"It's useless for that": Finding, Frustration, and Fun with Mobile Technology in Outdoor Markets

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ABSTRACT
This paper reports on the use of mobile technology–specifically, smartphones and tablet computers–in outdoor public markets in Australia and the United States, based on a survey and interview (n=44) conducted with attendees in public markets. After noting that past research in a variety of disciplines is deficient in regards to its assessment of technology use in such public spaces, we explore the different reasons and situations in which mobile technology is used in them, identifying the most prevalent problems and deficiencies encountered. We provide a foundation on which future work that examines communal public spaces and the use of technology can be based, and promote a broader view of how technology is used for information seeking and communication in such spaces.

Keywords
Information seeking, mobile, public spaces.

INTRODUCTION
This paper reports on a study that explored if, and how, mobile technology is used in communal public spaces, such as outdoor markets, and what impact it has on the attendees of such places. The study employed a broad questionnaire, and later a more focused semi-structured interview to explore how people are using their mobile technology in these places.

Significant past research has been dedicated to public spaces, in disciplines and industries ranging from urban planning, to architecture, to ubiquitous and awareness computing and information sciences. The work reported on in here is solely concerned with communal public spaces; that is, public spaces which encourage social engagement

but do not require it. A variety of different spaces fall into this category, including markets, museums, airports, conference halls.

Despite public spaces being a heavily researched area in a variety of different disciplines, there are substantial gaps in knowledge when it comes to understanding how technology is used in, and impacts the use of, these communal public spaces. Technology, in this case, refers to the use of the now ubiquitous class of smartphones, tablets, and similar popular devices.

BACKGROUND
Previous research into these spaces has typically fallen into two main groupings: one more action research-based, the other more ethnographic, where attempts have been made to understand how these places operate and currently exist. Urban planning, a discipline effectively combining design and architecture, is traditionally the first place one would begin to try and understand communal public spaces. Architecture is concerned with giving a space a sense of purpose, to convey a particular message and purpose, or as De Button (2006) stated "an impression of the psychological and moral attitudes it supports."

Urban planning has changed quite a lot in a relatively short amount of time. It was not until the mid-twentieth century that urban design considered creating spaces for social behaviour, or noted that traditional urban layout was leading to anti-social behaviour (Jacobs, 1993; Wall and Waterman, 2010). The suggestion that the effective distance for social interaction is approximately three metres has also changed in how urban planning views the social aspects of space (Gehl, 2011).

Modern urban planning is concerned with creating spaces that are places for people, enriching that which already exists, making new connections, working with the landscape, mixing uses and form, and creating an environment that is manageable and adaptable to change (Bentley, 1985; Walton, 2000; Wall and Walton, 2010).

While none of these principles rule out the use of technology in such spaces, they also entirely fail to account for its impact – if it has any.

Urban planning is not the only discipline to explore communal public spaces; the information sciences have, on occasion, touched on such places. In particular, information grounds are a popular means of exploring these spaces in information science.

Information grounds are described by Fisher (1999) as "synergistic environment[s] temporarily created when people come together for a singular purpose but from whose behaviour emerges a social atmosphere that fosters the spontaneous and serendipitous sharing of information." Information grounds are in general areas where there is a great deal of cross-communication amongst people occupying the space for a purpose primarily other than information exchange.

For example, information grounds have been used to explore how information flow occurs in a public library amongst immigrants in New York City (Fisher et al., 2004). The heavy cross flow of information resulted in the immigrants gaining an understanding into the available services and building trust amongst the library staff and its patrons. In another study (Fisher, Landy & Naumer., 2006) the information grounds of university students were determined and categorised leading to a framework describing the properties of information grounds in general. In both of these situations, information gleaned from technology or the use of technology to aid and impact information flow was not examined.

Of course, information grounds are not the only lens for examining communal public spaces. A variety of different frameworks have been derived and used to explain how people and information interact in complex environments (Savolainen, 1995; Oldenburg, 1999). In these frameworks, the role that technology plays is either understated (Fisher et al., 2006) or unexamined (Fisher et al., 2005).

