Jo Li Marie-Joelle Tay
Curtin University of Technology

Interaction, Interface and Interactivity

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Introduction

The introduction of computers resulted in a new way of interacting. As computer technology grew more advanced, allowing humans to interact with computers in more complex ways, greater care had to be taken in the design of computer systems. Eventually, design disciplines began to evolve out of the gaps that arose. This paper looks at some of these design disciplines, specifically interface design, user interface design, interaction design, experience design, user experience design and interactive design.

To understand the complex relationships between these various design disciplines, it is useful to know the history and origin of both the term and the discipline. The first half of this paper looks briefly at this to clarify the distinctions between them, while the latter half looks at how interactivity features in each of the six design disciplines listed above, and how interactivity connects them together. It also raises questions about how we view interactivity in these disciplines.

Interface design and user interface design

Initially, interface designs were focused on achieving technical function, but over time, the focus began to shift 'from efficiency and performance in relation to solving work-related tasks to user satisfaction with and experience of the product' and technology-based products went 'from being helpful and useful only to being fashionable, fascinating products that can be desired' (Jensen 2013, p. 184).

Two factors likely contributed to this: firstly, the move from fixed-program computers to stored-program computers. Secondly, computers started being used *en masse* by the general public. These same two factors are also tied to the origin of the terms "interface" and "user interface" (Grudin 1990).

The first computers were fixed-program computers that could only perform a single task and had to be physically rewired for a different task (O'Regan 2008). The interface was the boundary between the programmer and the computer, and since the first computer users were equipped to make any necessary changes themselves, there was no need to distinguish between the user and the programmer (Grudin 1990). Little thought was spared for the quality of the interface design.

Then stored-program computers were introduced that could be instructed to do several different tasks without having to be physically rewired each time (O'Regan 2008). This eventually led to the introduction of interactive terminals, which 'changed the user interface … by changing the user' from programmers to non-programmers (Grudin 1990, p. 263). As the user interface established itself in human-computer interaction (HCI) research, the interactive capability of terminals together with the introduction of visual displays gradually brought about a need to address more than just the perceptual, motor and cognitive issues. The increasing use of colour, graphics, windows, and other capabilities saw graphic artists being brought in 'with their different approaches to design and evaluation'. (Grudin 1990, p. 264)

Arguably, it is at this point that user interface design as we know it today was born. Bridging the gap between human-computer interaction and graphic design, today's user interface design 'brings together concepts from interaction design, visual design, and information architecture' (U.S. Department of Health & Human Services 2014).

Interaction design (IxD)

When Bill Moggridge gave the first conference presentation on interaction design in 1984, he saw it as 'the equivalent of industrial design but in software rather than three-dimensional objects', 'dedicated to creating imaginative and attractive solutions in a virtual world, where one could design behaviors (sic), animations, and sounds as well as shapes'. (Moggridge 2007, p. 14)

The early years of interaction design were decidedly interdisciplinary, since the absence of formal interaction design education, meant that designers from various backgrounds needed to work together. In Moggridge's first interaction design team, for example, 'One had been trained in information design, one in graphics and another in industrial design' (Moggridge 2007, p. 14). This mixing of disciplines echoes the postmodernist design thinking that dominated during the late 20th century, in particular its penchant for eclecticism, collage and pastiche. It was also a precursor

to the major paradigm shift that saw the boundaries between design disciplines become increasingly blurred and paved the way for new design disciplines such as experience design.

Those working amidst these blurred boundaries began to shift their focus: from working within their defined discipline to working toward ‘designing things so that they’re right for people’ (Smith in Moggridge 2007, p. xiii). As Smith explains, it is no longer enough to build interactive systems that ‘focus on the technology that makes them possible’, consideration must also be made toward ‘the interfaces that allow people to use them’ since ‘people … and their goals are the *point* of our systems, and we must design for them’ (Moggridge 2007, p. xii). Thus, in interaction design it is not enough to simply aggregate the individual design outcomes from each discipline. Interaction design requires an approach to the design of interactive systems that is both multidisciplinary and interdisciplinary. It should considers not only how they look and behave, but also the ‘*quality’* of how they interact with users (Moggridge 2007, p. xvi, emphasis in the original).

Although Moggridge originally saw interaction design functioning within ‘a virtual world’ and ‘in software’ (Moggridge 2007, p. 14), the discipline has evolved. Its evolution is in part dictated by its name – while Moggridge originally used “interaction” in reference to human-computer interaction (HCI), others see “interaction” as referring to ‘the way in which we interact with products and systems in general’ (Hallnäs 2011, p. 75). This shift from an HCI-based view to a more generalised one resulted in a new approach to design – designing how one interacts with the object, rather than the object itself. Doing so, however, inevitably affects (and sometimes becomes) the object’s design. As the concept of ‘designing the acts that define the intended use of things and systems’ started to spread to other design disciplines, interaction design began to include products other than ‘computer interfaces and computational devices’ (Hallnäs 2011, p. 75).

