Co-Curator: Designing for Mobile Ideation in Groups

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ABSTRACT

We introduce Co-Curator, a prototype mobile app designed to support collection and sharing of referential sources of inspiration in face-to-face design ideation meetings. The design of the app stems from both ideas of repurposing mobile devices in everyday mundane tasks and existing practice amongst designers to share and collate sources of inspiration during the early stages of collaborative design projects. The findings from a trial show that the app was positively received and that people felt that it supported creating a collection of sources, as well as the task of sharing within design ideation meetings. Furthermore, the trial suggests that the synchronised gesture required to share sources seemingly alleviates the awkwardness arising from public gesture performance. Finally, from the findings we also highlight further considerations that need to be given to better support co-ordination and focus within these meetings.

Categories and Subject Descriptors

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; H.5.3. Group and Organization Interfaces: Computer-supported cooperative work.

Keywords

collocated interaction; handheld devices; smartphones; ideation; mood boards; ideation; interaction design

1. INTRODUCTION

Designers presently make use of physical artefacts and provocative sources of inspiration during the ideation stages of collaborative design projects. These sources are used to produce myriad collections such as sketches, workbooks, and mood boards [18]. Designers can then use these collections to share interpretations, and allow for a collaborative construction of a collective understanding of a design brief [23]. In recent years, researchers have explored ideas of using technology to support these practices using technology such as augmented reality [22] or desktop software [24]. However, existing systems fail to account for the serendipitous and unanticipated nature of collecting such

sources [15], something that the pervasive nature of mobile devices could easily support. In particular, we orient ourselves to researching the idea of how a collection of digital sources of inspiration (including photos of physical artefacts) stored on mobile devices may be used once individuals get together to share their collections from their devices. We do this by conducting a trial of an app, Co-Curator, with groups of participants.

The prevalence of mobile phones precipitates their use far beyond their originally intended purpose of portable communications devices and instead transforms them in to ever-present computers that can be lent to many uses such as photo collage curation and sharing [6,17], personal museum guides [32], and collaborative gaming [28]. Indeed, the ability for mobile devices to be (re)purposed for use in everyday mundane tasks has allowed researchers to enhance and improve experiences of individuals and groups in a broad range of collaborative and collocated activities [5,8]. The question that concerns us is whether we can now consider mobile devices to collect, curate, and share sources of inspiration (i.e. *photos, notes, webpages* and *videos*) during an ideation process within a team of collocated designers.

We contribute the design and implementation of a prototype mobile app and discuss the findings from a trial with both a quantitative and a qualitative evaluation with groups of participants. Analysis of this trial was done using affinity diagramming (or the KJ method) [13] and the AttrakDiff questionnaire [11]. Through our findings, we make a contribution to understanding how designers can use mobile apps in the formation of mood boards within the ideation process. Finally, we reflect upon how the findings correlate with the initial conceptual design and highlight a number of actionable points including the need for a cross-platform solution and the benefit of including enjoyable co-ordinated interactions in connecting multiple devices.

2. RELATED WORK

We review a number of related approaches to collecting and sharing sources of inspiration, and underlining our reasoning for why this early stage of the ideation process is suited to mobile devices. We also review recent literature relating to the use of mobile devices in conversation and designing mobile interactions for use in public settings, both of which are considerations that should be given with respect to any implemented mobile app.

2.1 Sources of Inspiration in Design

Designers' use of both physical and digital sources of inspiration during the conceptualising phase of design projects is well established, especially when collaborating with others (e.g. [7,12,15]). The materials designers collect are typically presented in a number of different ways including through the construction of mood boards [18], which are used to help support idea development and analysis as well as helping the designer express perceptions and emotions about a design brief [10]. Additionally, for a team of designers working together in collaborative roles,

producing a collection of sources (e.g. to produce mood board) helps individuals to explain their ideas and understandings to each other [23]. Sharmin et al. [29], through contextual inquiry with designers, identified that designers have a number of key requirements relating to the use of previous design artefacts as sources of inspiration in future design projects. For example, they found that designers had the desire to know of the 'stories' associated with collected sources. Therefore, any such system should allow designers to quickly and easily reflect on a collection of materials with a verbal narrative, for example by presenting sources collected over a period of time.

