# AFFECTIVE DESIGN FOR THE THIRD AGE: EXPLORING ANALOGUE METAPHORS FOR PRODUCT INTERFACES

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## ABSTRACT

Anecdotal evidence suggests that many elders of the baby boomer generation find it difficult to operate contemporary everyday products such as microwave ovens and cellphones.

An affective design approach - encompassing the breadth of emotional, cognitive and intimate connections between product and user - offers a perspective on why this occurs and highlights the role of design in developing intuitive product interfaces.

Most products that are controlled and accessed through digital interfaces have been developed on the assumption that an electronic interface is inherently better than a mechanical one. The parallel assumption – that digital information is better than analogue – is not always true but is still an approach that prevails in product design, often owing to cost and manufacturing convenience.

This study proposes that many product interfaces are predicated on what can be termed *digital thinking* - interactions with electronic products that make sense to people familiar with digital products but are counter-intuitive to people grown up with mechanical interfaces. These fundamental differences mean that elders – who, for a number of reasons, are less likely to be digital thinkers - are frustrated by complex product interfaces whose basic assumptions they do not understand.

This paper uses everyday products as case studies to demonstrate the concept of digital thinking and its influence on affective design issues. It is further proposed that embedding familiar mechanical or analogue metaphors – *analogue thinking* - into product interfaces is a more appropriate starting point for products that will be used by elders.

## INTRODUCTION

Exemplifying international trends, New Zealand's population over the age of 65 increased by 20% to over 526,700 in the ten years 1997-2007 (Statistics New Zealand, 2008). As the number of people increase, manufacturers increasingly see elders as a lucrative niche market. However, approaches to product design for elders are often stereotypical: they either bury technology underneath a simplistic exterior or assume that the primary issues for elders are visual impairment and reduced motor control (Figure 1). While these are certainly issues, the problem that faces many elders is the fundamental disconnect between their previous experience with everyday products and the assumptions embedded in contemporary product interfaces.

*Figure 1: Bell 'Big Button' telephone exemplifies a typical approach to designing products for elders.*

What is happening inside the product is of little interest to users of any age, but the interface - those parts of the product that channels the information flow between the user and the product, both in a physical and cognitive sense – is of critical interest. Contemporary product interfaces assume that users are familiar with the basic ideas behind digital interfaces. These assumptions centre on the differences between analogue and digital systems: not just in an engineering sense, but in the design of the interface itself.

This disconnection occurs despite the increasing sophistication of product interfaces. While advanced products such as Apples' iPhone can be controlled by gestural movements across a multi-touch screen, many people still struggle with operating everyday products such as microwaves and DVD recorders. Anecdotal evidence suggests that elders, in particular, find the operation of complex contemporary products a daunting and frustrating experience.

This study is the beginning of a process to understand what causes these frustrations and propose alternative product interfaces based on an amalgam of the strengths of analogue and digital product interfaces. While the temptation is to concentrate on products specific to elders - like personal medical emergency alarms - the poor design of interfaces prevents elders from accessing the full range of functions in many everyday products. Therefore, the focus of this study is on how these products can be accessed by elders.

## METHODOLOGY

This research was prompted by questions raised through personal observations. In the context of social science research, Tolich and Davidson (1999) describe the approach of building from an observation and constructing a hypothesis as inductive research.

> *"Inductive logic research allows you to* [move] *from data collection to the developing of formal theory."* (Tolich and Davidson, 1999. p. 32)

To help develop an understanding of the issues highlighted in the initial observations, this study employs industrial design research processes and analytical tools. The umbrella approach is 'affective design': an acknowledgement that peoples' experiences with products are not limited to anthropometrics and biomechanics but constructed from the breadth of emotional, cognitive and intimate user experiences. (Affect Research Centre, 2009)

While not an industrial design-specific research method, case studies are an appropriate method to assist in the development of a hypothesis through the assembly of data from a variety of sources.

> *"… the case study's unique strength is its ability to deal with a variety of evidence – documents, artefacts, interviews and observations – beyond what might be available in a conventional historical study*." (Yin, 2003. p. 8)

## PERSONA EXAMPLE

The 'persona' is a research method used in industrial design to capture people's experiences and motivations. Personas are created to reflect real experiences and people and allow a design and development team to more objectively understand how users might experience their product (Laurel, 2003).