At the same time, the growth and evolution of interaction design also produced offshoots in the form of an array of new disciplines such as information design, experience design, media design, amongst others (Thomassen & Ozcan 2010, p. 850).

Experience design (XD) and user experience design (UXD or UED)

Arguably, the design of experiences has been around since experiences were recognised as such (Shedroff 2001, p. 2). As a discipline, however, it is fairly new and its origins are hazy. One of the earliest references to experience design can be found in a 1998 *Harvard Business Review* article titled 'Welcome to the Experience Economy', where authors Pine II and Gilmore write that they 'expect experience design will become as much a business art as product design and process design are today' (p. 102). The newness of experience design as a discipline means its definition is still open to interpretation and negotiation (Jensen 2013; Shedroff 2001). For better or worse, a formal definition is lacking, an issue Jensen (2013) tries to address. He offers a comprehensive and detailed look at 'the concepts and fields of user experience, experience design and user-experience design in order to account for their origins and meaning, to outline their interaction with one another and their interaction with other fields and concepts and to find a common understanding and definition' (Jensen 2013, p. 183).

One major point of contention when it comes to the definition of experience design is whether it is simply 'a field for digital media' or whether it more broadly refers to the collective array of design fields involved in the design of an experience. (Shedroff 2001, p. 2) Despite the lack of clarity surrounding its definition, experience design has come into its own. This can be attributed, in large part, to the emergence of what Hassenzahl (2013) calls 'a version of the Experience Society'. Oppelaar et al. (2008 cited in Jensen 2013, p. 180) write that while the 20th century was focused on products, the 21st century is focused on experiences. This emphasis on experiences is likely a manifestion of 21st century postmaterialism. One might say 21st century postmaterialists are the essence of Hassenzahl's (2013) Experience Society, whom he depicts as favouring 'deceleration instead of acceleration, less instead of more, uniqueness instead of standardisation, concentration instead of diversion, and making instead of consuming'.

According to Hassenzahl (2013), 'The challenge of designing interactive products for the post-materialist is to bring the resulting experience to the fore – to design the experience before the product.' Instead of the Modernism's form follows function or Postmodernism's form over function, the underlying principle of experience design is form and function follow experience. As Hassenzahl (2013) explains, 'Experience Design wants the Why, What and How to chime together, but with the Why, the needs and emotions, setting the tone.'

The term “user experience” (UX), on the other hand, started out as a mere ‘buzzword in the field human-computer interaction (HCI) and interaction design’ (Hassenzahl & Tractinsky 2006, p. 91), and has grown and evolved to become a design discipline in its own right. Peter Merholz (1998), founding partner of experience design consultancy Adaptive Path, looked at the origin of the term “user experience”, tracing it to a 1995 CHI proceedings paper by user-centred design proponent Donald Norman, who co-wrote it with Apple colleagues Jim Miller and Austin Henderson. Merholz subsequently emailed Norman about his use of the term, whereupon Norman replied:

> I invented the term because I thought Human Interface and usability were too narrow: I wanted to cover all aspects of the person's experience with a system, including industrial design, graphics, the interface, the physical interaction, and the manual.
>
> Since then, the term has spread widely, so much so that it is starting to lose its meaning. (Merholz 1998)

Fast forward to the present and the need for clarification with regard to meaning is just as applicable today. Oddly, despite experience design emerging from a move to combine multiple – digital and non-digital – design disciplines as part of a holistic approach and the term “user experience” originating from HCI and interaction design, the general consensus among academics and industry seems to be that user experience design is a subset of experience design (Jensen 2013; Paluch 2006). More precisely, experience design aims to create a holistic experience through the design of products, services and environments, focusing ‘especially on the interaction models and architecture’ (Jensen 2013, p. 201), while user experience design specifically applies to computer-related products (Paluch 2006). Jensen (2013, p. 202) further clarifies this, saying: ‘user experience and user-experience design are linked exclusively to interactive digital media or technologies’.

Interactive design and interactivity design

The word “interactive” has been bandied about for a while now, and features in one of the more recent contributions to the terminology mishmash: interactive design. Interactive design has been used as an abbreviation of interactive media design, which in turn, refers to the design of digital media that is interactive such as websites

and video games (as opposed to digital media that isn't, like e-books and MP3s). Interactive design has also been used interchangeably with interactivity design (Crawford 2002). Even tertiary institutions teaching interactive design use the term interactive design differently (Capilano University 2014; Kanbar College of Design, Engineering and Commerce 2014; Maryville University 2014; School of Interactive Design 2014; University of Lincoln 2014).

