

# Exploring User Reaction to Personal Projection when used in Shared Public Places: A Formative Study

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## ABSTRACT

It is expected that projector phones and pico projectors will be very widespread in a few years. This paper reports a formative field study in which we analyzed over a period of three days what people think about such devices, what they would use them for and how they react when seeing others using them. We report our findings regarding the usage of project phones for different applications and different social settings.

## 1. INTRODUCTION

The miniaturization of projection technology has allowed the development of pico projectors and their integration into mobile devices, projector phones (e.g. Epop EGP-PP01) or accessory projectors which either operate as standalone devices (e.g. Aiptek. PocketCinema V10) or require a media source (Optoma Pico Pocket Projector PK101).

Currently when interacting with mobile phones the small screen is a hindrance and limiting factor in certain situations and scenarios. This is in particular applicable in scenarios which use large amounts of information and rich media content. Combining pico projectors with mobile phones allows the creation of a large portable interactive display, allowing the projection of large scale information and media onto any surface. Furthermore, they allow the expansion of the interaction space from the mobile phone to any object(s) or space within the environment, potentially to any size.

A recent report stated that pico projection technology shall be embedded in computer devices, personal media players and consumer electronics to a scale exceeding \$ 1.1 billion within 5 years [1]. Although the report provides compelling evidence in defining the extent to which pico projectors may be included in mobile devices, and market speculation hints that mobile phones with integrated pico projectors shall be widely available by 2010, little is known about user acceptance and reaction to the introduction and use of these personal projection devices into public spaces.

At present when using mobile devices, the visual output is limited to the viewing of a single person (the device owner), or multiple co-located users (friends of the device owner). This not easily achieved with the small screen but the interaction is localized. Pico projection technology provides a large output in the environment from small devices, which is applicable to both the direct users involved in the interaction and everyone else within the public space. One such example is in a crowded bar where several friends are projecting pictures and videos onto a wall. Situations where multiple users or groups of multiple users each of which are equipped with a projector phone and operate within the same location simultaneously and possible even share the same interaction space also need to be considered.

Considering the above points, no prior research to the best of our knowledge exists on the intended usage scenarios, public reaction and acceptance to the use of these devices within shared public environments. This is both applicable to those directly involved in the interaction as well as everyone else within the environment. This is especially important if offensive content is projected.

This paper presents an explorative in the field user study whereby we went into shared public spaces and used these devices in various locations and contexts. We observed user's responses and acceptances for certain scenarios which we believe will be highly adopted. With our study, we seek to offer grounding and preliminary information further interaction and application concepts with projector phones, as well as point out potential risks e.g. in usability or privacy, which the developers of projector phone applications may find useful.

## 2. METHODOLOGY

At this early stage of our research, we decided that it would best be appropriate to carry out a formative study based around a three day field trial in Lancaster (UK) for various locations and contexts. This included the train station, several bars, public transport, a museum and several public hot spots. We had several personal projection devices (e.g. Epop EGP-PP01, Aiptek. PocketCinema V10, Optoma Pico Pocket Projector PK101) available to use in the above public spaces.

The consumption of media; pictures, video, web content and scenarios which use large amounts of information, for example map browsing are common activities which users perform on their mobile phones. We believe these scenarios are ideal usage scenarios for personal projection devices. For these reasons, we observed users in media browsing and map based scenarios in the above locations at various times during the day and evening. For the latter scenario, we portrayed the role of a lost tourist and projected a map of Lancaster and asked passersby if they would assist in navigation.

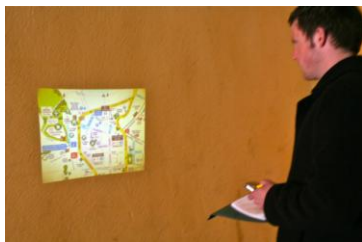
For the two scenarios depicted above we wanted to observe user behavior in reaction to using these devices in various public spaces and contexts. Specifically, we wanted to observe and explore the notion of one users or multiple user's personal projection space whilst interacting publicly. We elicited feedback and information with regards to whether users had any privacy reservations when projecting content in a public space. We wanted to gather users preferences, would they prefer a public or private setting or somewhere in between and reasons for this. We were also interested in exploring whether the current social setting (location and or who is in the current interactive space, member type) was significant for both the localized users and the remaining people in the environment, for example did they have any objections.

In recruiting participants we actively approached members of the public. We also welcomed passersby to approach ourselves without having to actively approach them. By adopting this approach we could both observe and gauge public reaction within public spaces as a reaction to our interactions.

