and Technology 38, 1 (2004), 187-143.

Sayogo, D. S., Jarman, H., Whitmore, A., Tayi, G. K., Zhang, J., Hrdinova, J., Pardo, T., Andersen, D. F., Luna-Reyes, L., Tan, X., and Andersen, D. L. 2012. A stakeholder analysis of interoperable data architecture: the case of I-Choose. Proc. Digital Government Research 2012, ACM Press (2012), 145-154.

Shaw, G., Brereton, M. and Roe, P. Mobile phone use in Australian indigenous communities: future pathways for HCI4D. In Proc. Australian Computer-Human Interaction Conference 2014, ACM Press (2014), 480-483.

Spink, A., and Saracevic, T. Human-computer interaction in information retrieval: nature and manifestations of feedback. Interacting with Computers*,* 10**,** 3 (1998), 249-267.

Trade Aid. Principles of Fair Trade. Trade Aid (n.d.). Available from: http://www.tradeaid.org.nz/index.php/page/wfto. Accessed 1 June 2015.

VRPO Metropole. First tast of chocolate in Ivory Coast. Youtube Youtube video. VRPO Metropole (2014). Available from: https://www.youtube.com/watch?v=zEN4hcZutO0. Accessed 30 May 2015.

Yamashita, S., and Mujibiya, A. Palette: Enhancing E-Commerce Product Description by Leveraging Spectrophotometry to Represent Garment Color and Airiness. In Proc. Human Factors in Computing Systems, ACM Press (2015), 1597-1560.