Interactive design is also confused with interaction design. A Google search for "interactive design" generates approximately 183,000,000 results and funnily enough, the first result is the Wikipedia entry for "Interaction design". (It is followed by the Wikipedia entry for "Interactive design" which, incidentally, contains a section titled 'Interactive Design Compared to Interaction Design'.) One source of the confusion comes from the use of "interactive" by 'ad agencies and other traditional (pre-online) entities as they branched into multimedia and eventually the web' (Crumlish 2010; Korman 2010; Silvers 2010). Within industry, it seems, interactive design refers to the design of interactive digital media including, but not limited to, websites, video games and mobile applications (Capricorn Digital 2014; HOW Design Live 2014; Moré 2014).

Mapping relationships

Others have tried to map the relationships between various design disciplines (Garrett 2003; Saffer 2009). Garrett's (2003, 33) model of the elements of user experience consists of five planes (surface, skeleton, structure, scope and strategy) and features visual design on the surface plane; interface design, information design and navigation design on the skeleton plane; and interaction design and information architecture on the structure plane. Saffer (2009) maps the disciplines of user experience design using a complex Venn diagram.

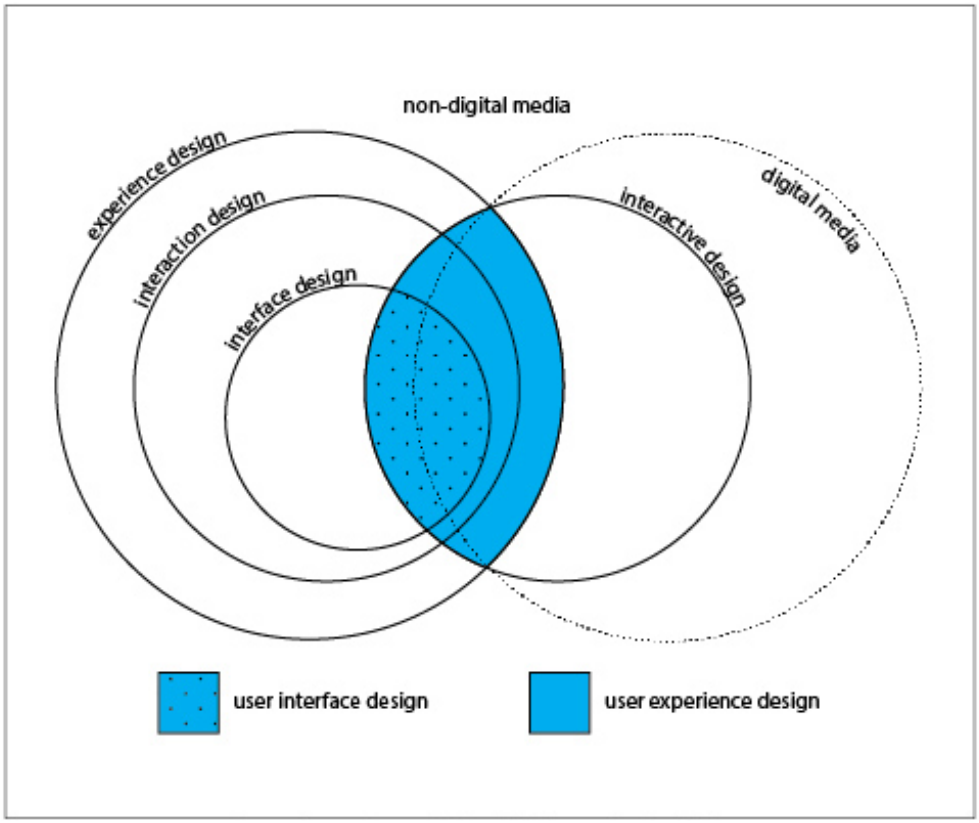

Figure 1. Proposed map of relationships between design disciplines

Figure 1 shows a proposed map of the relationships between the six design disciplines discussed in this paper. Like Saffer (2009), it uses a Venn diagram style. The map shows the overlaps between the six design disciplines themselves in both digital and non-digital contexts. As shown, although interface design and interaction design emerged from the field of human-computer interaction, today these design disciplines have expanded to include the design of non-digital interfaces and interactions. As a discipline, experience design can be said to be all-encompassing, being both multidisciplinary and interdisciplinary. However, user interface design and user experience design, as well as interactive design, are generally seen as applying only to digital media.