However, collecting and organising sources of inspiration as a team can be a time consuming and difficult task. Researchers have begun to explore concepts around supporting groups of designers to collect, present, share, and discuss inspirational materials with each other. For example, Martens et al. [22] present an experience reliant upon an augmented tabletop and wall display to support collaborative teams of designers in sharing and discussing materials, although such a setup is dependent upon technology not widely available. In contrast, Mendels et al. [24] present software tailored towards collecting and organising personal collections of sources on a desktop computer. This allows designers to represent and connect sources, providing an oversight of all materials in a collection. Finally, Keller et al. [14] make use of a fixed cabinet that can be used to add and discuss such sources to support ideation meetings amongst designers. However, each of these proposed ideas require non-portable technology or specific equipment to add and share sources, hence they do not support the unanticipated nature in which inspiration can come to us at any time and at any place. Thus, we were motivated by the idea that instead of desktop software or additional equipment designers could use readily available portable technology (i.e. mobile phones) for both opportunistically collecting and sharing sources.

2.2 Mobile Devices in Collocated Interactions
The use of mobile devices is prevalent and commonplace throughout everyday life, perhaps as an outcome of the ever-evolving social acceptability of such use [30]. The notion of designing experiences that embrace mobile devices being used in conjunction with other activities allows for such devices to be positioned as resources within conversations that can be drawn upon as and when they are needed. This is further built upon by work exploring mobile devices, such as smartphones, being used for collocated collaborative tasks [3,5,19].

Additionally, recent work has highlighted specific ways and methods in which individuals embed mobile device use within social interaction in unconstrained natural settings [25,27]. For example, through an ethnomethodological approach, Rooksby et al. [27] found that people were able to mix television viewing with mobile device use and that *"this interweaving is physical, embodied, orderly and coordinated".* Their work identified people's ability to quickly bring mobile devices in-and-out of conversations, co-ordinate their joint attention, and re-orient between their mobile device and a television. Furthermore, other work has identified how individuals can negotiate and manage mobile device use through conversation in collocated groups, both in mobile [1,9] and sedentary settings [25]. Although our research focuses on the potential of a tool to support collocated design ideation, we remain mindful of related work that explores the use of mobile devices in more open-ended face-to-face settings.

2.3 Gesture Performance in Public Settings
The choice of gestures is especially important when considering design for public settings. For example, Rico and Brewster [26] undertook studies to review the social acceptability of performing various screen and device gestures with mobile devices, and how (un-)comfortable individuals felt while performing them. Gestures that are subtle, look or feel similar to everyday actions, or which are enjoyable to perform were desirable in comparison to other gestures, which, for example interfere with communication. Through an exploratory study, Kray et al. [16] identified preferable gestures for connecting devices, with gestures that worked on location or rotation identified as suitable candidates, others were highlighted but these relied on sensors not typically found in mobile devices. We wanted to design an app that could be comfortably used during design ideation both in public and private settings. Therefore, it was critically important to identify gestures that are discrete, easy, and can be performed in an 'inexact' manner (i.e. the gesture would be recognised if performed in a reasonably wide variety of ways) and the gestures ought to require little attention from the device owner to perform [13]. Consequently, gestures should not require the phone to be put down or held in an awkward manner.

3. DESIGN AND IMPLEMENTATION
Based on the work we reviewed in the previous section, we designed a prototype that: 1) allows people to collect various sources of inspiration at whatever occasion using their mobile phones, 2) allows people to bring together their digitally collected sources of inspiration when meeting physically, 3) supports individually and collaboratively curating these materials. This section outlines our grounded approach to the design and implementation of Co-Curator, explaining the specific functionalities of the prototype.

3.1 Design of Co-Curator
We first discuss the design of the user experience of Co-Curator[1], and relate the decisions taken with the literature that informed the design. We support both individual and collaborative curation of sources of inspiration. People first collect their materials presented on a personal timeline on their mobile devices. When they feel they are ready to start discussing materials as a group, people can share their personal timelines and engage in a collaborative curating task, with the prototype app supporting the entire process.

3.1.1 Browsing Individual Collections
Whether actively involved in a project or not, designers continuously collect information and diverse sources of inspiration as part of an on-going process [12,15,18]. While these materials can be physical, e.g. handwritten notes and clippings from magazines, such sources also increasingly consist of digital media including photos, videos, or websites. Thus, we support collecting different types of sources of inspiration directly on mobile phones allowing individuals to view, modify, and delete previously added sources. At the start of a project, designers bring their sources of inspiration to their first project meeting to decide on a design direction; they can use their laptops, tablets, and mobile devices to share these materials. Therefore, we support the idea that the prototype can be used before a meeting to collect and collate sources and at the meeting to share the collected sources.

