Using eyetracking to evaluate label alignment in online forms

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ABSTRACT
We analyse the usability of different label positions in online forms, using an eye-tracking system, with a small sample of UK university-educated users. The results unexpectedly contradict Wroblewski, and recommend right-aligned labels, at least in the context of forms with multiple columns. The work was carried out by an undergraduate intern from an Indian University, who worked with HCI academics at a Scottish University and with a Scottish Usability Consultancy, and we reflect on the benefits of such internships to commercial and academic usability, both in the UK and India.

Author Keywords
Usability, eye-tracking, online forms, e-commerce, research into practice.

ACM Classified Keywords
H.5.2 Information interfaces and presentations (eg. HCI): User Interfaces, Screen design, Evaluation methodology

INTRODUCTION
The process by which HCI research passes into practice is a lossy and imprecise one. To extend this to the global marketplace is even more difficult. This paper describes a short experiment that was the culmination of attempts to bridge gaps between industry and academia and between the UK and India, and ultimately between the user and the forms we present before them on a webpage. In a tripartite partnership, all have been satisfied by the experience but we have also shed light on an area that has been the source of contradictory advice to the practitioner.

FORMS AND THE USER
Penzo [1] highlights that forms are the main route by which users communicate with e-Commerce and Web 2.0 sites and thus "usability of forms is often massively important to the overall usability of a site". Wroblewski [2] supports this, citing a CHI2004 paper about the benefits that a form redesign brought to eBay. Penzo [3] points out that eye-tracking allow designers to evaluate usability more effectively, for example to find the "optimal position for the labels of fields in a form".

This study describes an investigation into the optimal label alignment in form design using eye-tracking, with an opportunistic set of 11 users. The work was motivated by recent presentations by Caroline Jarrett on form design, and the desire of the usability company to identify ways to exploit their investment in eye-tracking technology. A previous study [2] showed that top-aligned labels (text prompts in a web page, such as "First Name", "Address" etc) took the least completion times, followed by right-aligned, then left-aligned labels. This was thought to be because in top-aligned format, as labels and input fields are in close proximity, processing them requires little effort. This study is further supported by Penzo's article [1] on lateral eye movement or saccade. He found that moving from label to input required just 50 milliseconds in a top aligned label, 10 times faster than left-aligned labels, and more than twice as fast as right-aligned labels. As reviewers of [2] have pointed out [5] this advice contradicts earlier received wisdom.

HCI researchers make discoveries all the time, but commercial usability companies have to make decisions for their clients and wrong, or subsequently-changed, advice has considerable commercial implications. In this case the company simply wanted to confirm the results of [2] before recommending the approach to their clientele.

EXPERIMENT

People
We used an opportunistic sample of 11 – a mix of academics, postgraduate students and an administrative assistant. Nine were male, and the age range was 28-60 years old. We viewed this as an initial investigation with a small sample and so did not attempt to control the order in which subjects completed the different forms, nor to

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analyse for gender, age or typing competence, all of which would need to be addressed in a full study.

They were familiar with the QWERTY keyboard layout, and used it daily. Most had no experience of eye-tracking but a few had previously used head mounted or table mounted eye-trackers.

