



Investigating users' intuitive interaction with complex artefacts

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ABSTRACT

This paper examines the role of intuition in the way that people operate unfamiliar devices. Intuition is a type of cognitive processing that is often non-conscious and utilises stored experiential knowledge. Intuitive interaction involves the use of knowledge gained from other products and/or experiences. Two initial experimental studies revealed that prior exposure to products employing similar features helped participants to complete set tasks more quickly and intuitively, and that familiar features were intuitively used more often than unfamiliar ones. A third experiment confirmed that performance is affected by a person's level of familiarity with similar technologies, and also revealed that appearance (shape, size and labelling of features) seems to be the variable that most affects time spent on a task and intuitive uses during that time. Age also seems to have an effect. These results and their implications are discussed.

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1. Introduction

In general parlance, in advertising and in academic papers (e.g. Frank and Cushcieri, 1997; Rutter et al., 1997; Thomas and van-Leeuwen, 1999), the terms “intuitive interaction” or “intuitive use” have been commonly used. However, there was previously no agreed definition of intuitive use and no experimental work to establish how it might work. The present authors aimed to de-mystify “intuitive use” or “intuitive interaction” and establish how it could be applied to new products in order to make them easier to use.

In order to achieve this aim it was necessary to base the research on a theoretical foundation which includes an understanding of the nature of intuition itself and how it relates to use of products and interfaces, and to empirically test that understanding in order to see how it can best be applied to design. This paper discusses the definition and operation of intuition. Based on this understanding of intuition, a definition of intuitive use or intuitive interaction is presented. Three experiments investigating intuitive interaction are described and findings and recommendations discussed.

1.1. Intuition

This section will briefly review the literature in relation to the main properties of intuition: prior experience, non-conscious

processing, speed, individual differences, and correctness. A much more in-depth discussion can be found in Blackler (2008).

1.1.1. Prior experience

This research is grounded in the underlying assumption that intuition is based on past experience. Much research suggests that intuition relies on experiential knowledge (Agor, 1986; Bastick, 2003; Bowers et al., 1990; Cappon, 1994; Dreyfus et al., 1986; Fischbein, 1987; King and Clark, 2002; Klein, 1998; Laughlin, 1997; Noddings and Shore, 1984). Intuition depends on using experience to recognise patterns that indicate the dynamics of a situation. It relies on implicit memory and “grows out of experience” (Klein, 1998, p34). People draw on memory for large sets of similar incidents, not one specific instance, which may be why they are not aware that intuition comes from their own experience. Described in this way, intuition does not seem as mysterious as some people may at first assume (Klein, 1998).

Bowers et al. (1990) propose that intuition involves memory and experience in judgement and problem solving; clues activate relevant networks in memory, thereby guiding thought to some hypothesis or insight. Bastick (2003) concurs that if something has been experienced before, it will be intuitively recognised. Noddings and Shore (1984) found that intuition does seem to manifest itself in familiar domains, and that people most knowledgeable in an area are those who have the most frequent and the most reliable intuitions. One could interpret their finding as suggesting that this is because those with most knowledge on a topic have a larger store of information for intuition to access.

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Dreyfus et al. (1986) claim that people use intuition all the time in everyday tasks and that it is not wild guessing or supernatural inspiration. To guess is to reach a conclusion when one does not have sufficient knowledge or experience to do so, whereas they equate use of intuition with having expectations, which are associated with remembered situations. Intuition, they believe, plays a role in the human ability to make sense of an environment which is potentially infinitely complex. This dependence of intuition on previous experience is often not recognised by the general public, and many lay people may assume intuition is instinctive or innate (Cappon, 1994).

The intuitive process integrates the information that one already has with what is perceived by the senses, and new associations between these various pieces of information produce insights, answers, recognition or judgements (Bastick, 2003). Boucouvalas (1997) suggests that intuitive knowing may have different origins, for example the memory or the senses. An optimum intuitive solution will have the most attributes in common between the fewest elements or, in other words, be a good match between stored experience and the current perceived situation (Klein, 1998). Thus, intuition uses a combination of existing knowledge and the perceived situation to rapidly generate answers.

Klein (1993) introduced the Recognition Primed Decision (RPD) model, a model of naturalistic decision making that describes how experienced people make rapid decisions in real situations. He asserts that the decision is primed by the way the situation is recognised. In his field studies involving fire commanders, he found that for many of them their vast experience had enabled them to merge individual cases and to be able to use a judgement of familiarity or prototypicality that would not be present with the retrieval of an individual case (Klein, 1993). Because the RPD model is based on decision makers using their existing experience, Klein (1998) sees it as a model of intuition.