Following is an example of a persona applicable to this study:

> **Mary Nunn**
> *A retired university lecturer, Mary was born in the early 1920's and is now in her mid-80's. She has a Queens Service Medal and an honorary Doctorate of Literature. She has travelled widely, and has never shied away from new experiences. She is physically active and reasonably healthy (apart from arthritis developing in her hands and hips), very widely read, articulate, enquiring, and intelligent. She keeps occupied in her retirement by contributing to community groups and supervising post-graduate students.*

*In her capacity as supervisor, it is useful for her to email her students, which she does using an Apple iMac. She finds the mouse awkward, the Macintosh OS10 interface frustrating, and does not understand the file management structure or graphic presentation – so she can create files but has problems finding them again. In terms of other products, she can use a cordless phone, a stereo, and limited functions on a microwave, but cannot operate a VCR, DVD player, cellphone or digital alarm clock.*

*Despite being shown how to operate more complex products, the details of operation make no sense to her – and this threatens her sense of independence. Mary will not fiddle or experiment with products she does not understand as she feels she might break them. Mary has trouble with the idea that the same button does different things: she cannot connect what's happening on a screen to a change in input or operation.*

The cause of Mary's frustration is not a lack of intelligence, and lack of experience with complex electronic systems is a symptom rather than the cause of the problem. Based on the issues identified through this persona, this study suggests that it is the characteristics of the systems themselves that create a barrier to access.

For example, Apple's Macintosh OS10 interface includes an easily customisable 'dock' that allows users to add, move and remove icons. It also allows Mary – who is hesitant with a double-click, and moves the mouse as she does so – to accidentally remove an icon from the dock without having any equally easy way to reinstate it. So, while OS10 is identified as a more suitable computer interface for elders than Microsoft's Windows (Ojeda-Zapata, J. 2009), the details still generate frustration.

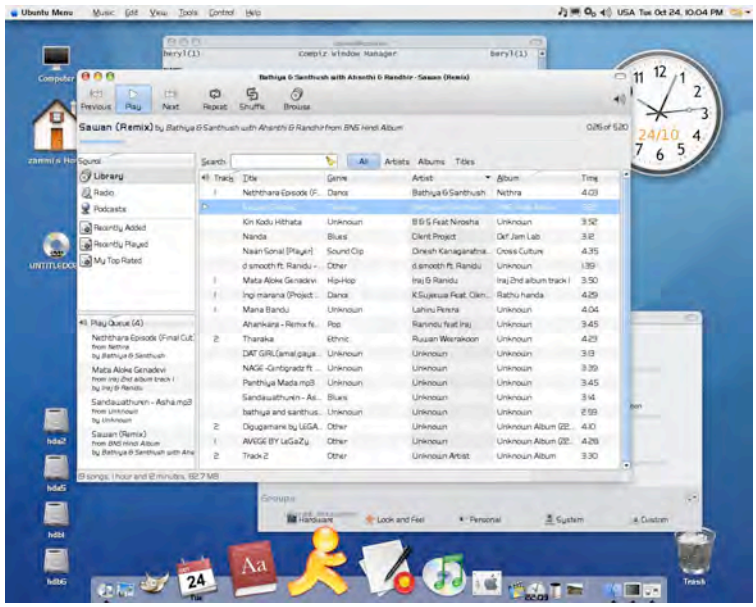

*Figure 2: the customisable 'dock' in Apples' Macintosh OS10 interface is shown at the bottom of this screenshot.*

## INTERFACE DESIGN REVIEW

This study proposes that there are two systems on which the design of product interfaces are based: *digital* and *analogue*. Table 1 shows the characteristics of these two systems.