Other research into public spaces has mostly focused on introducing technology into locations and seeing what impact this has, or how the system performs in such an environment (Kjeldskov and Graham, 2003). This problem-then-solution approach is typically found in computer-supported cooperative work (CSCW), ubiquitous computing, and human-computer interaction (HCI)-related research disciplines.

Communal public spaces – markets in particular – have been used in the past as environments for experimentation and exploration with mobile technology. This has led to systems that were designed to encourage social proximity amongst the participants of the market (Lee et al., 2008), and prototypes to encourage distributed information gathering amongst the people in the market (Nugent and Lueg, 2010). In both situations, the market was considered in the context of how it could adapt the system or be influenced by the system. The space itself was secondary to the focus of the research.

Technology in tourism is another popular area for research exploring communal public spaces. The GUIDE system was an early attempt at using location awareness technology to support tourism across Lancaster (Cheverst et al., 2000). The system would provide information about the attractions near to the tourist as they moved about the city and allowed them to to leave notes and recommendations as they explored. Another prototype system supported co-visiting exploration of a museum, allowing virtual and physical museum visitors to explore the space together as one group of tourists (Brown et al., 2003).

In both the case of the GUIDE system, and the co-visiting museum system, the focus of the research was on the system itself. The research was concerned with how the system worked, and how people reacted to it. The space was again secondary.

Very recent research outputs suggest that a convergence is beginning, where the disparate interested fields are starting to take aspects from one another. The "traditional" technology based fields are appropriating the "heavier" exploration of the spaces from ethnographic approaches: Tolmie et al. (2014) reported on how groups of people moved throughout a museum, and how they socially push-and-pull each other about, and using in-depth ethnography to do so. Another study (Van De Wiele and Tom Tong, 2014) explored the information behaviours and motivations of users of the mobile phone application, Grindr.

In a similar vein, "traditional" information science research has been pushing further into exploring technology, such as the investigation of the creation of a digital information ground by Counts and Fisher (2010). Other researchers are also focusing more on the current information behaviours and social context when using mobile phones (Absar et al., 2014).

Fields have emerged at the intersection of the different research disciplines, such as Urban Informatics, around around the concept of a "real-time city" allowing greater insight and encouraging people's urban behaviours. The Gelatine prototype, for example, used technology to enhance the social interaction of people in the space (Bilandzic et al., 2013).

Thus, despite the past research into communal public spaces, and technology, there is still a lack of understanding into what role technology actually plays, and what impact it has on communal public spaces. This study begins to address this gap.

THE STUDY
This study reported on in this paper explored if, and how, mobile technology is used in communal public spaces. The focus was on outdoor markets, and what impact it has on the attendees of the market. Markets were chosen as they provided a populated, easy to access, ubiquitous, representative public space that exists in a multitude of cities around the world. Smartphones, and other mobile technology such as tablets, are at around 85% and 60% penetration, respectively, in Australia (BuddeComm, 2015),

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and at 64% and 49%, respectively, in the United States (PewInternetResearch, 2015).

The study employed two data-collection techniques: a broad survey of attitudes and behaviours, and later a more focused semi-structured interview to explore how people are using their mobile technology in such places. Analysis of the data was performed using an approach based on grounded-theory methods (GTM), deriving broad themes from the participants' mobile technology information behaviours, resulting in guidance into what, how, and why participants are or are not using their mobile technology in the market.

The high-level goal of this study was to provide a grounding for future research into markets and other communal public spaces. This would allow future research or software development to begin improving the mobile technology support in the spaces. Lower-level goals of the study included exploring the popularity of mobile technology in outdoor public spaces, initially through the lens of markets, and understanding the most prevalent uses for mobile technology in the markets.

Method and Approach
Data-collection was conducted in two phases. The first phase had the goal of discovering if people were using their mobile devices during marketplaces, and what – if any – other technology was being used during the marketplace and for what general purposes. This phase used a survey and had 30 participants.