### 3. OBSERVATIONS & RESULTS

We now describe selected observations for the two scenarios media browsing and map interaction in various social settings, contexts and locations.

**Map Interaction:** Figure 1 depicts the map navigation scenario. The majority failed to use the map for navigation. One particular example was an elderly gentleman who worked in the museum. In reaction to seeing the projected map he commented “That’s good” but then informed us that he had a paper map downstairs that we could use. He provided directions to the destination by physically turning away from the projected map, looked out of the window in the direction we would travel and described the route from his memory using hand signals. The gentleman also commented on the brightness of the projector and shaking of the image due to hand movement. When asked for other possible uses, he suggested viewing pictures for families but expressed that he himself would not use one due to the fact that he did not browse pictures using his mobile phone, this was a common answer for several participants.



**Figure 1. Map Interaction.**

A further gentleman who did not participate in the navigation but approached ourselves due to curiosity, made the following comment, “Big map is much easier to see rather than viewing on the small mobile display”. The gentleman was familiar with the projected map which was available as a paper copy from the tourist information office. It seemed trivial to him to touch the wall rather than the device to physically interact with the map. He commented that he would like to be able to move the map using touch, zoom into places of interest, view additional information for example cinema listings, opening times of shops and museum exhibition information.

In general when viewing maps the majority of participants recognized issues with size, lack of detail, necessity to pan and zoom when viewing maps on mobile devices and commented the large projected map was much better and had many benefits.

**Media Browsing:** We presented ourselves in various different pubs, bars and public areas whilst projecting media onto public spaces. In the museum we approached a family, 2 adults and a child aged about 10 years old. The parents liked the idea of projecting pictures on to walls commenting they would only show pictures that were appropriate, “If you don’t want to show it you don’t have to”. The parents also commented that the technology was geared more to children, to view pictures, give presentations commenting their child would be the “Coolest in the class” having such a device. Instinctively the child took hold of the device and

instantly started projecting images on the wall. He did this with a huge smile on his face and commented “Cool, I want one for Christmas”. During the evening of the second day of the trial we spent several hours in one of the many student bars at Lancaster University, Figure 2. During the evening the location was heavily populated by students. The idea of projecting content in bars and clubs with friends was very appealing, “I would do it all day” and “Good idea in a bar with mates” were some comments expressed.

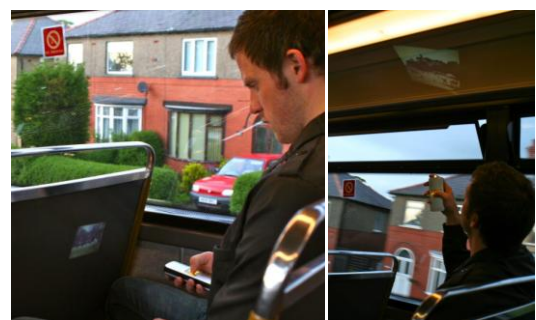


**Figure 2. Projecting pictures in a bar using alternative projection surfaces.**

This social setting differed considerably to other bars we visited which weren’t necessarily occupied by students. Here it appeared more acceptable to approach users and talk to them, and on several occasions we were approached. With regards to privacy the viewing and sharing of videos and pictures in bars with friends was highly acceptable. We conclude that this is the correct social setting and space to project media especially with groups of friends.

The idea of taking a picture and then immediately projecting it onto a surface to share with friends was recognized by a group of girls. In this instance we took a picture using a mobile phone which was connected to a projector, once captured the image was automatically projected on the ceiling. Eventually when the girls noticed their picture on the ceiling they appeared rather excited and were continually laughing and requesting more pictures to be taken and instantly displayed.

**Public Transport:** We caught the bus from Lancaster University to Lancaster city centre and during the journey of circa 15 minutes we projected pictures and videos on the back of bus seats and the roof, Figure 3.



**Figure 3. Public transport scenario.**

There were approximately 15 people on the bus. During the journey we observed 5 people who had direct eye contact and paid attention to ourselves projecting content and expressing interest but no one approached ourselves and questioned what we were doing. The bus was brightly lit but the projection was viewable, however there were limited large projection surfaces to project onto and thus the resulting image was rather small.

The feedback we received when we posed the question regarding projected content in public transport scenarios, for example on a bus was mixed. Several said they would happily do it “This is good while travelling” but also asked “Where would I project it” or “There is no projection space, adverts cover the walls”. Others commented that they would not indulge in this activity due to fear of their device getting stolen, had respect for others on the bus and realized that not all their media content is appropriate for the current environment. Worries about distracting the driver or worries about drawing attention to oneself and looking like a geek were also expressed. In one instance when asked, a passerby shone the projected image into his face and immediately said “No!” One individual raised the issue about projection size and commented “The size of the projection needs to be much bigger to have real benefits”.

