Tutorial: Principles of Interaction Design

Shane Morris
Echo Interaction Design, Australia
shane@echointeraction.com.au

This tutorial will introduce and explore many of the fundamental principles that underlie the practice of interaction design and user interface design. Knowingly or unknowingly, designers use these principles constantly in their work to produce effective designs in a timely fashion. Nevertheless, apart from some ‘heuristics’, many practitioners have never been formally introduced to these principles.

Topics covered in the tutorial include principles like functional layering and visual hierarchy, fundamental guidelines like Fitt’s Law and cognitive concepts like gestalt grouping principles. Beginners and more experienced interaction designers will develop their working vocabulary of design principles that can be applied in the design and evaluation of all forms of user interfaces in everyday use - including physical devices, graphical user interfaces and internet applications.

This highly interactive tutorial introduces each principle in turn, along with positive and negative usage examples. Short individual and group revision exercises are used throughout the day, and the tutorial ends in a rapid design exercise which aims to explore the pro’s and con’s of applying the interaction design principles.

User interface design, Interaction design, Design principles.

1. LEVEL
Beginner to Intermediate

2. TARGET AUDIENCE
Designers and evaluators of all forms of user interfaces, including graphical user interfaces, internet applications and physical devices.

3. PURPOSE
Many, if not most, interaction designers come to the field without formal training in user interface design. They apply personal experience, intuition, imitation and extensive evaluation to produce and refine the user interfaces they are responsible for. Along the way, designers build up a body of design experience, which ranges from rules of thumb or “heuristics”, through to specific solutions to common problems or “patterns”.

Between heuristics and patterns lie “Design Principles”. Design principles can be applied more widely than specific patterns, but good design patterns embody these principles. Heuristics (like “minimise memory load”) are good for evaluating existing designs, but are less useful for generating design solutions.

This tutorial aims to introduce practicing or upcoming interaction designers to key principles of interaction design, to build their familiarity with and ability to recognise them, and most importantly to equip them to apply these principles in their day-to-day work. In doing so, participants will build their skills in producing designs which are based on sound principles, are defensible and are of higher quality – all in less time. In addition, familiarity with these design principles gives participants a practical vocabulary to aid communication with colleagues and other interaction designers in the workplace.

4. LEARNING OUTCOMES
The main issues to be covered by this tutorial are:

- What are the main interaction design principles underlying the design of effective user interfaces?
- How do the principles support or interfere with each other?
- How can the principles be applied in the practical design and evaluation of user interfaces?
Participants will gain knowledge and skills in: (“Learning outcomes”)

- Familiarity with the principles of interaction design, their applicability and the relationships between them.
- Skill in applying the principles of interaction design to the evaluation of their own or others’ design work.
- Practical techniques to apply principles of interaction design in generating design solutions, and in discriminating between design options.

During the tutorial, participants will be actively called upon to contribute their own examples and experiences to illustrate the principles of interaction design being covered. By acknowledging that all participants have encountered and applied these principles in everyday life (even if they didn’t realise it), the tutorial is made much more participatory and engaging. Along the way, participants will apply the principles being covered to the evaluation of example user interfaces from a number of domains, both individually and as a group.

Finally, practical application of the principles will be reinforced in an exercise in small groups. Participants will use the design principles to create a low fidelity user interface design and then use the principles to defend and discuss their design with the class.

5. TOPICS TO BE COVERED

The bulk of the tutorial introduces a number of principles of interaction design, examining each in turn and using exercises and discussion to relate them to each other.

Before the principles are presented in detail we first introduce the idea of interaction design principles and their relationship to other concepts, such as heuristics and patterns. The principles are placed into context by discussing their role in the design and evaluation of user interfaces, locating them in the user-centred design lifecycle and discussing their application across different interactive media. A taxonomy for the principles is then introduced, which acts as a framework for the bulk of the tutorial.

The body of the tutorial is dedicated to introducing each principle in turn:

- Introducing the principle and where appropriate its theoretical basis.
- Discussing pre-prepared examples as well as examples offered by participants.
- Relating each principle to other principles covered in the tutorial, highlighting possible conflicts.
- Discussing the principle’s practical application in design and evaluation activities

In order to reinforce learning as the material is covered, students will participate in group and individual exercises evaluating sample user interfaces for potential design problems and identifying the design principles which apply.

In the second half of the day the major exercise involves participants in small groups collaborating to design a user interface for a modest application. Participants will produce a low-fidelity (hand-drawn) design, and then present their design to the class for discussion of how interaction design principles have been applied.

The outcomes of the exercise are then used to drive a discussion of how to identify and prioritise interaction design principles during the design process.

The tutorial ends with a group affinity diagramming exercise to re-cap the principles covered and a free discussion of how participants might apply the principles in their own work.
5.1. Principles covered

Interaction design principles to be covered are:

- Matching experience and meeting expectation
- Metaphor
- Consistency – internal and external
- Functional minimalism
- Cognitive load
- Engagement
- Memory load
- Functional layering
- Visibility
- Feedback and orientation
- Direct manipulation
- Mapping
- Control, trust, and explorability
- Error prevention, detection and recovery
- Mousing and Fitt’s law
- Affordance
- Hierarchy of control
- Spatial memory
- Visual hierarchy
- Natural reading order
- Grouping
- Visual weight
- Visual balance
- Visual minimalism
- Visual rhythm and scanability
- Aesthetics

While the number of principles to be covered in a day may seem large, the intention is to provide participants with a succinct description and practical tips for the application of each principle in a manageable chunk. Most of the principles are described in less than half a page, plus examples.