The second phase built upon the first and was designed to gain deeper insight into what people at the markets were doing with their mobile devices. This phase used a semi-structured interview using the information gleaned from the first phase to guide the interviewing. This phase had 14 participants. No participants from the first phase participated in the second phase.

The first phase was used to inform and guide the design and implementation of the second phase. The majority of the discussion in this paper is therefore focused on the second phase and its findings.

Markets
This study collected data at three different markets; one in the United States and two in Australia. The markets were: the Portland Saturday Market in Portland, Oregon, USA, the Salamanca Market in Hobart, Tasmania, Australia and the Queen Victoria Market in Melbourne, Victoria, Australia.

The first phase of the study involved only the Salamanca Market; the second phase used a combination of all three markets. The demographic makeup of the attendees of all three of these markets were equivalent to each other.

Portland Saturday Market
The Portland Saturday Market is primarily an arts and crafts outdoor market in the Old Town region of the city. Running each Saturday and Sunday it has over 250 stalls and attracts an estimated one million visitors each year (Portland Saturday Market, 2015).

The different vendor's stalls are fixed in their position and do not change from one weekend to the next. Figure 1 shows the Portland Saturday Market, illustrating its open and mostly-outdoor nature. All three markets used in this study were similar in structure and topology.

Salamanca Market
The Salamanca Market is a outdoor market that runs each Saturday with stalls following the road in the Salamanca Place region of Hobart.

The Salamanca Market has over 300 stalls that primarily aim to promote the Tasmanian brand and sell local goods and products with the number of visitors ranging between 25,000 to 40,000 people each weekend (Hobart City Council, 2015).

Much like the Portland market, a vendor's stall location is fixed from weekend to weekend.

Queen Victoria Markets
Another outdoor market, indeed the largest in the southern hemisphere, the Queen Victoria Market (QVM), located in inner Melbourne, covers two city blocks and has a wider variety of goods than either the Salamanca or Portland markets with the majority of market space devoted to fresh produce, in particular meats and deli goods, as well as more general and niche stores. Unlike either the Salamanca or Portland markets, which are set-up and torn down each weekend, the QVM runs every day of the week except Monday and Thursday (City of Melbourne, 2015).

Another difference between the QVM and the other marketplaces in this study is that vendor stalls in the QVM move on a day to day basis. This movement is planned in advance so on a Saturday a stall will not be in a different location from where it was last Saturday but it might be in a different location on a Tuesday. Some stalls however are fixed and do not move regardless of the day. A participant's use of technology in relation to these market logistics is noted later.

Figure 1. An image of the Portland Saturday Market, illustrating its open and mostly-outdoor nature. (CC BY-NC-ND 2.0, created by Flickr user drburtoni: https://flic.kr/p/tr6p6r)

Participants
In the first phase of this study, all 30 participants were sourced whilst they were at the Salamanca markets. In the

second phase, participants came from across all three markets.

There were 14 participants in total for the second phase of this study. Four were from the Portland Saturday Market, four from QVM, and the remaining six were from the Salamanca market.

Of the 14 participants, 9 identified themselves as a local to the area the market was held in, and 5 as a visitor. A definition of local or visitor was not supplied and all participants self-identified as one or the other based on their own internal understanding of the term.

Participants were recruited to participate in the study at the marketplaces, in both the first and second phases of this research, there was no particular demographics being targeted and people were recruited to join simply by being asked to participate by the researchers. In both phases of this study there was no incentive, financial or otherwise, given to participate in the study and all participation was entirely voluntary. This study was approved by the Human Research Ethics Committee at the University of Tasmania, with approval numbers H0013607 and H0014178 for the first and second phases, respectively.

Phase One
The first phase of this study was a survey into the mobile technology habits of the people at a market. The survey was designed to help provide an answer to the following question and sub-questions:

- Are people using mobile technology as part of their market activities?
  - for what general purposes?
  - what types of technology is being used?