Rasmussen (1993) developed the Skill–Rule–Knowledge (SRK) model of task performance. This model helps to explain how intuition plays a role in cognition. According to the model, people operate on one of the levels, depending on the nature of the task and their degree of experience with the situation. Highly experienced people will process at the skill-based level. This is non-conscious, automatic processing. Those familiar with elements of tasks but lacking extensive experience will be processing at the rule-based level. The rules are if–then associations between cue sets and the appropriate actions. When the situation is novel, decision makers will have no rules stored from previous experience to call on. They will therefore operate at the knowledge-based level, which is analytical processing using conceptual information. According to the SRK model, in a real-world context, a person might operate at the knowledge-, rule- or skill-based level and will switch between them depending on task familiarity.

Wickens et al. (1998) equate rule-based with intuitive processing, which separates intuitive from automatic processing. During intuitive rule-based processing there is more active cognitive processing than for automatic skill-based processing, as the person must consider a variety of cues. Which of these processing strategies people are most likely to use depends on the specific domain or job, level of expertise, amount of time and amount of uncertainty (Wickens et al., 1998). Klein (1993) also found that analytical strategies were often used by decision makers with less experience.

Importantly, the SRK model accords with the idea that intuitive processing is based on experience, and that different features of the environment can be processed differently depending on the perceiver's experience. It suggests a three strand or continuum model

of cognition, with intuition somewhere in the middle and analysis and automatic processing at each end.

1.1.2. Non-conscious processing

Despite the fact that many mental processes are undoubtedly unconscious or subconscious (Vera and Simon, 1993), the notion that information processing can occur outside consciousness has a long and controversial history (Baars, 1988; Dorfman et al., 1996). More recently, however, the idea that mental structures, processes and states can influence experience, thought and action outside of awareness and voluntary control has been more widely accepted (Baars, 1988; Dorfman et al., 1996). The existence of non-conscious processes is no longer questioned, although there is no uniform agreement about how sophisticated these processes are (Eysenck, 1995). Freud's version of the unconscious is full of emotion and negativity; actually, unconscious processing is less strange and more useful than he believed (Eysenck, 1995).

It has been argued that the reasoning process is not in evidence when intuition is used as the cognitive processing takes place outside the conscious mind. Many researchers agree that the understanding or knowledge required during the intuitive process is retrieved from memory during non-conscious processing (Agor, 1986; Bastick, 2003; Bowers et al., 1990; Cappon, 1994; Dreyfus et al., 1986; Fischbein, 1987; King and Clark, 2002; Laughlin, 1997; Noddings and Shore, 1984). People processing intuitively would often be unable to explain how they made a decision because it was based on stored memory associations rather than reasoning *per se* (Wickens et al., 1998). Bastick (2003) claims that the intuitive process could be non-conscious except for some of the sensations or guiding feelings of which the person must become consciously aware.

Remembering without awareness may operate in an early passive phase of processing that is involved in a variety of tasks, and Jacoby and Witherspoon (1982) claim that the judgement or processing that one remembers comes after this passive form of remembering. Eysenck (1995) suggests that people are "unaware of their unawareness" (p183) and imagine that consciousness covers a much larger ground than it actually does. He emphasises that the results and not the processes of thinking appear in consciousness, and sees intuition as a function of non-conscious processes.

Implicit learning is a process whereby knowledge of a complex environment is acquired and used largely independently of awareness of either the process of acquisition or the nature of the knowledge acquired (Reber, 1992). Reber presents intuition as the end product of an implicit learning experience. Implicit (or experiential or unintended or unnoticed) learning forms implicit or tacit knowledge, which allows processes based on experiential knowledge, like intuition, to operate. Reber et al. (1991) claim that tacit knowledge is practical, informal, and usually acquired indirectly or implicitly. It does not lend itself to being directly taught and is the type of knowledge used for success in most real-world settings.

Bowers (1984) claims that perception and consciousness of stimuli are different, and that it is selective attention that transforms perception into consciousness of what is perceived. For this case he uses the term *noticed*. Information can be perceived without being noticed, but not vice versa. The threshold for noticing a stimulus is higher than the threshold for perceiving it, so whether or not something is noticed can depend on involvement in alternative activities. Bowers (1984) argues that there are two generic modes of non-conscious influences: those that go unnoticed, and those that are unappreciated as influences. The distinction between perceiving and noticing allows these two modes. Information perceived but not noticed is not likely to be processed

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