Investigating Intuitive Interaction with Complex Artefacts

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Introduction

Exploring the meanings and applications behind the term “intuitive use” or “intuitive interaction”

• What it is

• How and why it happens

• How design can facilitate it
Research Problem

Products are often difficult to use correctly, especially at first.

Various factors have contributed to this problem:

Overimputation
Division of control
Poor documentation
Emerging technologies
Research Question

It has been suggested in the literature, in popular parlance and the media that things can be made intuitive to use. This may alleviate the problem.

How can designers utilise users’ intuition in order to make products easier to use?
Research Aim

To provide designers with principles and tools which they can employ during the design process in order to make products more intuitive to use.

In order to achieve this aim it is necessary to:

Establish a theoretical understanding of intuitive interaction
Empirically test that understanding
Intuition

Intuition is a type of cognitive processing that utilises knowledge gained through prior experience (stored experiential knowledge). It is a process that is often fast and is non-conscious, or at least not recallable or verbalisable.
Intuitive Interaction

Previously, no author had thoroughly defined the concept of intuitive use or suggested ways it could be designed into products.

Intuitive use of products had been mentioned (although not fully addressed) by variety of authors.
Intuitive Interaction

Intuitive use of products involves utilising knowledge gained through other experience(s) (e.g. use of another product or something else).

Intuitive interaction is fast and generally non-conscious, so that people would often be unable to explain how they made decisions during intuitive interaction.
Research Plan

Experiments 1 and 2 were designed to investigate how intuitively people with different levels of past experience could use a digital camera and a universal remote control.

Design criteria for intuitive use were developed based on the understanding gained from these experiments.
Research Plan

The remote control was re-designed according to the criteria developed.

Experiment 3 was implemented to see if applying these principles to the design process could make the product more intuitive to use.
Experimental Approach

Using products as mediators to study intuitive interaction (not a usability test).

Studying individual product features because it is with these that users have relevant past experience.

Looking at each feature use individually.

Users needed to be observed in great detail.
Factors of Intuitive Use

Three factors of intuitive use for each feature on a product:

- Function of the feature
- Appearance of the feature
- Location of the feature

Each of these factors could be intuitive or not, independent of the others.
Dependant Variables

Time to complete operations
Correctness of each use
Intuitive uses and first uses per participant
Intuitive uses and first uses of each feature
Familiarity of each feature
Assistance received
Expectedness of the three factors of each feature
Tools and Methods

Technology Familiarity questionnaire

Observation through video

Concurrent protocol

Structured follow up interview
Technology Familiarity Questionnaire

Designed to reveal information about participants’ relevant past experience with other digital products.

Products mentioned employed similar features to the mediating product.
Follow Up Interviews

Participants were asked:

to explain which features of the product were familiar and where from.

to assess how the function, appearance and location of each feature on the product conformed to their expectations.
Specialist Software

Noldus Observer VideoPro captures a level of detail not possible in live observations and that cannot be analysed easily without an automated system.
Correctness Coding

A correct use
   correct for feature and correct for the task or subtask.

A correct but inappropriate use
   correct for the feature but not for the task or subtask.

An incorrect use
   wrong for both the feature and the task.

An unsuccessful attempt
   failing to activate the feature.
Type of Use Coding

Intuitive
Quick comment
Trial and error
Reasoning
Getting help
Mistake
Intuitive processing does not involve conscious reasoning or analysis.

When processing intuitively, participants would not verbalise the exact details of their reasoning.

Their verbalisation was not in time with their actions.
Expectation

Intuition is based on prior experience and therefore linked to expectations.

If a participant clearly had an established expectation that a feature would perform a certain function when they activated it, they could be using intuition.
Subjective Certainty

Researchers have suggested that intuition is accompanied by confidence in a decision or certainty of correctness (Bastick, 2003).

Those uses coded as intuitive were those that participants seemed certain about, not those where they were just trying a feature out.
Latency

Intuition is generally fast and is associated with subjective certainty.

When users were able to locate and use a feature correctly reasonably quickly it could be coded as intuitive.

If a user had already spent some time exploring other features before hitting upon the correct one that use was unlikely to be intuitive.
Relevant Past Experience

Participants would sometimes show evidence of their existing knowledge:

- Feature was like their own remote or camera
- They had seen a feature before
“Intuitive use” codes were applied only when the use showed two or more of these characteristics.

All data were double-checked to make sure codes were correct.

Percentages of intuitive uses and intuitive first uses were important dependent variables.
Experiment 1

Twenty participants in four groups.

Level of expertise with digital cameras was the Independent Variable.

Objectives were:

To discover if intuitive interaction is informed by past experience

To try out research methods for investigating intuitive use
Experiment 1 Findings

![Graph showing technology familiarity score over time for different skill levels (expert, intermediate, naive, novice).]
Experiment 1 Findings

![Graph showing relationship between intuitive first uses and technology familiarity score.]