Other than their relatively short existence and their rapid, ongoing evolution, these design disciplines share another thing in common: interactivity.

Interactivity

Research on interactivity has grown exponentially since the 1990s and can be found across a wide range of disciplines, from media to education (Koolstra & Bos 2009). Downes and McMillan (2000) observe that the word “interactivity” is used

indiscriminately in both popular and scholarly literature and there are ‘few or no attempts to define it’, while existing definitions are ‘often contradictory’ (p. 158). Downes and MacMillan (2000, p. 159) acknowledge the difficulty in narrowing interactivity to a single definition. Many researchers agree, however, that interactivity should involve some kind of two-way exchange or dialogue (Crawford 2002; Downes & MacMillan 2000, p. 167; Quiring 2009, p. 901).

Evidence of a two-way dialogue can be seen across all six design disciplines discussed in this paper: interface design, user interface design, interaction design, experience design, user experience design and interactive design. The two-way dialogue in interface design can occur between humans and computers, or between the software and hardware in computers, as can be seen in Cramer’s ‘systematics of computer interfaces’ (Cramer 2011, pp. 118-119). Being a subset of interface design, user interface design also involves two-way dialogue, however the dialogue occurs primarily between humans and computer software.

Interface design, in turn, is situated within interaction design, suggesting that two-way dialogue exists within interaction design as well. The Interaction Design Association states:

> Interaction Design (IxD) defines the structure and behavior (sic) of interactive systems. Interaction Designers strive to create meaningful relationships between people and the products and services that they use, from computers to mobile devices to appliances and beyond. (Interaction Design Association 2014)

The creation of ‘meaningful relationships’ would suggest that a two-way dialogue does feature in interaction design, which therefore suggests that interactivity is a characteristic of interaction design. However, must the two-way dialogue occur between humans and computers/devices, or can it also include two-way dialogue between two or more humans that is facilitated by computers/devices? The 21 Swings installation in Montréal is a set of 21 musical light-emitting swings that is an example of the latter. Each swing produces a different coloured light and a pre-recorded sound from the others, and if ‘swung in unison with careful cooperation, more complex melodies and harmonies arise’ (Jobson 2012). Here, the two-way dialogue does not occur between an individual user and his or her swing, but between the different users of the swings. If interactivity is present in this instance,

would it then be present where the architectural design of a building facilitates interaction between the people within the building, and does the presence or absence of digital technology in the building design have any influence on its interactivity?

Sohn (2011) shares similar concerns. He states that interactivity 'has been the most popular term used for contrasting new media with traditional mass media' (Sohn 2011, p. 1320) but questions whether by calling new media 'interactive', we are simultaneously saying traditional media is 'non-interactive': should a website 'be considered interactive just because it has things to *click*?' (Sohn 2011, p. 1321, emphasis in the original) Sohn (2011) suggests that interactivity 'needs to be expanded beyond specific media or contexts (e.g. the internet) to reflect a more general communication experience' and should start from a 'common experiential domain – *what constitutes a person's perceptual experience of interaction,* namely *perceived interactivity* – rather than focusing on fast-changing technologies' (p. 1321).

An expanded definition of interactivity (or rather, perceived interactivity) is particularly important in experience design. Using the two-way dialogue to determine interactivity in experience design seems straightforward, since it encompasses interaction design, and as user experience design is a subset of experience design, the same can be said for it as well. However, traditional media forms of experience design may not meet this method of determining interactivity. Here, Sohn (2011) provides valuable insight: interactivity should not be related to 'the technological capability of a particular medium' (pp. 1321-1322), nor should it be defined by users' perception of its features (p. 1322).

Sohn also challenges the notion of two-way dialogue, where the two parties to exchange at least three messages with each other, with the third message referring to one or both of the previous two (Walther et al. 2005, cited in Sohn 2011, p. 1323). He points out that the concept of the two-way dialogue 'limits the scope of interactivity only to a one-on-one interaction form' and does not take into account situations where more than two parties communicate with each other and 'messages are exchanged in an indirect, multi-directional way' (Sohn 2011, p. 1323). He suggests viewing interactivity as the product of 'any interaction involving humans, whether direct or mediated' and that interactivity should consist of three distinctive dimensions: sensory, semantic and behavioral (Sohn 2011, p. 1325).

Such an approach would allow a richer examination of interactivity as it occurs in experience design, as well as other disciplines. It is hoped that this paper has opened the door to further academic research relating to this topic, and thus advance our understanding of interactivity in the worlds we inhabit, both real and virtual.

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