Triangulating Cognitive Styles with Open Question Survey Responses

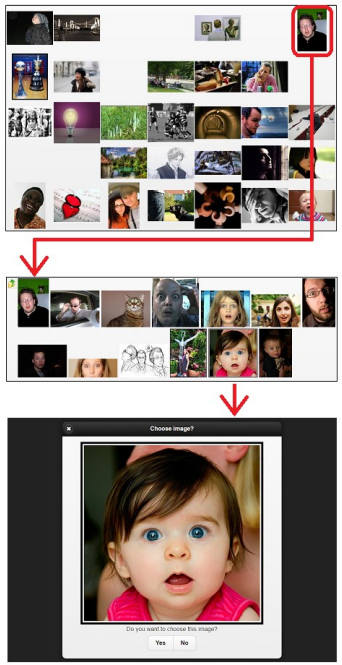

Figure 1: Screenshots from emotion image feedback browser used by participants during our study investigating cognitive styles and engagement of images for emotion expression.

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Abstract
Triangulation of qualitative with quantitative data presents challenges. Does triangulation risk putting off reviewers by intimately mixing quantitative with qualitative data and does it add value? We pose these questions for the workshop in the context of a recently completed and published study. We investigated whether and why people giving feedback on interior designs would enjoy expressing their emotions using images compared with text. We measured participants' cognitive styles and their reported engagement for the feedback formats and then correlated the two measures. We also gathered their insightful views using open survey questions but we decided against triangulating these directly with the cognitive styles after considering the risks and benefits of triangulation.

Author Keywords
Cognitive styles; affective computing; design feedback; mixed methods; perceptual and emotional feedback.

ACM Classification Keywords
H.5.2 [Information interfaces and presentation]: User interfaces: Evaluation/methodology.

Introduction
Our work has examined the use of image banks for fashion and interior design feedback to connect

The OSIVQ Score Data

The Three Subscales

These were ratio data (1 to 5) and measured participants' preferences in how they mentally represent and process information [2].

OBJECT-IMAGERY
Preference for colorful, pictorial and high resolution images of individual objects.

SPATIAL-IMAGERY
Preference for schematic images, spatial relations amongst objects and spatial transformations.

VERBAL
Preference for verbal thinking.

Two derived scores

Calculated for our study and used for correlation purposes, these represented the degree to which participants were more visual than verbal.

OBJVRBDIF
Object imagery score minus verbal score.

SPTVRBDIF
Spatial imagery score minus verbal score.

designers with crowds through an intuitive image based feedback mode. We built image banks, one of abstract images, rich in colors and unusual forms, and one of emotion images showing landscapes, faces, and people in situations (Figure 1). We tested this image based feedback format with designers who contrasted image feedback with text and found that they wanted to use a service offering the image based feedback [7]. The feedback givers who had been asked to express how the designs made them feel, had mixed views about the feedback methods with some preferring images and others text for expressing their emotions [6]. We decided to investigate to see if these varying preferences were due to the cognitive styles of the feedback givers. It is that recent investigation [8] which led to our consideration of triangulation.

In the end, after considering the challenges of triangulating qualitative and quantitative data, we decided against it. The paper was accepted for publication perhaps vindicating that decision. On the other hand perhaps it was a missed opportunity? Below we describe the study, the analyses we did, the challenges of triangulation in this case, and finally we pose some questions for the workshop to consider on the risks and benefits of triangulation. First we briefly provide some background on visual and verbal cognitive styles.

Visual and Verbal Cognitive Styles

Galton [3] wrote of the tendencies that people have to conceptualize in the form of mental imagery or in language. This was later developed into a visual-verbal dimension of the psychological construct, *cognitive styles*, and these were surveyed and consolidated by Riding & Cheema [5]. Inconsistencies were discovered in the bipolar visual-verbal dimension [1], neuroscience pointed to the involvement of two different areas of the brain in imagining color pictures and route maps respectively, and so a new model was devised and validated to replace it. The Blazhenkova & Kozhevnikov model of visual and verbal cognitive style had instead three monopolar dimensions, *object-imagery*, *spatial-imagery*, and *verbal*, and these can be measured with the Object-Spatial Imagery and Verbal Questionnaire (OSIVQ) [2]. (See side panel).

Our Recent Study

We recruited 50 internet users. They completed online consent and demographics forms and if they fit a gap in our age and gender sampling they were asked to continue. We measured their cognitive styles using the OSIVQ (see side panel). Then they did a feedback task viewing interior designs and responding each time in three different formats to the question "How did the design make you feel?" Each time they responded they also rated the response format for *engagement* and *utility* on two visual analogue scale (VAS) items (sliding scales between two semantically opposing anchors) [4]. The three formats were *abstract images*, *emotion images* and *text*. The VAS measurements were interval data, ranging from zero to the length of the scale in pixels, and were normalized 0 to 100 to aid understanding (Figure 2). Finally they completed a questionnaire consisting of mainly open questions. Below we describe two of the analyses carried out.