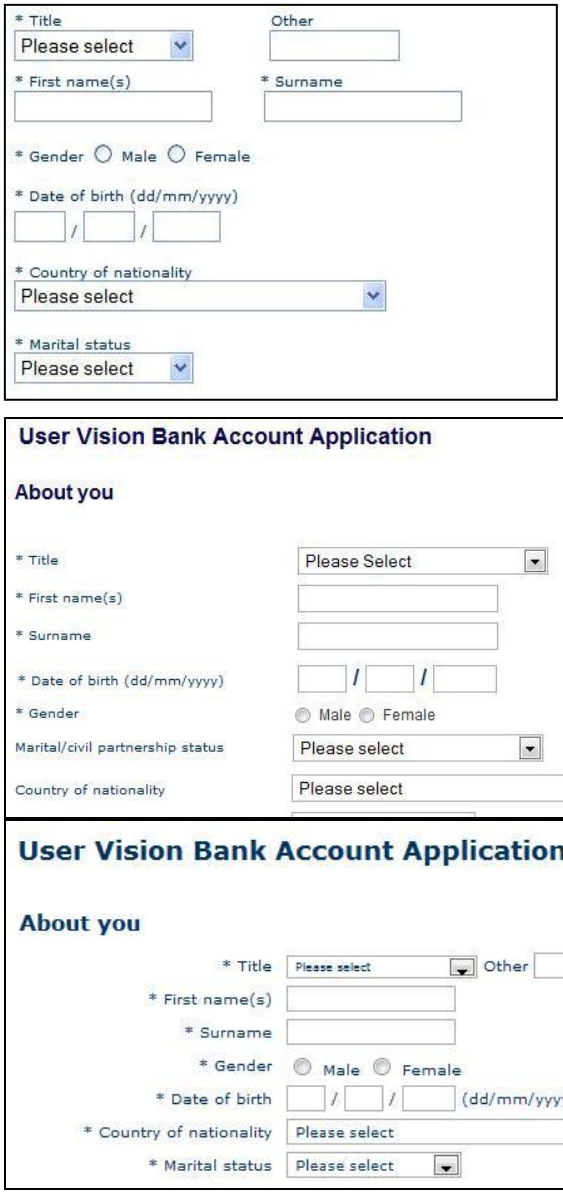

Fig 1. Form excerpts showing top-, left- and right-aligned labels

Activity

The forms that were tested had three types of label alignment: left, right and top aligned [Fig.1]. We asked the subjects to fill in familiar data in the forms, minimizing the need for recall. All the aspects of the form, including graphic layout and sequence of form fields, were left consistent between the forms. The only variation was in the alignment of labels with respect to their corresponding fields. However, due to an oversight in the left-aligned form, there were minor differences: the "Other" optional box was omitted, and two of the fields were not indicated as mandatory, and this was not noticed until after the experiments were completed.

A further set of 3 forms had the fields groups into chunks of approximately 7 fields (Fig 4). To minimize order effect, the different forms were presented in a pseudo-random order.

The participants were asked to fill pre- and post-experiment questionnaires. The experiment was conducted over a two day period with sessions lasting approximately twenty minutes per participant. Participants also carried out two other eye-tracking experiments within a single hour-long session (in one case two separate session were needed).

Context

Participants were seated at a viewing distance of approximately 70 cm and then the general calibration procedure took place. This was located at a standard desk in a shared office – a reasonably naturalistic environment, and the equipment felt to the users like a normal PC – the only evidence of eye-tracking hardware was what appears to be like a built-in webcam.

Technology

A Tobii 1720* eye-tracker was used in the experiment. This eye-tracker measures corneal reflection of an infrared light source relative to the centre of the pupil. After calibration, this eye-tracker is capable of measuring the orientation of eye in space [8] – a viewer's Point Of Regard (POR) – and presenting this on a visual display unit [9].

RESULTS

Our observations are based on a number of factors for the differently-aligned forms, including the completion times, screen real-estate, comparative analysis of eye fixations of subjects and subjective preferences of users, based on post-test questionnaire. We analysed the resulting eye-tracking data (heat maps, gaze-plots) and other numeric data such as observation length, observation count, etc.