| | **Digital system** | **Analogue system** |
|---|---|---|
| *Basic premise* | On or off. | Scaled / relative. |
| *Physical system* | Electronic or electrical | Mechanical or electrical. |
| *Strengths of system* | Precise communication of data within a small product footprint. Reliability. | Simple and intuitive interface. |
| *Weaknesses of system* | Complex interface. | Imprecise communication of data unless large product footprint is used. Limits the ability to control complex products. |
| *Typical controls* | Buttons. | Rotary knobs, sliders, levers, switches. |
| *Operation / input* | Same button performs different functions if pressed longer or several times, chords (combinations of buttons): longer / multiple press alters setting, double click, software context-sensitive. | Movement of control, More pressure, up/down, left/right, clockwise / anticlockwise assumptions conform to gestalt understanding. |
| *Feedback / output (other than through system change)* | Direct: clicks through controls Indirect: sounds, display | Direct physical feedback through controls (resistance), position of control shows start / finish plus relationship between current point and start / finish, sounds |
| *Visual feedback* | Digital / numeric display (eg LCD or LED) | Position of control, display change. |
| *Tactile feedback* | Through button (resistance, detent, etc) | Movement of control, detent |

*Table 1: Characteristics of digital and analogue interfaces*

The use of digital interfaces are used for most contemporary products on the assumption that an electronic interface is inherently better than a mechanical one. To extend the idea of assumptions further, within the context of product and software development Alan Cooper (1999) observes that the high level of expertise required to develop software tends to disconnect the developers from the people who will actually use the final product (Cooper, 1999). Cooper further contends that the focus of the complex product development process is on software and hardware efficiency rather than the development of the user experience.

This is supported by interface / experience designer Bill Buxton, who notes that "*generally, the last thing you should do when beginning to design an interactive system is to write code*" (Buxton, B., 2007. Pg. 240), and that design processes should begin with an understanding what users want and need.

Elders are distanced in two ways from this development process. Firstly, as a group they are unlikely to be strongly represented in software development teams, and secondly they have not previously been a high-priority market for manufacturers of electronic and consumer products.

A significant proportion of development effort for digital product interfaces focuses on approximating aspects of analogue / mechanical interfaces – tactile and aural confirmation for example. However, the connection between physical action and sound is not as direct as evident in many mechanical and electrical systems. Multiple confirmation sounds may also confuse or be missed entirely by elders whose hearing is degrading.

***Case study: alarm clocks***

Alarm clocks are a useful case study that demonstrates how user experiences are affected by the differences between digital and analogue systems, as there are both analogue and digital versions of the product (Figure 3).


*Figure 3: Typical analogue and digital alarm clocks.*

The brief analysis in Table 2 suggests that compromises in the quality of the user experience have occurred through the adoption of digital interfaces for alarm clocks. However, for elders there is no requirement for an analogue interface to be meaningfully or measurably better than a digital interface: the key aspect is that the assumptions inherent in the design of the interface are familiar to them.

| | Digital experience | Analogue experience |
|---|---|---|
| *Time display* | Digital (hour / minutes) plus am/pm. Slower to read. | Dial / hands analogue display (hours / minutes). Quicker to read. |
| *Time setting* | Change time / alarm button to 'time'. Simultaneously hold down 'hour' and 'adjust' buttons to change the hour display (cycle through 24 hours) then a similar process to alter minutes. The system only adjusts forwards through hours. Speed of change is constrained. | Rotate 'time' knob. Speed sensitive, with a direct visible and tactile connection between knob rotation and clock hands. |
| *Alarm on / off* | On / off: slide control. Silence alarm: 'sleep' or 'off' button. | Silence alarm: push button. |
| *Alarm setting process* | Change time / alarm button to 'alarm. Simultaneously hold down 'hour' and 'adjust' buttons to change the hour display (cycle through 24 hours) then a similar process to alter minutes. The system only adjusts forwards. Speed of change is constrained. | Rotate 'alarm' knob. Speed sensitive, with a direct visible and tactile connection between knob rotation and clock hands. |
| *Alarm display* | Only visible when the alarm slide control is set to 'alarm' or alarm sounds. Accurate to the minute. | Dial / hand. Visible all the time. |

*Table 2: Alarm clocks: comparison of digital analogue experiences*

## HYPOTHESIS

In the context of design for elders, this study proposes that people approach product interfaces from one of two standpoints: *digital thinking* or *analogue thinking*. These terms describe the conceptual framework that people use when developing and using technology.

People with a strong technical background such as software engineers and designers are more likely to be *digital thinkers*, while elders are more likely to be analogue thinkers as their formative experiences with products will have been influenced by the analogue thinking embedded in these products. This is not necessarily an age-related phenomenon, as digital technology is a relatively recent development. However, frustrations are the likely result if there are significant mismatches between the conceptual frameworks of the users of the product and those that develop them.