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[1] Co-Curator video. https://youtu.be/YDJcLnmeQp8

Co-Curator presents the collected materials chronologically on a single timeline (as in Figure 1a). Representing materials as a timeline allows for designers to critically reflect on the sources collected over a period of time [29]. Thus, to optimise the number of sources of inspiration shown at any given time, the app was designed for landscape use. The prototype supports four types of sources: *photos, notes, webpages* and *videos*. The material is represented as a thumbnail on the timeline using different sizes to easily identify them (i.e. small squares for photos and notes, large squares for webpages, and 'letter-box' rectangles for videos). Tapping on a thumbnail triggers the material to be displayed. In the case of webpages and videos, tapping on the thumbnail results in the opening of a full screen view of the device's default web browser or the video in the YouTube app respectively. In addition to the timeline, a grid-based overview of all displayed materials can be accessed with a pinch-in gesture, typically used to zoom out on mobile and desktop platforms, which results in uniformly presenting materials as a 5-by-3 grid.

3.1.2 Building an Individual Collection
To add a new source of inspiration, people must perform a long press anywhere on an empty part of the screen. Photos can be added from the native photo gallery and are appended as a small thumbnail to the end of the timeline. As with photos, webpages and videos are also appended to the end of the timeline, however for purposes of annotation and reflection, notes are added at the position on the timeline where the long press was performed to allow for annotation. Inspired by Twitter, notes are restricted to 140 characters to ensure readability. Building individual collections also entails pruning the timeline by further modifying or deleting existing materials. Performing a long press on a chosen thumbnail triggers the material to float on top of the timeline. Tapping on the floating material allows for editing, whereas swiping the floating material to the left of the screen removes the item from the timeline, also causing a paper scrunching sound to play.

3.1.3 Sharing and Curating Collections
Collecting and collaboratively curating these materials as a group can be difficult and time-consuming, and therefore, the design of the mobile experience should not draw an individual's focus away from the collaborative ideation session. When individuals feel they are ready to start discussing materials as a group, they can share their own and view each other's timelines to engage in a collaborative curating process. Based on the literature, we selected gestures that can be performed while individuals hold the device naturally in one hand and do not require the person to precisely perform the action.

To start sharing collections, two people must synchronously rotate their devices at least 150 degrees. This allowed for a small rotation of the wrist to ensure the gesture was easy to perform; early testing revealed 180 degrees was challenging for some. The gesture is based on the common practise of 'rotating the phone' to share or show another collocated individual something on their mobile phone [2,25], we made this action work in all directions to allow individuals to select the most comfortable orientation [4]. People can naturally hold their devices in one hand when performing this gesture, as opposed to having it flat on a table [17], or being within arms-reach of others. When the device gesture is detected, tactile (i.e. a vibration) and auditory feedback are triggered to provide confirmation. As a result, the existing timeline will fade out and both timelines will then appear on both devices and all materials will be rearranged to appear in chronological order. Each person has a uniquely coloured
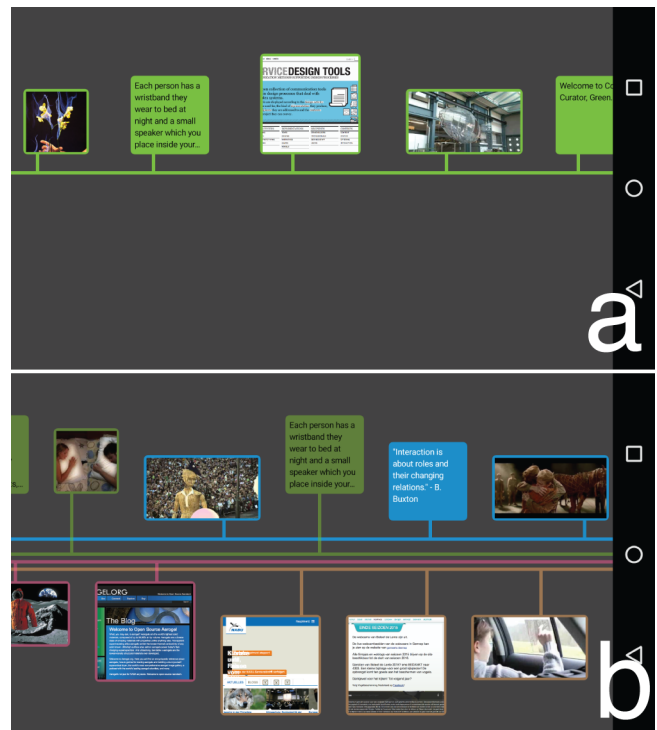

Figure 1. (a) Sources of inspiration laid out chronologically on a single timeline; (b) Four timelines are displayed once devices are connected.

timeline; these can be used to differentiate the author of each material. Connected timelines will appear slightly faded to further support differentiation between the authorship of the materials (see Figure 1b).