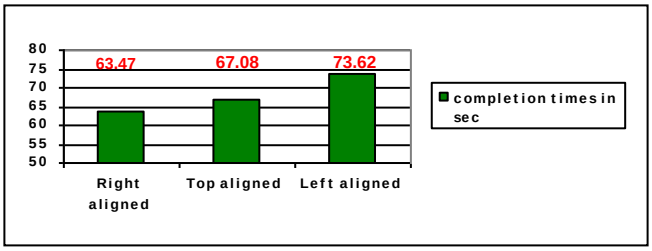

Fig. 2. average completion times of different alignments

To our surprise, our results appeared to disagree with [2]. We found that right-aligned labels had the shortest average completion times, followed by top-aligned and left-aligned labels [Fig 2]. In no case was the left-aligned form faster. However closer analysis suggests that less difference

between top- and right-aligned: the eleven subjects divided equally: five were faster at the right aligned, and five were faster at the top-aligned. The difference was at least three seconds (~5% of the total time) in each case. The final subject was marginally faster at the top-aligned by only 0.6s, and we consider this to be effectively equal (<1% of total time). The difference in average times is the result of right-aligned being very much faster than top-aligned in two cases. In such a small study it is difficult to control for outliers.

However there appear to be trends worth investigating. We ranked the data according to the fastest average completion time across all three conditions. Four of the five fastest overall, were those who also had faster times with right-aligned. This leads us to speculate that certain types of users may find either left- or top-aligned forms fastest. For example, future work might establish whether, say, more accomplished typists complete forms with right-aligned labels faster.

The difference in completion times we found between top-aligned and right-aligned labels appears to be due to columnisation that resulted because we wanted to fit all of the form on a single screen to avoid scrolling. In the case of top-aligned labels, as can be seen in Fig. 1, more vertical screen space is required. As a result the users have to jump from one column to other which results in higher saccade duration and longer completion times, as shown in the heat map and gaze plot in fig. 3.

Left-aligned forms have longer completion times as they require more number of eye fixations to parse from label to field and longer saccade duration due to extended distance between labels and inputs. Top-aligned labels increase the vertical length of the forms and may cause accessibility issues. Right- and left-aligned labels minimize the amount of vertical screen space but have less flexibility regarding horizontal space as longer labels might span to two lines. Labels spanning two lines cause cognitive overload for the users.

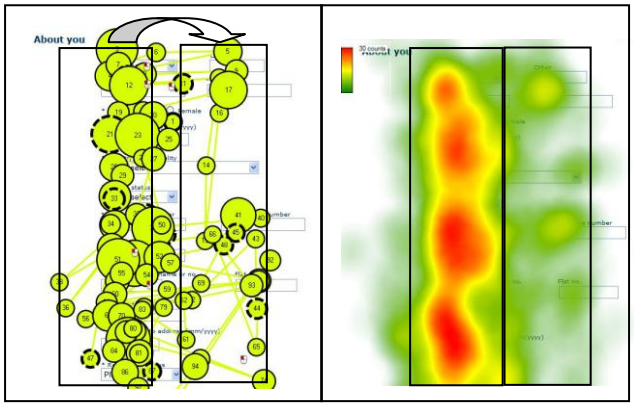

Fig. 3. Gaze plot and heat map demonstrating the jumping from label to label in a 2 column format

Top-aligned and right-aligned forms are completed quickly because they only require a single eye fixation to take in both input label and input field. In left-aligned forms people have to "jump" from column to column in order to find the corresponding input field for the input label. Therefore, number of eye fixations is considerably greater for left-aligned labels as compared to other alignments and this increases its completion times. Additionally our users tended to prefer right-aligned labels due to less visual length and width. Six out of the 11 subjects preferred right-aligned labels while only two preferred left-aligned (they professed to be more "used to" this). Only one preferred top-aligned format and the remaining two expressed no preferences. All of those who were faster with right-aligned labels also preferred them.

