FLAT DESIGN VS. SKEUOMORPHISM – EFFECTS ON LEARNABILITY AND IMAGE ATTRIBUTIONS IN DIGITAL PRODUCT INTERFACES

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ABSTRACT

In 2013 Apple introduced a new interface design for their mobile devices. Whereas the previous design language made heavy use of real world metaphors and cited material like wood, paper, and leather, the new interface now has a reduced and immaterial look. Avoiding metaphoric imitations its colourful graphic language is mostly non-representational. The pros and cons of both interface design approaches have been discussed in the interface design community ever since. Apart from aesthetic judgements, especially the question of usability and learnability has been debated heatedly. In this paper the theoretical concepts that are relevant for usability and learnability discussion, and a survey on how the interfaces' reception changed over time, will be presented.

Keywords: Interface design, multi-touch, mobile, flat design, skeuomorphism

1 INTRODUCTION

In the last decade, the amount of products that integrate digital interfaces has increased significantly. In this domain of hybrid products, product design education should address also developments and trends in interface design. A recent trend gained momentum when Apple released its new operating system for mobile devices (iOS) in September 2013. It employs a colourful, yet abstract design language, [1] abandoning the approach Apple had been following for the past six years. The old design approach was based on imitating real life artefacts, their physicality, and their materiality. Critics of these imitative interfaces introduced the term 'skeuomorph' [2] – suggesting that this approach is decorative and lacking reason in functionality and usability. In contrast, the new approach abstains strictly from using faux materiality and three-dimensional effects like drop shadow, hence its byname 'flat design'.

Interfaces today are partly based on dominant and cognisant metaphors like the 'book' or the 'waste paper basket', which provide models for whole operating processes and interaction sequences. But also on a small-scale level, interfaces make metaphoric use of physical analogies that indicate which parts a user can press, click, or slide, etc. These phenomena have been described as 'indicating functions in product semantics [3] and as 'affordances' in cognitive psychology [4] One of the criticisms towards flat design is, that it lacks these affordances and therefore is less self-explicatory and less usable. This hypothesis will be described considering diverse user groups ('Digital Natives' vs. 'Immigrants'). [5]

The findings from both sections, literature based and empirical, are believed to be also relevant for classic products like cars, machines, consumer electronics, etc. Even if these products employ physical interfaces, the implications of physical affordances vs. symbolic abstraction are transferable. In the age of digitization and diminishing mechanical constraints, the expected learnings are believed to be relevant for product design education. In order to understand the current shifts in interface design and to introduce to the related discourse, it is necessary to review some classic topics of human computer interaction and interface design. First, the concept of *metaphor,* which had been discussed thoroughly in the 1980s and 1990s. [6, 7] Second, the concept of *affordance,* which has played a key role in the discussions about self-explanatory easy-to-learn products since the late 1980s. [4] And third, the concept of *digital native* users, which surprisingly had been introduced already over a decade ago [5] and needs to be updated today. In the last part of the paper, a concise empirical study will be presented

on how the subjective perception of iOS6 and iOS7 has changed during the eight months since the presentation of iOS7.

2 METAPHORS

Physical artefacts can often be understood by merely looking at them. We are capable to figure out how a mechanism works by exploring it with our eyes, depending on previous knowledge and experience we see possibilities to move, press, or turn, and we know and recognize mechanical constellations that restrict these possibilities. This does rarely happen when we look at digital equipment. A look into the hardware does not easily tell if we are dealing with a GPS-tracker, a mobile audio recorder, or a control unit for heating systems. Even if a look at the digital statuses and processes inside the silicone modules was possible, it would not be meaningful for us – meaningless zeros and ones. To overcome this problem, 'humane' interfaces were invented, which are all based on language and (visual) metaphors.