The vertical order in which the timelines are stacked will differ between devices to ensure that the device owner's timeline always appears on top, and depends on the order in which the timelines are connected. Forming a group of four timelines can be achieved in a number of combinations: the sharing gesture can be performed by adding one member at a time to the group, two connected pairs joining through one member in each pair performing the device gesture, or all individuals performing the device gesture synchronously. Once two or more collections are browsed together, people can engage in triaging [6], or *co-curating* the sources of inspiration. In addition to having the same functionality that was available to them when browsing and curating their individual collections, people can now perform similar actions on other people's materials. People can either seek consensus and verbally negotiate what they think is missing or could be added, or directly act upon someone else's materials. However, it is only possible to add new content to the device owner's timeline.

Additionally, an individual can highlight a particular point of reference with others by double tapping on the screen, triggering a pulsating dot (in their particular colour) to appear at the same position on all devices in the group, similar in practice to a laser pointer used in presentations. If the dot is out of view, it appears at the edge of the screen corresponding to the direction that the dot is placed. The dot is displayed directly on the timeline due to timelines being in different positions on different devices, depending on the order they were connected.

3.2 Implementation

The prototype was developed as an app for the Android operating system with the native Android SDK. The trial was conducted using four identical LG Nexus 5 phones running a 'stock' version of Android 5.1 Lollipop. Each phone communicates with other collocated devices over a Wi-Fi or cellular data connection. The devices' in-built accelerometer and magnetometer were used to detect the orientation and rotation of the device in order to trigger the sharing of timelines. The prototype relied on a separate server for authentication and the handling of more computationally complex tasks to allow the devices to remain responsive to user interaction. The server handles tasks such as fetching screenshots of webpages and videos and handshaking (i.e. 'binding') of devices. When a device was rotated, the app queried the server for nearby devices that have performed the gesture recently and then connects directly to the identified devices.

4. EVALUATION

To evaluate the Co-Curator prototype, we performed four evaluation sessions in a natural group-task setting (see Figure 2). We collected qualitative observational data from groups interacting with the prototype and from semi-structured interviews conducted shortly after the interaction. Quantitative data was collected by means of a validated questionnaire, AttrakDiff [11], after groups completed a task to allow them sufficient time to experience the prototype. The questionnaire allows participants to provide their perception of the ease-of-use of an interactive product by rating it on 28 separate 7-point Likert-like scales, with each scale consisting of a rating from -3 to 3 between two opposing adjectives defined at each pole. The results of the questionnaire consist of four dimensions: Pragmatic Quality (PQ), the ability to support the achievement of the behavioural goals; Hedonic Quality, consisting of both Identity (HQ-I), the ability to address the needs of self-expression and Stimulation (HQ-S), the ability to encourage and stimulate personal growth; and finally Attractiveness (ATT), which describes a global value of the perceived quality of the product.

4.1 Participants

We recruited 15 participants to take part in the study (i.e. three groups of four and 1 group of three), all of which have some variety of design background. Four participants identified themselves as having a 'technical' background compared with ten who had a 'non-technical' background and one who identified as having both. Two were employed in industry, one in academia, and the remaining were postgraduate design students. Of the participants, ten self-identified as female and five self-identified as male; each group was unintentionally mixed gender. All participants owned mobile phones, although one did not have a smartphone. Ten owned tablets and just two participants owned smartwatches.

4.2 Study Setting and Procedure

Prior to the commencement of the study, participants were asked to provide ten actual sources of inspiration collected in their everyday life, and that they have previously used, or currently use, in a design project of any nature. We asked that participants provide a selection of sources of different types, in an order of their choosing, to provide a broad range and allow the groups to experience the various features of the prototype. The study was compliant with the university's ethics process. Evaluation sessions were conducted in a university building used by researchers and students on design-related courses (Figure 3). The large open-plan area in which studies took place was designed to allow for many

Figure 2. The setting used for all evaluation studies; here a group of participants are using the app during the trial.

small groups to work on collaborative tasks together. Our goal was to try and change the setting as little as possible, with the main addition consisting of an unmanned tripod used for the video recording of the task and the following interview. The sessions lasted approximately 90 minutes in total and consisted of a number of stages: introduction, guided explanation, group task, questionnaire, a short refreshment break, and a semi-structured group interview. Following the introduction, a walkthrough of the prototype was conducted, including demonstrating the sharing timelines to engage in a collaborative curating process.