Analyses

Here we describe the quantitative and qualitative analyses we carried out and the challenges of triangulation.

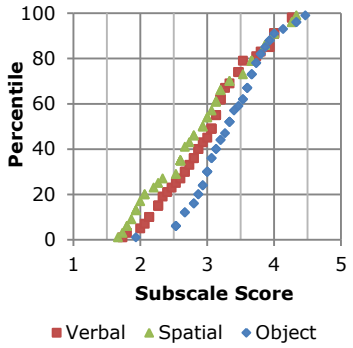

Figure 3: The percentile distributions of the OSIVQ scores from the study. This shows that, as Blazhenkova & Kozhevnikov [2] found, the object-imagery scores tend to be higher than the other two subscale scores. This illustrates one reason why, while using the differences for correlation purposes is valid, there is no definitive way of saying if a particular participant is more object-visual than verbal or vice-versa.

Qualitative Themes

- Engagement
- Ease of expression
- Clarity of text
- Ambiguity of images
- Images worked well for emotions
- Freedom of images
- Communicating with another person

Quantitative

The OSIVQ yields three subscale scores (object-imagery, spatial-imagery, and verbal). We used these to calculate two derived scores (ObjVrbDif and SptVrbDif, see side bar on page 2). High values in these derived scores indicated a participant was more visual than verbal while low scores indicated a participant was more verbal than visual.

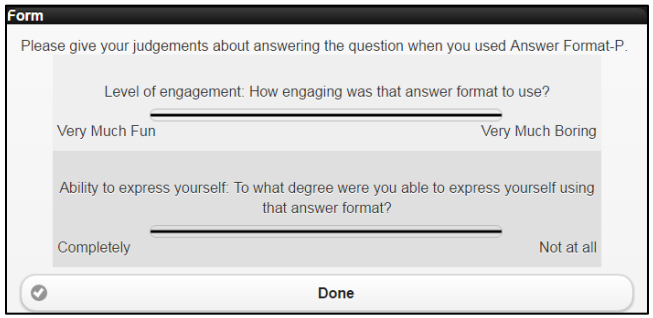

Figure 2: The rating items. On first click a 'draggable' cross appeared on the item scale. The answer formats were referred to by randomly chosen letters to avoid introducing preconceptions to the participants (e.g. emotion images were not called that during the task).

We correlated the rating scale responses with the ObjVrbDif and SptVrbDif scores and found that the more visual a participant was than verbal the more likely the participant was to rate the *emotion images* more highly relative to *text* for *engagement*.

Qualitative

In the post-task questionnaire we had asked participants to rank the formats by overall preference. 26/50 favored either abstract images or emotion images over text. 24/50 favored text over the image formats. We did a grounded theory analysis of the open responses to the post-task questionnaire and showed that there was indeed a range of views on the response formats. Several themes were exposed. (See side bar).

Some participants enjoyed using images and felt liberated by that mode when expressing their emotions. Some found it easier to express their emotions using images rather than struggle to put them into words. Others found that using text was easier and they were more comfortable with that mode. Text was not described as engaging by participants whereas the emotion images were frequently described as fun and enjoyable to use for emotion expression.

The quantitative and qualitative analyses worked well and our study was accepted for publication [8].

Challenges of Triangulation

When we considered triangulating quantitative with qualitative results we faced the following challenges: Firstly, how to additionally code the qualitative views in such a way that a mapping onto the cognitive styles might be possible. Secondly, while it was valid to use the two derived cognitive style difference scores (ObjVrbDif and SptVrbDif) for correlation with our engagement measure, there was no specifically definable midpoint to these derived scores. i.e. although ObjVrbDif was *Object* score minus *Verbal* score, an ObjVrbDif score of zero did not necessarily represent "equally object visual and verbal". See Figure 3. (However, for high positive or low negative ObjVrbDif it might be safe to categorize those as showing either *more object visual than verbal* or *more verbal than object visual* respectively).

In the end we took a cautious stance and kept our qualitative conclusions separate from our quantitative

findings. As our paper was accepted for publication it might be argued that this cautious stance was the correct one. Aside from the challenges of triangulation detailed above what were the reasons for our caution? Well, firstly we were cautious of possible adverse views from reviewers not familiar with mixed methods evaluation, who perhaps would be less trusting of our study were we to intimately mix our quantitative and qualitative data? In addition, would triangulating bring any extra value to the study? In short, would the benefits of triangulation have outweighed the risks? We hope that discussion of these questions will be useful for the workshop.

Summary

We have completed and published a mixed methods study in which we considered, but decided not to triangulate our quantitative and qualitative results. Triangulation presented challenges of how to recode our qualitative responses and also how to categorize two of our measures in particular. We would be interested in suggestions from others in the workshop on how triangulation might have been achieved. In addition we posed the questions of what extra value would triangulation have added and was there a risk of alienating some of our reviewers? We also look forward to hearing of other experiences in triangulating quantitative with qualitative data, discussing our challenges in our study and the questions over triangulating that we have raised here at the workshop.

Acknowledgements

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