As well as controlling for alignment we conducted a parallel study where we grouped form fields into chunks of around 7 fields (Fig. 4). Overall the grouped forms were three seconds faster to complete, suggesting that the speed is faster when cognitive load is reduced, as might be expected. But when we looked at the trends here, the slower form-fillers tended to be faster with grouped forms, and the faster form-fillers tended to be faster still with ungrouped forms. Further work is needed to confirm these trends and isolate the causes

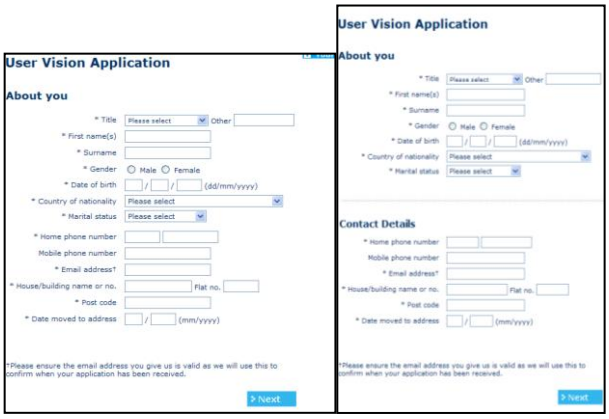

Fig. 4. Ungrouped and ungrouped forms

DISCUSSION

In any experiment such as this, a lot depends on the subjects chosen and the form design itself. In particular, many (eg [6]) recommend avoiding multiple columns in onscreen forms in any case, because of the divided attention. However others advise that scrolling should be minimised (though it's worth noting that horizontal scrolling is seen as much more problematic than vertical [7].

Clearly there is a trade-off between columnisation and scrolling. It seems too limiting to reject columns – users like to be able to refer to other fields in some contexts. Perfetti's iHotelier redesign [10] made much of the advantages of having all required information on screen simultaneously, and notably the various critiques of that

example in CUE-4 [11] don't find usability problems with the use of multiple columns per se.

We conclude that where vertical screenspace is constrained, then right-aligned labels are preferable to the columnisation that is inevitable if top-aligned labels are used. Additionally we posit that there are factors that lead those who complete forms more quickly, to be even faster with right-aligned labels, whereas those who take longer would benefit from top-aligned labels. Future work could isolate these factors, which may be linked to general typing competence or habituation to form-filling or cognitive factors.

CONSEQUENCES FOR PRACTITIONERS

Online forms play an important role in determining whether web based organizations can achieve their business goals or not. They are the hubs of information exchange between user and websites. This report focuses on the basic aspect of alignment of forms and offers explanations based on an initial eye-tracking analysis. Further work is needed to understand what appear to be trends. It may be possible to profile label preferences in such a way as to offer users the type of field labeling that they find fastest to work with.

For now the main conclusions drawn are:

- Avoid left-aligned labels
- Avoid columns but where you cannot, consider right-aligned labels
- Test with representative users to see if they are faster with top- or right-aligned labels.

REFLECTIONS ON "USING BRIDGES"

This project was the result of a series of unconnected events that needed bridging. The university wished to deepen its partnership with a local expert consultancy in usability. UserVision's consultants are in constant demand throughout the UK and abroad and though they had recently invested in the eyetracking equipment they'd had no spare staff resource to experiment with it. Caroline Jarrett had recently given a well-received lecture on form design to the Scottish chapter of the Usability Professionals Association. Three undergraduate Interactive Design students, from the Indian Institute of Technology Guwuhati, speculatively contacted Napier University seeking a short internship. The Scottish Government had made funds available to university's 2KT initiative for links between academics and industry, enough to cover the travel and accommodation costs. All parties entered into the partnership without fully knowing what the outcomes would be. For example in Scotland there is little awareness of the current maturity of the Indian usability industry.

For four weeks the students learned and applied Benyon's PACT methodology, and then worked a further four weeks at UserVision designing and conducting three separate studies, one of which is reported here. The company and university are delighted with the quality of the work done by these students, and are in no doubt of the potential for the Indian usability industry. The students in turn have grasped a new body of theory and gained an insight into the professional requirements of the usability industry.

We have built and used the bridges between Scotland and India, between university and industry, between undergraduate and consultant to bridge theory and practice and to start to close the gap between user and forms. Our results are useful to define a more in-depth experiment into the people, activities, context and technology issues in form design. More useful still has been the establishing of the aforementioned bridges which we all plan to keep using.

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