After about 20 minutes for participants to become acquainted with the prototype, each participant was given a device to use that was already set up with the prototype and the range of materials they provided prior to the study. Participants were tasked to discuss their individually collected sources of inspiration with others in the group, and for the group to agree upon a curated collection. Group evaluation tasks were video-recorded and photographed throughout. Immediately following the group activity, individuals were asked to complete the AttrakDiff questionnaire. Finally, semi-structured interviews were conducted to discuss and reflect upon the practices of collecting and sharing inspiration at the start of projects and to identify how well the prototype supports the intended practices of the group.

4.3 Analysis

We employed affinity diagramming (or the KJ method) [13] to drive the analysis of the recorded evaluation and interview sessions. Two researchers first independently reviewed the evaluation tasks, and recorded details of interactions that occurred between participants. The same process was repeated for the semi-structured interviews, with particular attention paid to noting down emphasis, observations, ideas, and quotes from participants.

Figure 3. The setup of the camera for the evaluation study sessions within the open-plan area of a university building.

A total of 787 notes were created in the process. The same two researchers then collaboratively analysed these notes through multiple clustering rounds until an overall affinity was reached. The findings section contains the resulting themes that emerged from this process.

5. FINDINGS

In the following section we describe the findings of the evaluation sessions and group interviews. We describe the identified current practices of interacting with sources of inspiration in design projects including the methods and tools used by participants to both collect and share their sources with others. We then highlight findings relating to how the prototype was used for curating a collection of sources of inspiration, and the participant's responses to- and experience of using Co-Curator. We use quotes from participants to exemplify our findings that are drawn from the iterative analysis of the evaluation.

5.1 Curating a Collection of Sources

With all participants having a design background, it is perhaps unsurprising that all said they actively collect sources of inspiration at some stage in design projects, although the nature of the sources varied depending on the type and purpose of the project. For example, in some projects where there is little in the way of design specification, P15 identified that they would *"use resources as a way to ground what I am doing."* Additionally, as well as intentionally collecting sources, we found that the process of collecting sources *"can be really organic"* (P6) and occurs throughout everyday life (8/15). Participants suggested that they do not always collect sources with a particular intention to use them in a project: *"I take a lot of photos, often I don't know why I'm taking the photo (...) say, at that moment I just like the colour combination"* (P8). Moreover, P1 stated that they often collect sources that they *"don't see on the Internet: photos, pictures from billboards, people doing stuff",* effectively supporting the idea that sources can be collected at any point including when mobile.

In addition to collecting imagery and photographs, eight stated that they typically interacted with sources physically, either by bringing tangible items to group sessions, or by choosing to *"print a collection of pictures",* (P14) with three participants identifying that they would typically produce *"a sort of mood board"* (P14) with their sources. In terms of collecting and storing digital sources, participants identified websites and apps such as Evernote, Pinterest, YouTube, and bookmarks of webpages for finding and storing inspiration; P12 stated that *"[a timeline] is somehow how I do structure my bookmarks".* The idea of storing the sources as a timeline was specifically identified as useful for retrieval by three of the participants, e.g. *"If I collect, and I remember it was at the beginning of the process, this [a timeline] helps a lot"* (P12). While many of the platforms identified by participants are designed for non-collocated interaction, three participants stated that they would use a laptop in a collocated setting to share sources, although P6 also identified that they had previously used their mobile phone to share sources in a design project. There was also hesitation towards laptop use, with P3 recalling that *"when sharing sources of inspiration on laptops, someone always disengages, so two people look at the screen but a third doesn't".*

5.2 Curating a Collection with Co-Curator

The AttrakDiff results (see Figure 4) identified that there is room for improvement with respect to the hedonic qualities. Participants in the study identified with the initial premise behind the concept, although this was never presented to groups during the evaluation
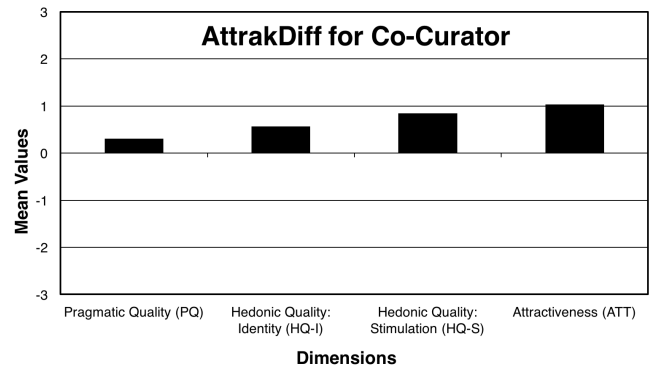

Figure 4. Results from the AttrakDiff questionnaire.

sessions. For example, P1 stated that *"[the prototype would be] interesting to have when not with the group, like going home and seeing something inspiring and taking a picture with the app",* with P3 continuing *"it [Co-Curator] makes sense to me if, after splitting tasks, we can all come together and discuss it".* A number of participants identified that they collected sources on their mobile phone although some specifically stated that they would still prefer to use a laptop at times. Participants generally accepted a mobile device as suitable for this task, although the wish for a cross-device system was the overall consensus amongst all groups.