#### 4. FINDINGS & DISCUSSION

During the study which to the best of our knowledge was the first observing the usage of personal projection devices in personal spaces, many interesting observations, topics and issues were highlighted. The following describes several important findings based on observations and interview.

**Use cases:** As described above, our study was founded on two common bases scenarios, map interaction and the consumption of media on mobile devices, which are both obvious to the user and easily justified when using a personal projector. It was surprising that users identified a limited set of further scenarios. Typically, scenarios revolved around media and the ability to project to a bigger audience, something which is very novel to the user. Several mentioned advertisements, gaming scenarios and physically interacting with the projector via touch. The concept of physical interaction was presented to participants but again potential usage scenarios were limited.

**Social context matters:** Personal projection is social technology: the projection is shared with many in the current social context and space. This also distinguishes it from the traditional mobile usage, which is generally localized unless devices are exchanged and can be kept private if needed. The study clearly highlighted the effect of the social context, for example when used in a different genre of bar, this including the typical clientele occupying the bar. It was very surprising how little attention we received when we used projectors in peaceful bar, where people were mostly sitting and chatting within small groups. For the majority, they glanced once and then continued chatting. They didn't pay much attention nor appear too interested, concerned or offended. We respected everyone in the environment and refrained from showing inappropriate content. When viewing videos the sound was very low. These conditions could be greatly different which may lead to alternative observations and user reactions, in this case I would imagine they would be very negative.

There was a clear difference in a more relaxed bar environment which was full of students, had a dance floor and people were continually moving around rather than sat stationary. Here the majority of people were excited, they were willing to try the technology providing plenty of feedback and comments. Furthermore, in the more relaxed social context projection was seen as tool for self-expression in public. People liked the idea of showing personal content in real time in public spaces.

**Social acceptance:** Mobile and ubiquitous technology is often seen as an intrusive technology, something that easily breaks the

social code in public place. The intrusiveness and social acceptance of the mobile phone usage in public places is quite widely studied (for example [2], [3]). Projection naturally allows public sharing of content information and experiences and could be described as “stealing” public space.

We used projectors in several different social contexts during 3 days and attracted a large amount of attention, several hundred people were either passersby or noticed ourselves using the technology. We received almost no clear negative reactions. When used in commercial public spaces for examples bars, shops and museums and in general public spaces that didn't belong to us we received no complaints from staff. Of course the ignorance can be a sign of embarrassment if people feel like they are visually forced to eavesdrop our private area, again there was no clear evidence of this.

When interviewing people, little privacy or social acceptance concerns were raised. However, the situation may be very different when this technology is commonly used. Then “the visual noise” and intrusiveness will increase heavily, negative public opinions might be expressed in several social contexts in response to visual pollution.

#### 5. CONCLUSION

We briefly presented selected observations and findings of a 3 day field study of user reaction and acceptance in response to the usage of personal projection devices in public spaces. Our observations led us to believe that pico projection technology is both socially acceptable and likeable in the correct context. User reaction was positive with little reservations made. However, observations and findings are founded when using personal projection devices with the respect to others in the public environment in mind. We refrained from projecting inappropriate or malicious content and the use of audio in the case of watching videos was both limited and low and as a result we received no negative feedback. When used in alternative circumstances, public opinion and reaction may be somewhat different. Our field study highlighted the lack of user insight into further scenarios when using personal projection devices, the typical response were viewing media, pictures and videos in a big screen fashion with friends in social settings. Further research and observations are necessary, for example user reaction as a result of projection inappropriate content, reaction to multiple parties projecting in the same public space and exploration of alternative scenarios. One idea for a follow up study would be to equip several users over a period of time with these devices and report observations and findings describing what users really do with these devices.

#### 6. REFERENCES

- [1] Embedded Picoprojectors Ready to Break Out Worldwide.. Jim McGreg. April 2009. In-Stat. <http://www.instat.com/abstract.asp?id=66&SKU=IN0904435WH>
- [2] Scott W. Campbell. Perceptions of Mobile Phone Use in Public Settings: A Cross-Cultural Comparison. *International Journal of Communication* 1 (2007), 738-757
- [3] Rich Ling. The Social Juxtaposition of Mobile Telephone Conversations in Public Spaces. *Conference on Social and Cultural Impact/Meanings of Mobile Communication*, Chunchon, Korea. 13-15 July 2002.