Participants were given a survey that was initially inspired by the People-Place-Information (PPI) trichotomy from information grounds research (Fisher, Landy and Naumer, 2006), focusing on information topics as opposed to information relevance. The survey also had a secondary focus of general questions relating to why the participant is at the market. PPI was the starting point for this research as the original investigative trigger was the potential to explore technology in information grounds, a path which evolved to the study reported here.

The survey was designed to take between five to ten minutes for participants to complete and had a series of both open and closed questions. Participants were not required to elaborate on answers, and were free to not answer questions if they did not wish to do so. The participants answers were recorded with consent, and later transcribed after the completion of the survey for the purpose of analysis.

This phase of the study was designed to provide focal points for the second phase, or to uncover that marketplaces are not popular places for mobile technology use (this was not the case). The findings from the first phase led to the creation of the second phase of the study.

Phase Two
The second phase was a semi-structured interview with a focus on gaining greater detail and insight into how and why people were using mobile technology at the markets. The interviews started out with very simple questions such as "have you used your phone while at the market, what for?" and then proceeded ask more in-depth question based on the participants answers and the guiding findings from the first phase of the study.

The interviews took approximately fifteen minutes to complete and, much like the first phase, participants were not required to answer a question if they did not wish to however clarification and elaboration to responses were asked for by the researchers during the interviews.

Data analysis
The data for both phases was analysed using a grounded approach inspired by grounded-theory methods (GTM) (Strauss, 1967; Charmaz, 2006; Strauss and Corbin, 2007; Muller and Kogan, 2010), and had the following stages: data familiarisation, data coding and theme identifying. All of the analysis and coding was done by a single researcher.

After the data was transcribed the researcher familiarised themselves with the data before beginning any coding. The coding itself was inspired by the open coding component of the Strauss and Corbin (2007) approach to grounded theory.

In the final stage of analysis, codes identified were grouped together via their similarity to one another into the major themes which are discussed in the findings. Examples of higher level codes developed: *information seeking*, and *meeting up with people*. Examples of codes placed below "information seeking" are: *mapping*, *Yelp service*, *Facebook service*, and *asked stallholder*. Examples of codes placed below *meeting up with people* are: *Tinder service*, *Facebook service*, *SMS*, *phone calls*, *loses track of family*.

FINDINGS
This discussion of the findings of this study is broken up into a number of sub-sections. First, the findings of the first phase of the study are discussed, following this the findings related to information seeking and frustration, meeting people and keeping in contact, and photos and sharing are discussed. Concluding the findings section is a review of secondary findings.

Initial Findings
First and foremost, the findings of the first phase of this study suggest that mobile technology is quite popular with market attendees. All but one participant had a smartphone, and several of the participants also had tablet devices, such as the iPad. The one participant which did not have a smartphone did bring an Apple iPad to the market. All but one participant used their mobile technology while they were at the market. The prevalence of mobile technology at the market served to reinforce the and validate the objectives of this research.

Secondly, the first phase provided some insight into what general areas participants used their mobile technology for while at the market. For example, one of the more common

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uses of mobile technology was for market related information searches. Participants reported that they used their devices to search for general information on the market such as closing times, vendor or product searches, or searching for navigation information relating to the market. The tools used in these searches varied but included social networking sites such as Facebook, review sites such as Yelp, as well as general web search services like Google. Finally, participants reported using mapping software like Google Maps and Apple Maps.

Participants also heavily used mobile technology to document their experiences as they progressed through the marketplaces. The reasons for this are not clear from the collected data, but it possibly part of the post-visiting experience identified by Brown et. al. (2003).

The primary way participants documented their experience was with cameras, most often the built in cameras in their phones or tablets but some participants did also carry larger dedicated cameras with them. Some participants also made notes, and again this was done on their phones or tablets.

The final most prevalent use of mobile technology at markets was to enable to participants to keep in contact with one another. Participants used a variety of different tools to do so including social networking, instant messaging, and phone calls.

The majority of this paper is focused on the findings of the second phase of this research, the above findings were presented as they were used to help guide the semi-structured interviews for the second phase.