The big era of the metaphor in computer interfaces began when the first affordable pointing device – the 'mouse' – and enough computing power for a graphical display was available. Now the transfer of real life concepts to the computer screen had become technically feasible. In the late 1970s and early 1980s a new visual interface paradigm imitated the real life context of the new target audience: the office. Until the 1970s only specialists could operate computers. Now 'simple' office clerks and secretaries were to use them. To lower the cognitive effort and cost of learning, familiar items where imitated: a desktop, files, folders, and waste paper baskets. [8]

A second wave of real life metaphors became fashionable with the 1990s 'multimedia' interfaces. Driven by the upcoming World Wide Web, computer games and multimedia edutainment, the computer started to migrate into home offices and living rooms. Again metaphoric approaches were used to facilitate computer use for everyone. Microsoft even developed a Windows substitute based on a visual *living-room* metaphor (Microsoft Bob). [9] The idea behind this approach is, simply put: Give inexperienced people what they already know: Office people get an office interface, users who use a personal computer in their free time get an living-room interface. Still the approach failed this time, because the desktop metaphor had already been internalised by too many users – and it simply fits better to most of the activities and functions offered by a computer at that time.

Until Apple introduced the iPhone in 2007, the discussion about the pros and cons of strong real life metaphors stagnated. Still, there had been a continuous discourse about if and how to move interface design 'beyond the desktop'. However, simply rebuilding the physical world in interfaces was hardly considered an innovative option anymore. Along with the multi-touch interaction paradigm, Apple then revived the idea of transferring knowledge from the real to the digital world and resumed the discussion about metaphors. Very similar to Microsoft Bob, books on the iPhone and iPad looked again like real books with stitched leather covers stored in wooden shelves, calendars showed chrome plated spiral binding, and so forth. [10]

3 AFFORDANCE

As said at the beginning of the section about metaphors, we often figure out what an object allows us to do with it, by mere visual exploration. Based on experience with other objects in our environment, we learned about the laws of physics, mechanics, and about relations between our body and the things that surround us. Seeing a gap or a hole, we directly 'see' for instance if we would be able to insert a fingertip or only a fingernail. Gibson, a cognitive psychologist, coined the term *affordance* to describe this relation between a subject and an object. [4] Even earlier, these self-explanatory functions had been described as *indicating signs* in German product design theory [11], and in the product semantics approach [12]. These *designed* affordances (from the designer's point of view), or *perceived* affordances (from the user's point of view) can also be understood as *micro-metaphors*. Whereas for instance music software often imitates a recording studio and its equipment on all levels – workflow, spatial layout, interaction patterns with modules like mixers and effects, and colours and materials – the design of affordances only employs basic physical and mechanical rules. The orientation of the groove of a slider for instance clearly indicates in which direction the slider can be dragged. To do so, a photorealistic rendering of a brushed stainless steel slider is not necessary. To communicate the mechanical restriction to only one direction a simple black and white representation will suffice.

Along with visibility, consistence, and feedback, creating *artificial affordances* used to be considered one of the key factors for self-explanatory, easy to use interfaces. [12] Following this theory, buttons indicate their 'clickability' by a bevel effect and for instance a ribbed surface indicates the 'dragable' corner that allows resizing a window. Both of these examples make use of moderate 3D-effects to create the desired affordances. This explains why the interface design community has been engaged in a heated debate about the trend towards *flat* design. To put it in simple terms, the main argument of the critics of flat design is: Without 3D-effects there are less affordances, therefore the interface is less self-explanatory, and the result is bad usability.

4   CHANGING USERS

In 2001 Prensky introduced the term *Digital Natives* to describe a new generation of users who 'have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age'. [5] While a lot of Prensky's claims are still valid today, some of his examples for the Native/Immigrant-divide show their age of more than a decade. In 2001 a Digital Native grew up using a cell phone. Today using a cell phone with hard keys is considered digital *naïve*. Today's Digital Natives use smart phones that combine all the different gadgets Prensky mentioned in a single mobile multi-touch device: 'computers, video-games, digital music players, video cams, cell phones'.