We also found that the visual representation of sources was well received, with P14, in comparison between Co-Curator and Evernote, stating that *"this takes away the influence of the title"* and P8 summarised: *"it's visual and thus it [note] becomes more engaging".* Further to the concept of connecting timelines to share sources, P5 felt that *"here you can put two timelines at the same spot in time and then you can talk about it and you can express emotions and understanding",* identifying the merits of the timeline, although five expressed desires to categorise or group a subset of materials. The questionnaire results show that the prototype was considered very attractive (ATT). However, despite being found to assist users, it was rated as average on the pragmatic quality (PQ) dimension, meaning there could be improvements in terms of usability.

5.2.1 Experience of Connecting

P6 reflected upon the experience of using the prototype in a group by saying that *"maybe it's the movement or the timeline matching, it's like you're really connecting closer, so it feels more social than social media",* later explaining that everyone seeing everything and everything being mixed into one shared view

Figure 5. (a) Three members simultaneously offer to connect with a fourth member; (b) All connect with one member performing a different rotation gesture to the other three.

enhanced their experience. All participants liked the connecting gesture, with P8 stating that *"I like the embodiment of the sharing motion",* reinforcing the idea of the group being brought together through the action. Indeed, during the evaluation task, groups were most vocally and visually excited during and immediately after performing the gesture.

All groups described the connection process as *"fun",* although P7 also identified the power of using a gesture in a communicative manner: *"it [the gesture] was very helpful for me, as small talk in group work is very difficult, as I'm not a native English speaker [and that] with such an app, I don't have to talk so much in English, but I could communicate with others by flipping (...) asking to flip was a good starter for conversation".* This reinforced the notion that the practice of collaborating on the shared view was, as termed by P15 *"a connecting experience".* The AttrakDiff results contain above average score for 'bring me closer to people' (HQ-I). Figure 5 exemplifies two groups using the connecting gesture during the trial. In some instances we observed individuals offering to connect with other members' devices by holding their device towards another party, in essence revealing to us that individuals physically gestured with mobile devices to communicate their intent with other members by proffering a connection. Groups also synchronised the connection gestures with each other by counting verbally and physically, and by using interactional resources such as gaze and co-orientation.

5.2.2 Experience of Co-Curating

Our primary focus with the design was to allow for co-curation to occur within conversation in conjunction with the app. All participants verbally co-ordinated actions during the task, with P15 recalling that *"conversation was essential to co-ordinate"* and P14 stating that the group performed *"lots of co-ordination work; in a sense it brought us together".* P12 exemplified the need for co-ordination amongst the group because *"working separately on phones is quite messy because everybody can make a change at the same time".* Figure 7 shows a number of ways in which individuals viewed shared content on the mobile devices, either by working individually on a device or by looking at others' devices.

All groups also used the pulsating dot to simply re-orient their screen to share items or help explain a particular point of interest, an affordance of the device's portability. The act of presenting one's own materials to the group was common, although people typically avoided modifying or deleting other people's materials, with a number of participants voicing concerns about doing so: *"[the] thing is, I don't want to eliminate your stuff"* (P13) and
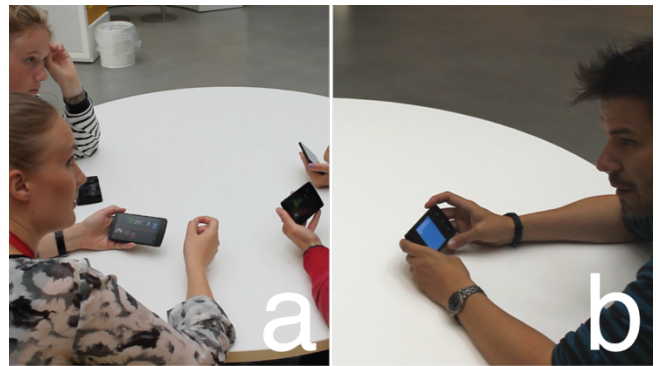

Figure 6. Two groups of participants displaying eye contact in conjunction with mobile device use.

"the idea that people can delete my sources of interest bothers me a little bit" (P3). While collecting feedback, individuals suggested ways to support co-curation through consensus within a system, such as voting within the prototype or by only removing items from the shared collection and not individual timelines.