The codes derived identified after analysis of the data from the second phase were grouped into the following three themes: information seeking and frustration, meeting people and keeping contact, and photos and sharing. Each of these three themes will now be discussed individually, followed by a discussing of secondary findings.

Information seeking and frustration
Information seeking at the markets was a very prevalent occurrence amongst the participant. Nine of the participants in the second phase reported using their mobile technology to search for market related information. What information people looked for varied depending on what they were interested in at the time.

For example, one participant noted that she looked for a stall at the Salamanca market that sold pies, and one participant at the QVM used the market's website to see what stalls would be open on the day she visited, and where they would be located. She noted that without access to this information it would be "difficult to get around" the market.

The stall locations was a common information seeking task for several participants, with another QVM participant, who visited the market every day of the week, noting that he would check the locations of the stalls he was interested in visiting.

There were also participant comments about general market research before and during the markets, with comments such as "I sometimes research the place I'm going, but not always," and, "I did a bit of research on the market, time but not location, a few basic details," coming from participants.

Other information searches were more specific to particular items, such as one participant when talking about their habits when shopping "I use it for research; if I'm going to buy something [at the market], I will Google it."

Some participants used social networking tools like Facebook to get recommendations about the market and stalls from friends and family who had visited before. Participants also used their mobile technology for more general and non-market related information searches, with one participant using his phone for reading the news and another to check the time while at the market.

Another common information seeking use of their mobile technology was for navigation, with half the participants using mapping applications as part of their market visit. The map services were primarily the built in Google Maps or Apple Maps applications on the participants phones or tablets, and were used at a few different points but mostly to navigate to and from the markets.

Frustration
Going hand in hand with participants' information seeking was a frustration with the information they could gain, or lack thereof, through technology.

For example, when using mapping services, there was a great deal of frustration between what the map was able to show, and the information that the participants wanted to see. In one situation, the participant used the mapping service to navigate to the market, but was unable to use the map application to find a parking spot.

When trying to navigate the market itself, every participant who tried to use a mapping service to do so reported being frustrated with its inability to aid in this task. One participant noted that they "find it difficult to get a good understanding of the space from phone, have to use paper map, would prefer to use phone since its glued to our hands anyway," and another declaring "not useful for actually getting around or finding stuff to look at"; a third bluntly stated that "it's useless for that."

In an attempt to get around this limitation in the map functionality two participants used the map apps to orient themselves relative to the market as they explored, despite the map not showing any data on the market stalls themselves.

There was also a great deal of frustration towards the information available on vendors, their stalls and their goods, such as one participant who reported trying to discover which vendors are worth seeing: "wish there was a way to find the stalls or see what locals recommended. things like Yelp don't really cut it for a marketplace type environment" and later in the interview, the far more direct "Yelp is useless."

Another participant at the Salamanca market who had never visited before was frustrated with the difficulty in approaching stallholders to learn more information about their products: "they're busy or surly looking." This participant didn't want to interrupt the vendors and would have instead "prefer[red] to learn about them with my phone, but there's no way to do that."

One participant who was a regular at the Salamanca markets was frustrated by the lack of information on the changes in the market, and what was and was not on sale from the vendors saying "can't find specials at the market." Later on during the interview, a costumed zombie march started in the vicinity of the market and the participant was again annoyed that if her phone alerted her in advance she would have participated: "why can't it tell me? Surely my phone knows I go to the market every week?"

This frustration with availability of general market and vendor information was reiterated by another market regular stating "would like to know where someone has a special sale." In the case of one participant, the frustration in attempting to find a particular item reached the point where it was easier to stop trying to use technology to find the information and instead turned to people for the answers: "I tried to find pie shops in the market with my phone, but couldn't find anything, so I ended up asking a local who I met wandering the market, and he told me where to get pies."

Another participant had a similar view, not even trying to use mobile technology because "there is no useful way to find stalls or people."

Meeting people and keeping in contact
It was unsurprising that people at markets are using their mobile technology to keep in touch with one another, meet up with friends or family, or to encounter entirely new people. Of the fourteen participants in the second phase only two did not use their mobile technology to keep in contact or to meet people while at the market place.