Anyone who ever saw a two-year-old child using an iPad can anticipate that a new generation of Digital Natives is on its way. However, also today's Digital Immigrants are different then ten years ago, they are a much more heterogeneous group than in 2001. There are those who were driven out of their analogue world by force – due to changes in their professional environment or by social peer pressure, and there are the ones who immigrated eagerly, attracted by the promises of the new digital world. Furthermore, a lot of today's Digital Immigrants have been immigrants for more than two decades now, so their 'analogue accent' becomes weaker and weaker. For them, a double click may feel already more 'natural' than cracking a nut or peeling an orange.

For both types of users, the second generation of Digital Natives and the assimilated Digital Immigrants, the idea that interfaces are being learned by transferring knowledge from the 'real' (i.e. analogue) world to the digital world may loose its dominance. Experienced Digital Immigrants rather transfer knowledge they previously acquired using *other* interfaces, as opposed to employing knowledge they acquired interacting with the physical world. [13] Children today learn and grow up in both worlds more or less *simultaneously*, which makes a strong and obvious metaphoric transfer between these worlds obsolete. But will it also make the small-scale metaphors behind designed affordances obsolete? Will a flat button do the same job as a bevelled one for second generation Natives and assimilated Immigrants?

Figure 1. Old and new sliders of the unlock screen of Apple's iPhone:
Strong affordances based on physical micro-metaphors (left). Weak affordances by only an arrow and a left to right animation effect (right)

5   FLAT DESIGN VS. SKEUOMORPHISM

A skeuomorph, as defined by the Oxford Dictionary, is 'an object or feature which imitates the design of a similar artefact made from another material', or for the domain of 'computing': 'an element of a graphical user interface which mimics a physical object'. [2] The term had been used in archaeology for more than a centennial to describe for instance residues of typical forms of metal vessels found in copies that were made of clay instead of metal. [14] Recently the term 'skeuomorph' was frequently used to discredit Apple's design approach for mobile devices and its imitations of stitched leather, wooden shelves, etc. Traditionally, the esteem of imitations and fakes is not too high in the design community. Therefore, it came at no surprise that parts of the interface design community celebrated Microsoft's new version of *Windows Phone* in 2010, which was designed in a visually consequent flat

and abstract style, reminding of classic (Swiss) typography. It is devoid of three-dimensional effects like bevel, emboss, or drop shadows, and it refrains from citing material of the physical world. Put positively, it solely employs solid colours and clear typography. However, also abstract interfaces like Windows Phone are based on citations originating from the non-digital world - in this case the source is the typographic style of the 1960s, as well as classic airport signage and guidance systems. [15]

Whereas the use of faux leather and wood in digital interfaces can be considered as *kitsch*, the idea that there could be anything like 'authenticity' or 'honesty' in the design of digital interfaces is, strictly speaking, absurd. [15] There is no way of designing an interface appropriate to any material. Anything seen on a digital screen is based on metaphors and conventions. What might be perceived as a genuine digital look is the result of a long history of contingent design decisions that formed a visual tradition. These stereotypes of the digital world are reproduced regularly in Hollywood movies, where for instance password screens (to cancel the countdown) cite interfaces of the 1970s, displaying green type on a black screen.

6   SURVEY ON IMAGE ATTRIBUTIONS

After Apple presented a preview of its 'flat' mobile operating system iOS7 on 10 June 2013, the author carried out a first survey only three days later, in order to document the very first impression the new interface design evoked. The same study was repeated eight months later, in order to document if and how images and attributions of both the old and the new interface have changed over time. The studies were to provide insights on how users of mobile devices adapt to a rather radical redesign measure and how the perception of the two interface versions changed after eight months of exposure to the new iOS. After the survey informal discussions were held in order to gain insights that would help to analyse and interpret the results. Both surveys used the same semantic differential to sample associations attributed to both the new and the old interface. The bipolar pairs, polled on a five point scale, were:

- professional – amateur
- cheap – expensive
- serious – fun
- finished – unfinished

- happy – sad
- grown up – childlike
- loud – quite
- dynamic – calm

- tactile – not tactile
- natural – artificial

Before the questionnaires where distributed, screenshots of iOS6 and iOS7 where displayed by a projector. Both surveys where conducted in regular classes of a Bachelor and Master program in Business Communication Management. In the first survey 34 students took part, in the second 69 different students of the same program in the same semester. Age was between 19 and 42, with a median of 27 years. Only 24% of the participants were male. Hence, social background, age, and gender distribution are far from being representative for average population. However, the fact that the participants' smart-phone use is clearly above average leads to higher relevance in the target group of smart-phone users: 91% of the participants owned a smart-phone (49% an Apple iPhone). Only 9% use a classic cell phone with hard keys.