Given that this tutorial is for practitioners, emphasis is placed on imparting the practical implications of each principle, rather than its research basis. Participants will be encouraged to do their own further reading if they want to further understand the theoretical underpinnings of the principles discussed.

Some of the design principles covered in this tutorial are familiar “heuristics”, but the intention of this tutorial is to present these principles as tools for generating design solutions.

5.2 What this Tutorial is not About

This tutorial is not about design process, but rather the underlying knowledge that designers apply when generating design solutions, regardless of the process.

Neither is this tutorial about visual design, although some principles of visual communication are covered.

6. SAMPLE CONTENT

6.1 Sample slides and workbook content

**Functional Layering**

Ensure that the most common actions are the most accessible.

The number of possible actions available is often quite large. Usually, though, a small number of key actions will be used most often. Make these functions easy to find by setting them apart (e.g. in command buttons or in a toolbar).

Hide infrequently used or advanced functions (e.g. in a menu bar, or `Details >>` panel).

Consider default settings and pre-set choices for users who do not wish to access advanced functionality.
Visual Hierarchy

Information and controls should be grouped and sub-grouped in a clear hierarchy.

The layout of the page should represent a hierarchy of groups and sub-groups of elements.

This allows users to first get an ‘overview’ of the main groups of information and controls on the interface. They can then concentrate on one grouping at a time, progressively examining the hierarchy in more detail.

The user first sees the major groupings on the screen, then examines the groups and sub-groups to get more details.

6.2 Sample Illustration of a Principle

Mapping

The Tivoli Audio ‘PAL’ radio is admired for its quality and aesthetics. The designers made an interesting mapping decision. The band selection knob has ‘AM’ above ‘FM’, but the frequency dial has ‘FM’ above ‘AM’.

By mapping the two knobs consistently, would the PAL be easier to use?

6.3 Sample Individual Revision Exercise

Examine the example user interface below, which is used to configure the ‘special function’ buttons on a PC keyboard. Identify any possibly weaknesses and strengths of the user interface and classify them according to the interaction design principle they relate to. How many can you find?

(Exercise user interface omitted here.)
7. TUTORIAL FORMAT
The tutorial is classroom based with a combination of lecture material, group discussion and exercises, culminating in a rapid design exercise in small groups. This tutorial works best with a ‘cabaret’ style room layout.

Students receive a purpose-written handbook which includes additional detail about the principles covered, references and exercise material. Note that the handbook is not simply a printout of the presentation slides.

This is a one-day tutorial.

8. METHOD OF DELIVERY
The tutorial is presented in a combination of:
- Lecture material
- Group discussion
- Individual revision exercises
- Workbook exercises
- Individual and group design exercises.

Group discussion is an important component of this tutorial. In effect, the discussion determines the order and emphasis given to the principles to be covered. Participants’ own examples provide opportunities to discuss relevant principles in context. This keeps the day dynamic and maximises student engagement.

9. SESSION ACTIVITIES AND SCHEDULE
As discussed above, group discussion is used to set the tutorial agenda, which may result in some changes to the order of presentation.

9:00 – 9:45   Introducing Principles of Interaction Design
              Welcome and Warm-up exercise. Group discussion and introductions.
              Principles of Interaction Design. Heuristics, Principles and Patterns
              Principles throughout the User Centred Design Lifecycle

9:45 – 10:15  4 General Design Principles (including revision exercise)
10:15 – 10:30 Break
10:30 – 11:00 4 Information Design Principles (including revision exercise)
11:00 – 12:00 9 Interface Design Principles (including revision exercise)
12:00 – 1:00 Lunch
1:00 – 1:15  Class Exercise: Evaluating a sample user interface against Interaction Design Principles
1:15 – 2:15  9 Presentation Design Principles
2:15 – 2:45  Individual Exercise: Evaluating a sample user interface against Interaction Design Principles
2:45 – 3:00 Break
3:00 – 4:30 Main Exercise
              In groups, use interaction design principles to produce a low-fidelity user interface design.
              Class discussion of designs and application of design principles

4:30 – 5:00  Wrap-up
              Applying Interaction Design Principles in Design Activities
              Prioritising Interaction Design Principles
              Group Affinity Diagram of Interaction Design Principles
              Group Discussion: Applying Interaction Design Principles in your Work
10. DURATION AND PARTICIPANTS
This is a **full-day** tutorial
The ideal number of **participants** for this tutorial is 8 to 20. Suggested maximum is 25.

11. PREVIOUS TUTORIALS
Note that previous versions of this tutorial have been successfully delivered in the corporate environment and at OzCHI 2005 in Australia. This version of the tutorial contains new and expanded material.

12. SPEAKER BIO – SHANE MORRIS
Shane Morris is one of Australia’s most experienced interaction designers, having worked in the field since 1991. In that time he has worked on traditional graphical user interfaces, web sites, kiosks, multimedia products, mobile applications and physical devices. Shane has taught user-centred design techniques in the USA, UK, New Zealand and Australia. His clients have included Sensis, Hewlett Packard U.S., DHL, Telstra, The Australian Football League, NSW Department of Education and Training, The Australian Taxation Office, Telecom New Zealand and the Royal Australian Air Force.

Shane has degrees in both Computer Science and Cognitive Science. He is a member of the HFESA’s Computer-Human Interaction Special Interest Group and the Usability Professionals Association. Shane is also a guest lecturer in Information Architecture at Swinburne University in Melbourne.

Previously General Manager - Victoria for the Hiser Group, Shane has been Principal of Echo Interaction Design since 2002.

13. CONTACT INFORMATION
Shane Morris
Echo Interaction Design
shane@echointeraction.com.au
+61 438 818 888