We found that the design of the prototype required individuals to co-ordinate their personal interactions with the device with each other due to the asymmetrical way in which content is displayed. P15, in describing the ability of being able to browse the timeline independently of others, said that *"to have that kind of experience, it is so fun to browse through imagery and be peripherally informed about it",* later describing the phenomenon as *"looking through different windows at the same content".* However, P4 also elaborated: *"it's weird that we are all four together looking at individual screens",* suggesting it is not entirely seen as a natural experience. In support of our rationale to allow for a user to hold a device naturally, P10 stated that *"I kind of like the privacy (...) even though it's shared"* when asked about being able to hold the device in their hand if they wish. However, individuals sometimes chose to place phones flat on the table too.

The notion of using mobile devices as shared screens can be seen as a potential reason for 8/15 participants identifying that they would have liked to perform the task on a larger screen or tablet as opposed to a mobile phone, with P4 stating that *"maybe co-curation could happen on a single tablet?"* Two groups also raised ideas for larger screens to share material with each other, and allowing for a *"shared view"* (P1) of the timelines, either instead of, or in addition to, the separate mobile devices. Three groups also proposed ideas of tiling mobile devices to view timelines across screens in a co-ordinated manner. Furthermore, in each group there were multiple instances of individuals making
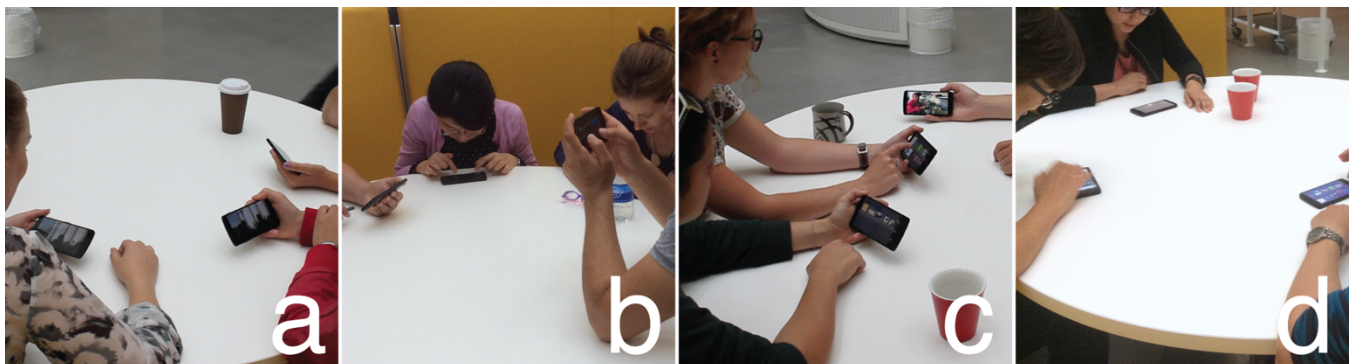

Figure 7. (a) Four participants are each looking at the same video separately; (b) Two participants have their phone in their hands, although one is hiding his screen from others; two participants have their device flat on the table; (c) One participant is showing a video to the group by sharing his mobile device screen; and (d) All participants have their devices flat on the table.

eye contact while interacting with the prototype; for example, individuals might open a photo while listening to an explanation, alternating their gaze between the source and the person talking. For example, in one such instance (seen in Figure 6a), after beginning to explain their choice of a video, group members briefly watch the video before refocusing their attention on the person, who then explains the video as an inspirational source.

Overall, a majority of the participants (11/15) said they felt the interactions with each other were 'natural', with P6 summarising *"I'm so used to just been with my friends and you have a device out"*. Further to the idea, P2 stated that *"this app brings up the normal conversation and discussion that we would have"*, with P6 identifying the mobile device as a tool within conversations that can be used as part of the discussion: *"If you're all having a discussion about something, the phone becomes the tool for whatever you're laughing about"*. In contrast, however, P12 stated that *"[with mobile devices] it's harder to get other people's attention to what you're saying"* a sentiment two other participants agreed with. The spirit of this sentiment may arise from issues of joint attention and individuals meeting the social expectations of those around them while using the mobile device, something others have found to be achieved by individuals with varying degrees of success [27] and could be addressed by the ideas of larger displays.

6. DISCUSSION

In our study we were motivated by ideas of incorporating existing disparate knowledge of design practice (e.g. [18,23]), existing proposed solutions to assisting designers (e.g. [22,24]), mobile collocated interactions (e.g. [17,19,25]), and performance of gesture in public settings (e.g. [16,26]), to design Co-Curator, a prototype we could use to probe how design ideation could be supported better through a tailored mobile app.