7   SELECTED RESULTS

The informal discussions after the survey revealed some unexpected connotations of the terms used in the semantic differential. Usually this can be realised and avoided by conducting a pre-test, which in this case was not possible, because the goal was to preserve the impression the participants had after they saw the new iOS for the very first time. The parameter 'cheap – expensive' was intended to relate to the look-and-feel of the interfaces. However, the discussion revealed that many participants confused interface and overall brand, stating that 'Apple is always expensive'. Also the 'finished –
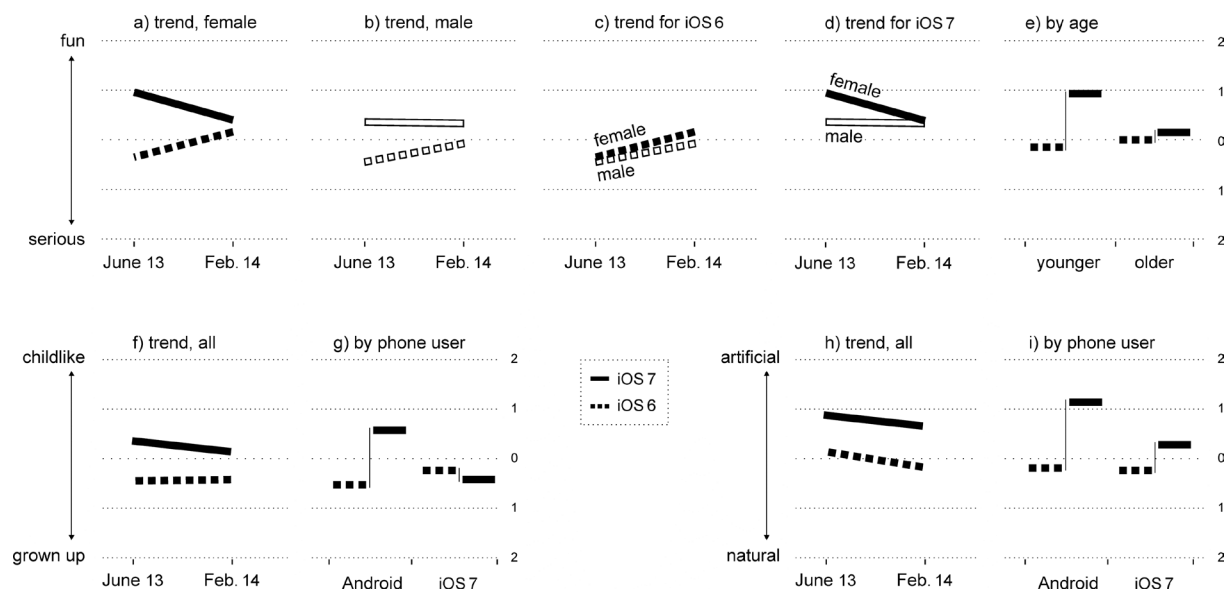
Figure 2. Trends and differences in attributions to iOS6 (dotted) and iOS7

unfinished' pair was not understood in the intended sense. Again it was intended solely as a description of the look of the interface, the discussion revealed that 'finished – unfinished' was often confused with product age. Then the evaluation of the questionnaires revealed that often the pair 'tactile – not tactile' had been skipped. Obviously a lot of the participants had problems understanding the meaning of 'tactile' in this context. This is why the mentioned parameters were not used in the results.

