TEACHING GRAPHICAL USER INTERFACES: AN EXPERIENCE

Dr. M V Ananthakrishnan  
Kanwal Rekhi School of Information Technology,  
Indian Institute of Technology, Powai, Mumbai 400 076, India  
manantha@it.iit.ac.in

Abstract

The myth, amongst many software engineers, is that graphical user interface design is all programming. The present paper is an attempt to demystify the myth in a well-planned, logical and convincing manner by helping the participants to themselves experiment, explore, understand and review their own work…through a well-planned and tested out approach. It primarily involves the participant doing their own design, the faculty hand-holding them in exploring and reviewing their work progressively and the participants once again presenting their work…to be reviewed primarily by the peer groups.

Bridging the Gap

According to John et al (2004), an attempt has been made to bring together all aspects of user interface development as well as Software Engineering and Usability. This is as a result of the work by Andrew Walenstein (2003) who introduced the term “Boundary Objects” from a study made by Star and her colleagues. The finding was that participants

a) co-operate without having models of each other’s work  
b) successfully work together while employing different units of analysis, methods of aggregating data and different abstractions of data  
c) cooperate while having different goals, time horizons and audiences to satisfy

Boundary Objects are, therefore, “objects that are both plastic enough to adapt to local needs and constraints of the several parties employing them, yet robust enough to maintain a common identity across sites”. (John, 2004)

Why teach Graphical User Interfaces?

A very pertinent question indeed! Is it needed? Has it not become an in-thing in today’s world? Do we need to educate people on it? These are some of the questions on everyone’s lips! But, then, at the other end, we have the critics who blow hot and cold over the websites…many of them demanding their immediate deletion.

So, what is it that makes the lay user like and dislike the interface? …Is it something qualitative and judgmental…a trait that goes beyond programming skills and systems design, or is it more systematic and scientific?

There is yet another problem…the Programmer Syndrome. The programmer thinks that all that is to GUI design is the mastery of a programming language (Visual Basic, Visual C++, Java, ASP, HTML and what have you!). Little does he realize that a scientifically
well-designed interface will look more or less the same, independent of the development tools.

The answer to the above dilemma lies in adopting a commonsense and exploratory approach to the teaching of graphical user interfaces…independent of programming!

The “Sketchpad” of Sutherland (2003) was the first fundamental contribution to Computer-Human Interaction, being one of the first graphical user interfaces. His work led to the Xerox Star workstation followed by its commercialisation by Macintosh and Windows interfaces…and the widely recognized benefits of direct manipulation.

The TCS Experience

The author has been teaching the course over a period of 12 years within TCS and external institutes and organisations around the country, covering over a thousand participants (from fresh college graduates to professionals with experience as high as 10 years.

The TCS experience has led the author to come up with a series of metaphors and icons for multimedia approaches to literacy and universal interfaces.

The Curriculum and Schedule

The GUI curriculum has been designed to cater to
   a) A one-day appreciation programme
   b) A two-day workshop

Whereas, the one-day workshop provides an overview of GUI Guidelines, replete with examples and case-studies, the two-day workshop helps the participants discover the good, bad and ugly of interfaces through a well-orchestrated review and critique by peers and faculty.

The respective schedules for the one-day and two-day formats are shown in Table 1.

<table>
<thead>
<tr>
<th>ONE-DAY APPRECIATION COURSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>**Day</td>
</tr>
<tr>
<td>-------------</td>
</tr>
</tbody>
</table>
| 1           | • Introduction  
              • What goes wrong with Interfaces? |
|              | Exploring Interfaces |   | • Designing good interfaces  
              • Guidelines for a good interface |
|              | |   | • Evaluating interfaces  
              • A Natural Interface (an example)  
              • Programme Closure |
A TWO-DAY WORKSHOP

<table>
<thead>
<tr>
<th>Day</th>
<th>Session 1</th>
<th>Session 2</th>
<th>Session 3</th>
<th>Session 4</th>
</tr>
</thead>
</table>
| 1   | • Introduction  
     | • Design of version 1 of a website (based on prior knowledge/common sense) | • What goes wrong with Interfaces  
     |   | • Guidelines for a good interface  
     |   | • Evaluating Interfaces | |
| 2   | • A Natural Interface (an example)  
     | • Design of Version 2 of the website (based on inputs and guidelines) | • Presentation of design of website (Ver. 1 and 2) along with reasons for change  
     |   | • Critique by participants and faculty  
     |   | • Programme Closure | |

Table 1: The Programme Schedules

The Methodology for the Two-day Programme

The programme starts with the details of the activities of the participants and the faculty. Special mention needs to be made here of the case-study assignment, spread over two days as follows:

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Version 1</th>
<th>based purely on one’s understanding of a good interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 2</td>
<td>Version 2</td>
<td>Review and redoing of Version 1, based on the norms and guidelines evolving out of the lecture and exploratory sessions 3 and 4 on Day 1</td>
</tr>
</tbody>
</table>

The case study

The exercise assigned is from a collection of real-life scenarios but two of them have been found most appealing, exciting and educating viz.,

1. Designing a web page for a Matrimonial Agency
2. Designing a web page for an Automated Teller

The expected deliverables are to reflect the following requirements of potential clients:

<table>
<thead>
<tr>
<th>Assignment</th>
<th>Minimum Requirements of the potential client</th>
</tr>
</thead>
</table>
| Matrimonial Agency | • Client able to input/modify his personal/ward’s details as well as his requirements (of his/her potential spouse or partner for his son/daughter)  
     |   | • Client able to list out the best three matches  
     |   | • Client able to get further details of the three best matches (addresses, contact nos. etc)  
     |   | • Further follow-up through actual person-to-person interactions |
Automated Teller

- Client should be able to draw money in any currency
- Client should be able to convert from one currency to another
- Client should be able to use credit/debit cards

These two assignments have been encouraging in terms of the participants stretching their imagination to the limits… by providing for all possible needs and requirements! Who says…computer professionals are not creative…in the graphical sense?