- **Intuitive first uses (%)**
- **Technology Familiarity score**
Experiment 1 Findings

Prior exposure to products employing similar features helped participants to complete the set tasks more quickly and intuitively.

The digital camera borrowed, or transferred, features from other digital products.
Experiment 2

Thirty participants in three groups

Technology Familiarity score was the Independent Variable, determined by the Technology Familiarity questionnaire

Objectives were:

- to confirm the findings of Experiment 1 with a larger group of participants.
- to gain an understanding of a universal remote control in order to re-design it.
Experiment 2 Findings

![Graph showing the relationship between Technology Familiarity Group and Time to complete operations (secs). The graph indicates a positive correlation, with higher familiarity leading to longer times.]
Experiment 2 Findings

![Graph showing intuitive first uses across different technology familiarity groups. The graph indicates a decrease in intuitive first uses as technology familiarity decreases, from High (>75) to Medium (60-75) to Low (<55).]
Experiment 2 Findings

![Graph showing the relationship between Intuitive first uses of features (%) and Familiarity of features.](image-url)
Experiment 2 Findings

Consistency is assumed to enhance the possibility for transfer of skill from one system to another.

On the remote control some basic features had different function, location and appearance for each device.

Also, some features employed words and others symbols.
Experiment 2 Findings

Supported the findings of Experiment 1.

People use their previous experience with similar features in order to use new features intuitively.

Understanding of problems with remote control was gained and used for the re-design.
Design Criteria for Intuitive Interaction

Use familiar symbols and/or words for well-known functions.

Make it obvious what less well-known functions will do by using familiar things to demonstrate their function.

Increase the consistency between features.
Re-design

18 postgraduate designers were given a brief prepared by the researcher.

They used the criteria to re-design the remote control interface.

Fine-tuning and adaptation was done by the researcher.
Re-design

Four new designs were tested:

- Appearance
- Default
- Location
- Location-Appearance
Experiment 3

60 participants in a 4x3 group design.

Independent Variables were remote configuration (design) and age group.

Objectives were:

To establish if appearance or location was the most important factor in intuitive use

To investigate whether age had an effect on intuitive use
Experiment 3 Findings

![Graph showing the time to complete tasks (secs) with different configurations and age groups.]

**Configuration**
- Default
- Location
- Location-Appearance

**Age Group**
- 18-29
- 30-39
- >40

**Time to complete tasks (secs)**
- Range from 0 to 1200 seconds

Introducing the findings from Experiment 3, this graph illustrates the time taken to complete tasks under various configurations. The data is categorized by age groups, showing significant variations in performance across different conditions.
Experiment 3 Findings

![Graph showing intutive and correct uses (%) across different age groups.](image)
Experiment 3 Findings

The change in appearance of the features had more effect on speed and intuitive uses than location.

Findings support those of Experiment 1 and 2.

Intuitive interaction depends on past experience.
Conclusions

Intuitive interaction is based on past experience, which can be transferred between different products or systems to allow people to use a new interface intuitively if they have used similar features previously.

The appearance of a feature is more important for intuitive interaction than its location.
Conclusions

Age affects intuitive interaction. Older people are slower at completing tasks and also have less intuitive uses.

This research has successfully applied intuitive interaction to the detail design of an interface.
Principle 1

Make function, location and appearance familiar for features that are already known.

Use familiar symbols and/or words, put them in a familiar position and make the function comparable with functions users have seen before.

Principle 1 involves applying existing features, labels or icons that users have seen before to similar products that perform the same function.
Principle 2

Make it obvious what less well-known functions will do by using familiar things to demonstrate their function.

Principle 2 makes something completely new familiar by relating it to something already existing.

This principle requires transfer of features from differing domains.
Principle 3

Increase the consistency within the interface so that function, appearance and location of features are consistent between different parts of the design and on every page/screen/part/mode.

Use redundancy in order to maximise the number of users who can intuitively use the interface and the ways in which they can choose to complete their tasks.
Contributions

This research has empirically established that intuitive interaction and familiarity are related.

This research has established how the different factors of function, appearance and location can affect intuitive interaction, and successfully applied intuitive interaction to the detail design of an interface.
Contributions

The principles and the model that have been developed can be used by designers to facilitate intuitive interaction with products.

This work may be particularly important for the design of those interfaces that are based on new technologies or formats and so have no established conventions.
Contributions


Use of video observation software to make decisions about the type of cognitive processing a participant is using during an experiment.

Use of the three factors of function, appearance and location to unravel the ways in which users experience problems with an interface.
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Thank you

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Publications

The following papers have been published based on the work reported here:


All papers are accessible at http://eprints.qut.edu.au/view/person/Blackler,_Alethea.html