As Table 2 suggests, there are benefits in both digital and analogue interfaces. The intent of this study is not to advocate for a wholesale return to analogue control of products, but to propose an approach that melds the

intuitive operation and strengths of analogue controls with the ability to control the complex functions of digital products inherent in digital interfaces.

Simply grafting rotary controls onto a microwave oven will not improve its usability for elders. The second part of the hypothesis suggests that embedding metaphors for familiar mechanical or analogue ideas in the design of product interfaces may increase usability for elders. A *metaphor* – a reference to a familiar idea rather than a literal representation - may present the interface in a manner that is familiar to analogue thinkers.

Figure 4 shows the Muji wall-hung CD player: an example of digital technology packaged so that it can be understood by analogue thinkers. The basis for this product is a kitchen fan: the metaphor connects the visible, mechanical spinning fan with the spinning of the CD (which is typically invisible) and is operated is by a pull cord.


*Figure 4: The Muji wall-hung CD player refers to a kitchen fan as a metaphor for a spinning compact disc.*

While design for elders is unlikely to have been the main aim of the product, this design demonstrates how a rethink of the interface can change the experience of the product. This product also demonstrates that the successful metaphors might not be the obvious ones.

## ELDERS, ANALOGUE THINKING AND DESIGN

There are a number of metaphors that might be appropriate for products used by elders which can be applied to both the overall format of the product and the detail of its controls.

It should be noted that these ideas are proposed without explanation of technologies that might be required to realise them. Rather than letting technology determine the experience for elders, an affective design approach

is to define the appropriate experience and develop a product to deliver that experience.

***Overall format***

The metaphor of a book has relevance to elders for a number of products. Books are a very familiar concept, and allow information to be easily structured and located. It is proposed that a physical component of the product would turn in an analogy to a page.

As manufacturing technologies improve, the reliability of digital technology is being applied to physical / analogue controls. This opens up the possibility of applying physical elements of the metaphor to a complex product.

As a screen paradigm this approach is already used, but does not have the depth of representation of a physical metaphor. As an electronic / screen representation, it would be possible to control a book metaphor using a gestures, but the applicability of a gestural interface to analogue thinkers needs to be tested as it lacks a physical interaction.

Book metaphors could benefit the following product areas:

- **Communication / telephone / cellphone**: based on an indexed telephone book or flip file. The phone would have two parts: the handset and the base or book itself. The indexing can be used to assign different functions to buttons. Contacts are accessed through flipping indexed pages. A physical dial or metaphor such as the 'click-wheel' used on Apples' iPods could be used for dialling. The physical size of a product of this nature may be more appropriate for elders.
- **Cooking / microwave**: based on a cookbook. Flipping 'pages' could allow access to dedicated 'chapters' of the product that access more complex operations such as defrosting or reheating. Heating times can be entered through an analogue clock interface using rotary knobs.
- **Memories**: a photograph album is an obvious metaphor for storing and accessing photographic memories. Turning pages moves forwards and backwards through the images, with an analogy for a bookmark functioning as a pause control. Notes for individual photographs could entered directly from a small scanner for handwriting that refers to a pen and notepad. Settings could be changed through the notepad as well.

***Details***

Several products could employ analogue clock references to improve access to and control of complex product functions. Using the alarm clock case study as a start point, an analogue clock metaphor could be the basis of programming a media recorder such as a DVD player: a rotary control could be used to enter times on a representation of a clockface, either on the product itself or presented through the television screen. In a similar vein, a representation of a calendar (also accessed through a rotary control) could be used to select dates.

## CONCLUSION

As noted earlier, this is the beginning of a process rather than the end. This is particularly evident in the product concepts, which are still sketches of ideas and are well short of firm product proposals. Further investigation needs to be undertaken to explore the relevance of the digital thinking / analogue thinking hypothesis to interface design.

Another research aspect that requires investigation is the possibility that this particular issue will decline as Generation X - who are familiar with digital products - becomes older. It is also hoped that access to newer technologies will become more transparent as product design becomes less dependant on technology and more sensitive to the latent needs of users.

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