The participants are grouped into groups of 3 or 4 (depending on the enrolment) each, and their roles defined for the exercise, as follows:

<table>
<thead>
<tr>
<th>Group G</th>
<th>Team Member G1</th>
<th>Client</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4 members)</td>
<td>Team Member G2</td>
<td>Requirements Gathering</td>
</tr>
<tr>
<td></td>
<td>Team Member G3</td>
<td>Designer</td>
</tr>
<tr>
<td></td>
<td>Team Member G4</td>
<td>Reviewer</td>
</tr>
</tbody>
</table>

P.S.: In case of three members, Roles G2 and G4 are played by one member

At the end of Session 2 of Day 1, the designs (Version 1) are frozen. Figure 1 shows Version 1 of sample screens developed by two independent groups.

![Group 1: VIVAH BANDHAN](image1.png)  ![Group 2: SHUBH VIVAH](image2.png)

Figure 1: Version 1 of the Screen Design

Sessions 3 and 4 on Day 1 are devoted to helping the participants

a) discover the good and bad of interfaces…through well-structured and documented case-studies from real-life…across the world.

b) evolve guidelines for the development and evaluation of graphical user interfaces
The case histories used for (a) include

(i) the nuclear disaster of the 1980s in the US, one that resulted in a leak…with the post-mortem showing a serious fault in the GUI as well as errors introduced by human beings…apparently to facilitate better management!

(ii) The monitor screen, displaying unfriendly and unforgiving messages

(iii) A banking software application, needing entry of a variety of unrelated and possibly redundant data

The participants are continuously encouraged to document their revisions/changes to version 1 (of their case study) as lessons are learnt from each case history.

The coverage of (b) includes debates and discussions on

(i) Icons and Metaphors
(ii) Constraints
(iii) Physical and Mental Models
(iv) Human-computer Interaction
(v) Visualisation
(vi) Human Memory

Once again, the participants are encouraged to re-look at their Version 1 and suggest possible changes to their design based on the systematic coverage of (b).

As a final outcome, Day 1 ends with a concrete set of guidelines for a well-laid out interface.
Day 2

Day 2 is wholly devoted to each group in

a) Compiling documentation on the changes suggested in version 1 in the following format:

<table>
<thead>
<tr>
<th>No.</th>
<th>Item in Version 1</th>
<th>Current Status</th>
<th>Changed Status</th>
<th>Justification based on CASE HISTORIES and GUIDELINES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

b) Reworking on Version 1, based on (a), and preparing Version 2.

c) Presenting Versions 1 and 2 in the following format:

<table>
<thead>
<tr>
<th>Group</th>
<th>Team Member</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group G (4 Members)</td>
<td>G1 (client)</td>
<td>States Initial Requirements</td>
</tr>
<tr>
<td></td>
<td>G2</td>
<td>Presents Version 1</td>
</tr>
<tr>
<td></td>
<td>G3</td>
<td>Presents changes</td>
</tr>
<tr>
<td></td>
<td>G4</td>
<td>Version 2 (also presented by G3, in case there is a three-member team)</td>
</tr>
<tr>
<td>All</td>
<td></td>
<td>Review &amp; Critique Session</td>
</tr>
</tbody>
</table>

Group 1: VIVAH BANDHAN

Group 2: SHUBH VIVAH

Figure 3: Version 2 of the Screen Design
Day 2 ends with

a) A presentation on a natural interface concept, ELAI, developed by the author as a teaching model for Graphical User Interfaces (Ananthakrishnan, 2001)

ELAI (Figure 4) is an acronym for Ergonomically Laid-out Application Interface. It uses the banana leaf as the interface metaphor and a wedding feast as a typical scenario. All food-items are initially served on the leaf

- In a defined sequence
- In specific positions
- In positions that are defined ergonomically
- With access permitted/restricted base on need

Figure 4: ELAI

Figure 5 clearly indicates the similarity of ELAI with the typical Windows desktop interface.

Figure 5: ELAI and its similarity with a Desktop

Using this model, the author has been able to effectively explain, amongst others, the concepts of icons, metaphors, menus, opening of applications, keeping multiple applications open, reducing all applications to icons except one. The value addition is conveyed through mention of culture, food items, nutrition, balanced diet etc.
b) Summarisation and consolidation of the finding of the workshop in terms of lessons learnt, do’s and don’ts in GUI design, natural interfaces.

Summary

The teaching experiment carried over so many years and across so many participants has helped in the participants appreciating the relevance of good interface design and the follies/limitations of bad designs with respect to web pages.

Acknowledgements

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References