6.1 Overall Impression

Our findings show that participants found the experience to be fun, and the prototype was perceived to be attractive. During the design of the app, while we never planned to create a "fun" experience, we did strive to create an app that was: easy and attractive to use, and somewhat quirky and different to existing apps. These goals are largely in line with existing work on creating more enjoyable user interfaces [31], including through the use of certain gestures [26]. During the design of the prototype, we primarily focused on representing the collection of sources visually, and allowing for all interactions to occur from the resulting timeline, without the need for menus or different screens. We deem the design rationale of orienting the interface around the visual sources contributed to the positive reception of the aesthetics and visual nature of the app in interviews and questionnaire responses.

6.2 Collecting Sources on a Mobile Device

Our work identified that designers *"organically"* collect sources, and that a mobile device was suited as a tool for the task. Additionally, participants identified that presenting sources as a timeline made sense for reflective purposes and when individually collecting sources in group projects, reinforcing others' findings about reflection that guided our initial design [28]. Furthermore, in a previous project, P4 stated they had made a timeline on a wall to record their thoughts and progress visually (with images and inspirational sources) for this very purpose. We did see, however, a number of limitations that would inhibit a full deployment of Co-Curator: we accounted for organic collection, but failed to account for "inorganic" collection (e.g. at a desk). Participants

highlighted that they also collect sources using other devices, and that while Co-Curator would be useful to them, it could not fully replace existing tools (although it is worth highlighting that replacing existing tools was never our intention). Therefore, while it may be possible for a mobile device to replace larger format computers, as can be expected, participants may still prefer to use a desktop or laptop computer to complete a task if sedentary for a period of time.

6.3 Sharing Gestures

In designing the prototype app, we were conscious not to include complicated actions that dictated the specific methods of group work, and allow for Co-Curator to be used with the device held as preferred. This is in contrast to other collaborative collocated interactions work that typically required devices to be flat on a table to perform sharing (e.g. [17]). Although sometimes participants chose to place their phones flat on the table, our findings suggest that in addition to the mentioning of privacy, participants particularly enjoyed the sociable aspects of the sharing gesture performed with the device in hand. We were inspired by related work on the performance of interactive gestures, such as Rico and Brewster's findings that gestures that are subtle and look or feel similar to everyday actions are enjoyable to perform are more desirable [26]. In particular, in our design rationale we sought to capture the similarity to the everyday 'screen showing' gesture people use frequently to share screen contents when collocated (e.g. [2]).

Our findings show that participants enjoyed performing the gesture together (and succeeded at sharing). Although there may be a novelty effect at play it is of note that the collaborative setting, and the need for synchronised performance of the gesture appears to alleviate any form of awkwardness previous work has found when studying single users performing gestures publicly [26]. Doing gestures alone can feel uncomfortable; while doing gestures together can feel fun and sociable.

6.4 Curating a Collection with Co-Curator

In general, participants reflected well on the experience of co-curating and sharing collections using the app. Existing work had discussed individuals performing group-based triaging on mobile devices in a casual setting [6] and so to uncover similar findings in relation to a more work-oriented environment is positive. However, some participants had reservations about deleting material added by others suggesting further work could be done to support the interactions from within the app, to embed real-world mechanisms within the design (e.g. voting to decide to remove a source). We also identified that tendency for individuals to share mobile device screens was still present, perhaps highlighting the value in being able to temporarily present or demonstrate a source on a larger screen.

In designing Co-Curator, we wanted to explore ways for a device to be used as a resource in face-to-face design ideation sessions, without people getting 'sucked into the mobile bubble' [21], or distracted from others in a setting. While we do not wish to overgeneralise, both our observations and participants' statements in the interview and responses to the AttrakDiff questionnaire suggest that the experience brought the group together. Some found the work of co-ordinating interactions and focus amongst individuals more challenging, thus highlighting an area for future designs to address.

7. CONCLUSION

Co-Curator allows people to collect and curate a collection of sources of inspiration on their mobile device. The prototype app supported group collaboration in curating a shared collection amongst designers, and employed a design tailored for a simple and enjoyable experience. This was in order to allow people to discuss collected sources while using the app with relative ease. Overall, impressions were positive to the idea of collecting sources with the app given the spontaneous way in which inspiration may be realised, and for the app to be used in design ideation sessions to share sources amongst designers. Furthermore, the need to co-ordinate and perform the device gesture together proved to be fun and sociable for participants. Ideas such as a communal screen were raised to further support co-ordination and focus while using the app to provide a more structured experience.

8. ACKNOWLEDGMENTS

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