Unsurprisingly, in both surveys the very colourful iOS7 was attributed more 'fun' and 'childlike' than the skeuomorph iOS6. Correspondingly, iOS6 was rated more 'grown-up', and 'serious' (see figure 2 a and f). Whereas older students (aged 27 to 42, median = 29 years) do not see too much difference between the two versions of iOS, the younger students (aged 19 to 26, median = 23 years) rate them more extremely different (see figure 2e). After only eight months, the novelty effect already seems to wear off: The new iOS7 drifted towards 'serious' and 'grown up', and the old iOS6 was rated more 'fun' than before (see fig. 2a and f). This trend is even stronger in the female part of the participants. In the male part only the old iOS6 moved from clearly 'serious' towards more 'fun', whereas the perception of iOS7 almost remained unchanged (see fig. 2 a, b, c, d).

Also subjective expressions of opinion were stronger in the informal discussion after the first survey: 'too garish and loud', 'looks like a toy', etc. In a smart-phone context a 'fun – serious' scale does not have a clear positive – negative connotation. However, 'childlike – grown up' does have positive – negative implications. It comes to no surprise that the iOS7's rating as rather 'childlike' stems mainly from Android users, whereas iOS7 users rate their operating system of choice even a bit more 'grown up' than the old iOS6 (see fig. 2f and g).

As expected, the abstract and 'garish' iOS7 is rated more 'artificial' (see fig. 2h), whereas iOS6, which cites natural material like wood, leather, and felt, is rated more 'natural'. However, both surprisingly show a trend towards 'natural'. In the case of iOS7 this might be due to a habituation effect. The users simply got used to the vibrant colours. An interesting fact is that Apple and Android users rate the old iOS6 almost equally neutral (between 'artificial' and 'natural'), whereas they rate the new iOS7 more extremely different (see fig. 2i, which shows an average of both surveys by user type). This is probably due to the rather negative connotation that 'artificial' has today (compare: 'artificial flavour' vs. 'natural grown'). Therefore Android users will rate an Apple OS more easily 'artificial', i.e. in a negative way, whereas Apple users will want to avoid negative connoted ratings – even if they actually like the 'artificial' look.

8   CONCLUSION AND OUTLOOK

Of course a survey based on subjective impression does not produce any knowledge about the actual learnability or usability of the examined products. This could only be achieved in a more objective way by user testing. Still, the clear trend that iOS7 becomes more accepted as a 'serious' and

'professional' tool over time is revealing that the subjective attributions may be disconnected from factual usability. Another interpretation is, that affordances based on physical micro-metaphors are not needed anymore, because a majority of the users have been using iOS6 for several years and do not need metaphoric-physical hints anymore, for instance to find out how to unlock an iPhone. The 'unlock-slide' has become a well-trained habit. Even non-iPhone users have seen this interaction pattern so often that the flat and typographic interface works fine – in spite of its lack of affordances. The matter seems to be too complex to come up with clear and simple recommendations – like which approach is more suitable for which target audience. However, it seems probably today that also the long-term trend will lead towards abstraction, especially when we consider that digital natives are introduced to today's digital world almost simultaneously with the physical world. One decisive question will be, if there will be enough Digital Naïves and early Immigrants left when the next interface paradigm change will come. Then, interface design might again 'fall back' into using real life metaphors to attract new users – just like it did when GUI emerged in the 1980, with Multimedia in the 1990s, and when Multi-Touch was popularized in 2007. We might discuss this further at E&PDE 2025.

Concerning product design education, the topic should be covered more intensively, for the continuing digitalization unavoidably leads to a loss of physically determined indicating signs. Even in classic product domains, we are confronted with interfaces that are completely detached from mechanics and physical coupling. Even physical controls like a car's steering wheel, and the accelerator and brake pedals have technically become mere digital input devices. In the case of the steering wheel, tradition constitutes a strong argument. But in many other cases, like radio or heating controls, we have to discuss with what kind of signs operability and use patterns can be communicated in future.

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