The most common means of engaging with people was through instant messages, with eight participants using a variety of different tools including SMS, iMessage and WhatsApp. Only two of the participants mentioned using their phones to actually make phone calls, although the number may be higher than this as participants were not explicitly asked if they made phone calls.

There were other systems used during the market including social network services, like Facebook or Path, or more niche applications such as Apple's Find My Friends or Tinder.

Despite the plethora of options and means to start and maintain contact, participants mentioned their inability to do so. Six different participants went to the markets as part of a group (not the same group) and others met people already or soon to be visiting the markets. In one participants situation a participant was visiting the market with her family and had trouble finding her teenage children "when they go missing at places like the market."

One participant felt that the technology available was not doing a good enough job of informing her when her friends were at the market "as they all live up in [distant place] and come down to the market most weeks but don't always remember to tell me when they're there." Another participant who had come to the market with friends lost track of them after they split up at the market: "Don't know where they got to, hard to keep track of them."

Even with the trouble some people were having keeping in contact, other participants were taking advantage of the technology, allowing the group to split apart and go their own separate ways or to not be bothered prearranging a time and place to meet knowing they could do it on the fly.

One participant had used Apple's Find My Friends service to keep an eye on her daughter and was even able to use the service to meet back up later in the day. Another participant had attended the market with friends and lost track of them "they stopped but I kept walking" and was able to use Facebook to "get in touch with someone I've lost." One participant had arranged to meet people at the market and used the Path social networking app to share her location with her friends when she was ready to meet up with them.

One participant was using her phone for "keeping in contact with my husband" after intentionally leaving him behind near the market knowing "he isn't a great market person", and was arranging to meet him later for lunch allowing both of them to enjoy the market in their own way and at their own pace. This behaviour of groups dynamically splitting up and reforming shares similarities with Tommie et al.'s (2014) report on group movement behaviours at a museum.

Although the majority of the participants who attended the market, or later met up, with other people were doing so with people who were already existing members of their social circles, there were three participants used the dedicated matchmaking social app Tinder to try and try and meet new people while at the market. The concept of meeting new people through technology was echoed by two other participants, although neither of them knew of any way to do so using their technology.

Photos and Sharing
The final of the three major themes identified in the second phase of the research revolves around participants documenting, primarily through photography, and then sharing their experience with other people – both those who are at the market with them, as well as those elsewhere.

Seven of the participants mentioned using their mobile devices to take photos as they moved about the market. Their reasons for doing so were not fully explained by the participants, but their explanations seemed very heavily tied to then sharing the photos with other people.

One participant described themselves as "constantly" taking photos and sharing them via social networking services, while another participant used instant messaging systems to send photos to his family having done that "three or four times already today." The sharing was not as prevalent

amongst every participant however with one participant only sharing photos "very occasionally."

The means in which people shared photos fell into two main categories: social networking sites, with Instagram and Facebook being the most mentioned, and instant messaging services such as SMS and iMessage.

The people who the photos were shared with again varied. In the case of participants sharing via social media, the sharing was generally for any of their friends and family, while those sharing via instant messaging were often sending to specific people. In some cases, participants reported sharing to people at the market with them, making photos another means of keeping in contact.

Participants also reported reasons for taking photos other than (or in conjunction with) sharing the photo. For one participant, the photos were a quick means of retaining contact information, as he reported using his phone camera to take a photo of a business card of a vendor in place of taking the card or writing down the details.

Another participant who was visiting on his wedding anniversary was taking a photo explicitly to send to his in-laws as he had been asked to do so. Only one participant that mentioned taking photos without sharing them used the photos as references for creating artwork as he would "draw them at home later."

Participants showed a strong compulsion to take and share photos, almost as if they had a responsibility to do so. This is best exemplified by one participant's response to being asked if they had been taking any photos while at the market "I haven't taken any photos– oh no, I haven't! I suppose I should have!" The participant, an interstate visitor on vacation, did state that they had been sharing every other part of her vacation: "I guess I have been sharing information about what I've been doing with the family but I haven't at the market". This reinforces the slant towards sharing their experiences with people that some participants appeared to have.

Secondary findings
It is important to note that despite the three themes– information seeking and frustration, meeting people and keeping in contact, and photos and sharing–capturing the most prevalent participant use and attitudes about technology at markets, they do not capture everything. This section will report on a number of secondary findings from the study.

First, while the above three themes are presented separate from each other, the participants did not have such clear lines drawn in their mind. All three themes were heavily interlinked, with participants looking up places they could meet later, or sharing photos to keep their fellow market attendees in the loop of their behaviour.

Some participants did have and use tablet devices (in every case in this study, this was an Apple iPad). In one case the participant used an iPad in preference to a phone due to his poor eyesight, yet his use of the device was similar to how other participants used their phones.

In another case, a participant reported using the iPad before attending the market, looking up information about the market and not using the iPad itself at the market. This is similar to the pre-visiting behaviour in tourism that was reported in Brown and Chalmers (2003). One participant who was visiting with his family had an iPad with them the entire time, but only used when sitting down at a café, deferring to the smaller phones when moving about.

There was also a general feeling at all three markets that mobile technology could, and should be, doing better than what it currently did, such as in the earlier example: "why can't it tell me, surely my phone knows I go to the market every week." In many situations, whenever participants felt that they couldn't use their phones for a task, they either gave up on the task at hand, or in the case of three participants, they utilised the knowledge of the other market attendees, asking them. This again ties back into the frustration issues described earlier.

DISCUSSION
The study reported on in this paper provides the basis for future work exploring the use of mobile technology in both outdoor public spaces broadly, and markets specifically, to build upon. First of all, by specifically querying whether technology was being used at all by market-goers, and if so what technology they were using, we were able to establish both the validity of the line of research, and reinforce the need to probe further.

The first phase of this research indicates how prevalent mobile technology usage is by market-goers; all thirty participants in that phase, with one exception, used their phones and tablets whist at the market. This first phase also raised the most prevalent facets of technology use in the market: people wanted to find information about the location and vendors, document their experiences for their own benefit, as well as for sharing with others, an communicate with friends and loved ones.

Armed with these facets, the second phase probed deeper during the semi-structured interviews, exploring the most common information sought by market-goers with their technology. This revealed that whilst it was hard to find information on vendors, and navigation around the market, participants found it difficult to get around without it and were frustrated with current technologies' ability to help them. The myriad services and tools used by participants, ranging from Facebook, to Apple Maps, to Path, and beyond suggests that the frustration felt is more widespread, rather than a limitation or deficiency of one particular product.

Whilst it was unsurprising that being social and keeping in touch were prominent uses of mobile technology for market-goers, it came as a surprise that participants were quite frustrated with this facet as well. Everything from parents having trouble locating teenagers who accompanied participants to the market, to locals being disappointed that their technology did not inform them when distant friends were at the market was mentioned.

Likewise, the market-goers documented their experience, using mobile technology, in a significant manner. Many participants reported taking photos, and sharing their experiences at the market with others both nearby and far away.

CONCLUSION

This paper has reported on a two-phase study conducted in public market places. The study sought to explore if, and how, mobile technology is used in communal public spaces, and determine what impact it has on visitors to such places. The two phases of the study employed a broad questionnaire, and then a more focused semi-structured interview.

Three interlinked themes were derived from the data, and used to discuss the findings. These themes were: information seeking and frustration, meeting people and keeping contact, and photos and sharing. Together, they represent some of the most prevalent facets of the way people use mobile technology in outdoor markets.

In general, mobile technology was heavily used but frustrated people, due to the lack of availability of features and systems that they often felt should be available for them to use in the outdoor space. People particularly had trouble finding contextual and relevant information about the space they were in, finding and meeting people in the space, and enjoyed sharing their experiences about the space. There is a great deal of opportunity for technology to both fill gaps, and improve existing systems that are used.

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